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ABSTRACT BOOKLET

Sponsored by: Biosense Medical

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Keynote Guest Lecture

Multisensory Vestibular Cortex in Humans

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ABSTRACTS

Motor Performance and vestibular function in children diagnosed with congenital cytomegalovirus (cCMV) Infection or connexin 26 (Cx26) mutation

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Objective

CMV infection is the leading non-genetic non-syndromic cause of congenital sensorineural hearing loss (SNHL), whereas Cx26 mutations are the most frequent cause of genetic non-syndromic congenital SNHL. Hearing impaired children are at risk for vestibular damage and delayed motor development. The impact of cCMV and Cx26 on vestibular and motor function has not been investigated thoroughly and was, therefore the purpose of this study.

Methods

Forty children (mean age 6.7 months; range 4.8 - 8.9 months) were divided into five age-matched groups: normal hearing control, asymptomatic cCMV, and hearing impaired Cx26. Children were examined with the Peabody Developmental Motor Scales-2 and cervical vestibular evoked myogenic potential test.

Results (summarized)

Hearing impaired symptomatic cCMV children demonstrated a significantly lower gross motor performance compared to the control group (p=0.001) and Cx26 group (0.005). A second analysis demonstrated that the weakest motor performance was observed in those children with absent cVEMP responses.

Conclusion

The weak gross motor performance of hearing impaired cCMV-infected children is related to abnormal saccular function examined by the cVEMP and emphasizes the importance of vestibular and motor function testing in order to start the appropriate rehabilitation programs.

Are White Matter Abnormalities associated with "Unexplained Dizziness"?

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Introduction

Although cerebral small vessel disease is a significant contributor to the development of imbalance and falls in the elderly, whether it causes dizziness is not known.

Methods

A retrospective case analysis was conducted for 125 dizzy patients referred to two neurootology tertiary centres in London and Pisa. Patients were divided into 'explained' causes of dizziness (e.g. benign positional vertigo, vestibular neuritis, orthostatic hypotension, cerebellar ataxias) and 'unexplained' causes of dizziness. White matter hyperintensities (WMH) in MRI (T2 weighted and FLAIR) were blindly rated according to the Fazekas scale.

Results

61 patientss (mean age = 72, SD=7.95 years) in the *'unexplained'* group and 64 (mean age =72.01, SD=8.28 years) in the *'explained'* group were recruited. The overall frequency of lesions (Fazekas 1-3) differed between groups (p=0.015). The frequency of severe lesions (Fazekas 3) was significantly higher in the *'unexplained'* group (21%) than in the *'explained'* group (5%; p=0.005).

Conclusions

Increased severity of WM abnormalities in cases of unexplained dizziness suggests that such abnormalities are likely contributory to the development of dizziness. WM lesions may induce dizziness either because patients perceive a degree of objective unsteadiness or by a disconnection syndrome involving vestibular or locomotor areas of the brain.

Multisensory conflict is associated with activity in posterior insular cortex

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The brain combines visual and vestibular information to distinguish between self- and world-motion. In this study we used functional magnetic resonance imaging to explore human brain activation when visual and vestibular cues were complementary or in conflict. We combined a horizontally moving optokinetic stimulus (OKS) with a caloric irrigation of the right ear to produce cognitions where the vestibular activation and visual motion would indicate the same (congruent) or opposite direction of self-motion (inconguent). We found that visuo-vestibular conflict was associated with increased activation of the left posterior insular cortex. In the congruent condition there was increased activation in primary and secondary and visual cortex. Visual dependency and subjective or objective measures of the intensity of the vestibular activation were not predictive of individual differences in activity within these regions. These findings sugest that when there is conflicting information regarding self-motion there is preferential activation of vestibular areas to resolve the ambiguity, whereas when the sensory cues for self-motion are congruent there is a bias towards

the visual activation. These data support the view that posterior insular cortex may play an important sensory-reweighting role in a network of regions responsible for integrting and disambiguating visual and vestibular cues for self-motion perception.

Comparison of different electrode configurations for the oVEMP with bone-conducted vibration

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Objective

This study was performed in order to determine if there are better electrode configurations (sternum and nose) for the oVEMP measurements than the standard electrode.

Methods

Fourteen healthy subjects participated in both parts of the study. oVEMPS were recorded making use of a hand-held bone-conduction vibrator (minishaker – 500Hz tone bursts – stimulus intensity level of 140 dB FL).

Results (summarized)

The n10-p15 amplitude obtained with the standard electrode configuration (mean – 15,8 µV) was significantly smaller than the amplitude measured with the nose (Z = -3,3; p = 0,001) (mean = 35,0 µV; sd = 19,1 µV) and sternum (Z = -3,3; p = 0,001) (mean = 27,1 µV; sd = 12,2 µV) electrode configurations. The 95% prediction intervals (given by the mean ± 1,96* sd) for the different inter-ocular ratio (IOR) values were [-41,2; 41,2], [-37,2; 37,2] and [-25,9; 25,9] for standard, sternum and nose electrode configuration. Based on the obtained results, we recommend the nose electrode configuration for further oVEMP measurements.

Comparisons between caloric testing, rotating chair, head impulse and peripheral posturography tests after acute unilateral peripheral loss: Dependence on recovery and central compensation

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Background

Acute unilateral peripheral vestibular deficit (aUPVD) patients have asymmetries in vestibular ocular reflexes (VOR) that improve over time. The question arises how much of the VOR improvement is due to peripheral recovery and central compensation, further, whether differences in peripherap recovery influence VSR function in balance tests.

Methods

30 patients were examined at onset of an aUPVD and 3, 6 and 13 weeks later with 4 different VOR tests. VOR responses of 9 patients who had a canal paresis (CP) value of 90% or more showed no recovery

compared with those of 11 patients with CP recovery to less than 70%. Balance control in the form of trunk sway was also measured with a gyroscope system (SwayStar) for several stance and gait tasks.

Results
There was a reduction of VOR response asymmery over time for both recovery (RCV) and no-recovery (no-RCV) patients. However the reduction was less for the no-RCV patients. At 13 weeks the no-RCV asymmeteries were greater than those of RCV patients who had normal asymmetries. The asymmetries were caused by weaker than normal responses for rotations to the deficit side which remained deficient in no-RCV patients at 13 weeks. For all balance tests there was on a slight increase in sway for no-RCV patients compared to RCV at aUVL onset and 3 weeks later, but at 13 weeks there were no differences. Only walking with eyes closed showed differences in improvement over time.

Conclusions
Central compensation is observed in both RCV and no-RCV patients and consists of increased deficit side responses. However peripheral recovery appears necessary to reduce asymmetry to normal. Balance control improvement is independent of peripheral recovery. For this reason balance control needs to be tested separately.

VOR Gain in the Abducting versus Adducting Eye during vHIT: a Tale of Two Cameras

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Video head impulse testing (vHIT) has recently evolved as a clinical research tool for evaluation of high-velocity vestibulo-ocular reflex function. Currently, two infrared goggle systems and one remote camera system calculate head velocity/eye velocity gain from a single eye regardless of abduction or adduction. A fourth system utilizes two cameras that can analyze both eyes in both directions. In this study, we were interested to investigate potential differences in gain as related to medial-to-lateral or lateral-to-medial eye movement using the dual camera goggles.

We analyzed vHIT gain for both eyes in 17 normal subjects (ages 30-82 years, mean 53) during both abduction and adduction movement. Using multiple comparison tests, we found a significant difference between adduction gain (1.05, 0.02 SE) and abduction gain (0.95, 0.02 SE) ($t=3.56$, $p<.05$). This difference remained significant after controlling for center-to-side and side-to-center performance of the head impulse.

Conclusion: vHIT gain is significantly higher in the adducting versus abducting eye during vHIT and may be a confounding factor during clinical testing if only a single eye is analyzed for both leftward and rightward head impulses. Further studies are underway in subjects with unilateral dysfunction to evaluate the extent of this phenomenon on identification of pathologic gain asymmetry.

Visuo-Cortical Adaptivity in Bilateral Vestibular Failure

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Background
Bilateral vestibular failure (BVF) inducs intense oscillopsia (due to loss of the vestibulo-ocular reflex), which diminishes with central compensation. We wondered if this improvement in oscillopsia is mediated by changes in visual cortex (V1) excitability and investigated the effects of visual motion adaptation (using optokinetic stimuli) on this. We proposed that constant exposure to visual motion and subsequent central adaptation may show a reduction in the perception of TMS-elicited phosphenes following visual motion adaptation.

Methods
Single pulse TMS was applied at V1 in 12 BVF patients and 12 controls and phosphene threshold was estimated. Phosphene perception was recorded during motion, prior to and following the adaptation phase and phosphene probability calculated offline. All subjects completed oscillopsia scale questionnaires.

Results
Baseline phosphene thresholds were significantly higher in patients with BVF ($p=0.02$). There was a significant decrease in phosphene probability between baseline threshold and motion in patients ($p=0.007$). There was no significant interaction effect between groups and conditions ($p=0.13$). Lower oscillopsia scores correlated with reduced baseline visual cortical excitability ($p=0.013$).

Conclusion
Increased baseline phosphene thresholds (reduced visual cortical excitability) in BVF support clinical observations of reduced visual motion perception and correspond with a better functional level. These findings provide evidence for adaptive visuo-cortical mechanisms following BVF.

Living with Meniere's disease: Understanding Patient Experiences of Mental Health and Wellbeing

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Aims
This presentation will discuss how people experience and adapt to the onset and progression of Ménière's Disease in the context of their everyday lives. It draws on the findings of a mixed-method exploratory project examining the mental health impacts of this long-term progressive inner ear disorder.

Methods
Findings emerging from the second project phase will be presented, involving 20 in-depth interviews with Ménière's patients at different stages of the condition and 10 interviews with family members identified by each patient as being central to their everyday management of the illness. Narrative analysis of the interview data offers insights into how each participant's sense of self and personal life trajectory shape their experiences of the illness over time.

Conclusions
Findings suggest that Ménière's adversely impacts on patients' mental health, emotional state and life satisfaction, particularly during periods of recurrent vertigo attacks and with the onset of bilateral hearing loss. Participants emphasised the value of public awareness and supportive social relations, and the need for shared efforts to understand and adapt to the condition, despite its often distressing, unpredictable progression.

A Survey of Physiotherapists' Current Management of Benign Paroxysmal Positional Vertigo (BPPV) in the United Kingdom (UK)

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Introduction

Extensive research outlines the epidemiology (1) and management of different sub-types of BPPV (2-8). Despite international guidelines for education and practice in Vestibular Rehabilitation (VR) (9) and an international survey of therapists (10), little is known about the practice in the UK.

Methods

An electronic questionnaire was emailed to physiotherapists interested in VR, to explore if current practice is in line with evidence-base. Data (n=80) was analysed descriptively and by non-parametric tests. Open-text answers were analysed using evidence-based content analysis with a total awareness score calculated.

Results

Evidence-based awareness was highest for posterior BPPV (assessment 99%, treatment 90%) with horizontal BPPV awareness mixed (assessment 46%, treatment 75%). Differential diagnosis was poor (subjectively 25%, objectively 43%) with all three characteristics of nystagmus described by just 29%. Only 36% were able to list three or more test precautions. 81% provide advice on activity restrictions after treatment.

There was a trend for years' of experience correlating to evidence-based awareness (r_s=0.212 p=0.061). Working in a specialist vestibular service enhanced evidence-based awareness (p=0.072 median difference 1 point) but working in a team did not (p=0.547 median difference 0.5 point).

Recommendations included: more external courses (26%), competency guidelines (15%), introduction to VR at undergraduate level (16%) and postgraduate modules (5%).

Only 28% of participants were aware of existing practice guidelines or Cochrane reviews in BPPV management.

Conclusions

Physiotherapists demonstrate varying awareness of research evidence for BPPV management. Access to peer support, training and other educational resources were recommended in order to achieve knowledge translation. Changes to academic programs and the development of UK endorsed practice guidelines or competency training protocols are suggested.

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Diagnosis and Management of Drop Attacks in Meniere's disease

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Introduction

In 1936, Tumarkin1 first described sudden falls/drop attacks in patients with a peripheral vestibular syndrome and speculated that these falls resulted from a mechanical deformation of the otolith organs.

Objectives

To describe drop attacks and their management in 12 Menière's patients.

Methods

The criterion for inclusion were both:

- the occurrence of at least one sudden falls without loss of consciousness or associated neurological symptoms
- and a definite Menière's disease according to the criteria of the American society2

Results

Twelve patients had sudden falls in Menière's disease that could be complicated either by severe head trauma (n=1) or various fractures (nose, wrist…) (n=4). Interestingly, 7 patients complained of vertigo or dizziness after the fall. The follow up was favorable in all patients, spontaneously (n=6), after chemical labyrinthectomy (n=5) or vestibular neurotomy (n=1).

Conclusions.

Sudden fall in Meniere's disease is an impressive phenomenon with a high risk of traumatism. This risk is an argument for chemical labyrinthectomy, alternatively vestibular neurotomy, although spontaneous remission is possible. From a physiopathological point of view, the occurrence of vertigo or dizziness after the fall would suggest that the mechanism initially limited to the otolith system could spread to the semicircular system.

Références.

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The Effect of Age on Improvements in Balance Control after Acute Unilateral Peripheral Vestibular Loss

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Background
Acute unilateral peripheral vestibular loss (aUVL) causes balance problems. As pre-existing sensory loss is greater in the elderly, improvements vestibular-ocular (VOR) and balance function over time after aUVL could be less for the elderly than for the young, we investigated possible differences due to age.

Methods
30 aUVL patients were included (8 mean age 28.1, 10 mean age 51.4, 12 mean age 65.7 years). To test horizontal VOR function caloric irrigation, rotating chair and head impulse tests were used. To measure balance control 7 stance and 7 gait balance tests were performed. A gyroscope system (SwayStar™) was mounted at lumbar 1-3 to measure trunk angle and velocity. Measurements were performed at onset of the deficit, and 3, 6, and 13 weeks later.

Results
There were no differences in changes in VOR between the age groups. Differences were seen in balance recovery amplitudes for stance and walking eyes closed because the young were less and the elderly more affected at onset. Sway for stance and gait tests was different from healthy controls for the elderly at onset and at 13 weeks, but not for the young.

Conclusions
These results indicate that VOR recovery of an aUVL is not different between young and elderly. Recovery rates are different between age groups for balance control tests without vision. Crucially, balance control in the elderly is more abnormal (with respect to healthy controls) for stance and gait with the remaining abnormalities after 13 weeks. Thus balance in the elderly is more affected by the UVL whereas the young overcome balance deficits rapidly.

Cortical Reorganization in an Astronaut's Brain after Long Duration Spaceflight

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Introduction and Aim
To date, hampered physiological function after exposure to microgravity has been primarily attributed to deprived peripheral neuro-sensory systems. However, to our knowledge, no MRI-based neuroimaging study has yet been performed to assess neuronal function in space-travelers.

Materials and Methods
A male cosmonaut (44y) who had his first long-duration mission to the ISS was scanned with a functional MRI protocol twice: preflight (30days) and postflight (9 days upon return). During both assessments, the cosmonaut had a scanning session in a resting condition and a session while executing active mental imagery tasks. A group of matched healthy controls was included to account for data variance.

Results
There was reduced connectivity in the right insula ($P_{FDR}<0.05$ cluster-level) and ventral posterior cingulate cortex ($P_{FDR}<0.05$ cluster-level) postflight. Network-level functional connectivity changes showed a reduced connectivity in the precentral gyrus and the postcentral gyrus postflight.

Conclusions

These results highlight the underlying neutral basis for the observed physiological deconditioning due to spaceflight and indicate alterations in vestibular and motor-related regions. These dysfunctions can account for reduced vestibular function and motor control abilities at re-entry. Understanding this is pivotal for the development of adequate countermeasures and may have clinical relevance, e.g. for vestibular and immobilized patients.

Vertigo Induced by Downhill Mountain Biking and Road Cycling

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Vertigo has been described after the practice of mountain bike. This study aimed to investigate the prevalence of vertigo following competitions or training sessions of downhill mountain biking (DMB) or road cycling (RC). One hundred and two DMB riders, 79 road cyclists and 73 control participants filled in a survey intended to evaluate the prevalence of vertigo in daily living activities and following competitions or training sessions. Vertigo causal factors (crashes, head trauma, fatigue, characteristics of the path/road ridden) were recorded. DMB riders had more risk to report vertigo than age-matched road cyclists (OR: 5.06, 95% CI: 1.23-20.62). Road cyclists aged between 20 and 29 were 2.59-fold (95% CI: 1.06-6.27) more likely to report vertigo than controls. After competitions and training sessions, DMB riders were 2.33-fold (95% CI: 1.22-4.41) more likely to report vertigo than road cyclists. Vertigo causal factors were crash with head trauma in DMB riders and fatigue in road cyclists. The accumulation of impacts (crashes, vibrations) during the career of a DMB rider may generate micro-traumatisms of the central nervous system and/or peripheral vestibular structures (otolith) organs. To avoid injuries, DMB riders should be aware that vertigo may occur at the end of training sessions or competitions.

Electro-Cortical Therapy for Motion Sickness

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Introduction

In light of the increasing popularity of immersive technologies and complex motion environments, the prevalence of motion sickness is set to increase significantly. However, current behavioral and pharmacological therapies are somewhat ineffective (Golding & Gresty, 2005).

Aims

As an intact vestibular system plays a critical role in the development of motion sickness (Golding & Gresty, 2005), we investigate the potential therapeutic benefits from transcranial direct current stimulation (tDCS) used to suppress vestibular function (Arshad et al., 2014).

Methods

We used an off-vertical axis rotation (OVAR) protocol, in which subjects were seated in a motorized chair and were rotated in darkness. Twenty healthy subjects (10M; 10F) were randomly allocated into two age, sex and susceptibility matched groups. Both groups underwent an initial OVAR session during which they were given SHAM-stimulation only. Time taken to self-report: 1) onset of symptoms 2) onset of moderate nausea and 3) self-recovery was recorded. Following a one-hour recovery period, a second OVAR session was performed with unipolar tDCS (either left-cathodal (i.e. test condition) or left-anodal (i.e. control)).

Results

Repeated measures ANOVA for cathodal tDCS stimulation with within-subjects factors: measurement (OVAR duration, first onset of symptoms and time to recovery) and condition (before tDCS, after tDCS) showed a significant interaction measurement*condition ($F= 9.48$, $df=2$, $p = 0.033$) (Figure 1).

Conclusion

Suppression of vestibular cortical function with cathodal tDCS results in subjects exhibiting enhanced tolerance for motion sickness. We propose this technique provides a novel approach for the future treatment of motion sickness.

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Keynote Guest Lecture

Long term outcomes of intratympanic steroid vs gentamicin in the management of Ménière's disease: first results of a major new RCT

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Bidirectional Modulation of Numerical Magnitude

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Numerical cognition is critical for modern life, however the precise neural mechanisms underpinning numerical magnitude allocation in humans remain obscure. Based upon previous reports demonstrating the close behavioural and neuro-anatomical relationship between number allocation and spatial attention, we hypothesised that these systems would be subject to similar control mechanisms, namely dynamic interhemispheric competition. We employed a physiological paradigm, combining visual and vestibular stimulation, to induce interhemispheric conflict and subsequent unihemispheric inhibition, as confirmed by transcranial direct current stimulation. This allowed us to demonstrate the first systematic modulation of numerical magnitude towards either higher or lower numbers, independently of either eye movements or spatial attention mediated biases. We incorporated both our findings and those from the most widely accepted theoretical framework for numerical cognition, to present a novel unifying computational model which describes how numerical magnitude allocation is subject to dynamic interhemispheric competition. That is, numerical allocation is continually updated in a contextual manner based upon relative magnitude, with the right hemisphere responsible for smaller magnitudes and the left hemisphere for larger magnitudes. Application of this methodology will allow us in the future to probe directly the role of numerical cognition upon human action and behaviour.

Perceptual Changes of "Self" Modulate Number Sense

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Numerical and spatial representations are proposed to be intertwined in the human brain. Previous research has shown that shifts in spatial attention alone or secondary to eye movements, lateral head turns or whole body rotations can modulate numerical cognition. Such modulation is in line with results that are predicted by the theoretical framework for numerical-spatial interactions. However, following spatial attentional shifts the perceptual component has not yet been delineated from the oculomotor component with respect to its subsequent impact upon numerical cognition. Accordingly, here we specifically assessed the effects that different perceptual states had upon numerical cognition, whilst controlling for eye movements. In the first experiment we implemented a visual motion stimulus (i.e. optokinetic stimulation).We observed a differential modulation of numerical cognition based upon the perceptual state of the subject. That is, if the perceptual state of *world-motion* was induced with the visual stimulus, rightward motion biased subjects towards smaller numbers, whereas leftward motion biased subjects towards larger numbers. However, when the perceptual state of *self-motion* was induced using exactly the same visual stimulus, subjects were biased towards larger numbers irrespective of the direction of the visual motion. In the second experiment we compared numerical cognition during vestibular activations that were

either perceived or subliminal. We found that changes in the perceptual state during vestibular rotations did not differentially modulate numerical cognition. Our results provide the first evidence that visually, but not vestibular mediated perceptual changes in self can modulate numerical cognition.

Right hemisphere dominance directly predicts the degree of top-down modulation exerted over low-level brain structures

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Right hemisphere dominance for visuo-spatial attention is characteristically observed in most right handed individuals, attributable to both an anatomically larger right fronto-parietal network and the presence of asymmetric parietal interhemispheric connections. It has previously been demonstrated that following interhemispheric conflict and subsequent left hemisphere inhibition, that the right hemisphere can modulate via top-down control mechanisms both the (i) excitability of the early visual cortex and (ii) induce suppression of the brainstem-mediated vestibular-ocular reflex (VOR). However, it remains unknown whether the extent of an individual's right dominance for visuospatial attention relates to the degree of top-down modulation exerted by the right hemisphere. We directly tested this by correlating line bisection error or pseudoneglect, as a measure of interhemispheric asymmetry with both (i) visual cortical excitability measured using single pulse occipital trans-cranial magnetic stimulation (TMS) to elicit phosphenes and (ii) the degree of trans-cranial direct current stimulation (tDCS) mediated VOR suppression following left hemisphere cathodal inhibition. We found that in those individuals with greater right hemisphere dominance (i.e. greater negative line bisection error) had a less excitable early visual cortex (i.e. higher TMS thresholds) and additionally demonstrated a greater degree of tDCS mediated suppression of vestibular nystagmus. In summary, our results provide the first demonstration that an individual's degree of right hemisphere dominance can directly predict the degree of top-down modulation exerted upon low-level brain structures.

Outcome Evaluation of the Dizziness Handicap Inventory in an Outpatient Vestibular Clinic

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BACKGROUND
The DHI is a widely used questionnaire for the evaluation of the self-reported handicap in patients with balance problems.

OBJECTIVE
To investigate the relationship between the DHI scores and demographic, symptomatic and diagnostic parameters.

METHODS
Retrospective study in 568 patients with balance problems.

RESULTS
We observed a total of 61.3% of patients with moderate (DHI total score between 30 and 59) to severe (DHI total score between 60 and 100) handicap. Patients with chronic complaints experience their self-reported

disability to a greater extent than acute patients. Moreover, patients suffering from continuous complaints have a larger than patients with shorter symptom duration. The first effect (acute vs. chronic) is primarily caused by emotional factors, the latter effect (symptom duration) is attributable to functional and physical factors, not to emotional aspects. Patients with daily and weekly complaints have larger DHI scores than patients who reported only one episode. Female patients reported larger DHI scores than males. We found no effect of age, diagnosed pathology or reported symptoms on the DHI scores.

CONCLUSIONS
The information retrieved from the DHI questionnaire is complementary to the information obtained from clinical investigation and diagnostic tests and therefore is an essential tool in a vestibular clinic.

Age at Onset of Meniere's disease in the Netherlands: No evidence for a forward shift in peak incidence

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Objectives
This study aimed to establish if the trend of a delayed age at onset of Menière's disease as reported for the Japanese population also occurs in the Netherlands.

Methods
We performed a retrospective data analysis of patients diagnosed with either 'definite' or 'possible' Menière's disease between January 2000 and December 2013. We used the diagnostic criteria of the American Academy of Otolaryngology-Head and Neck Surgery. Linear regression analysis was used to establish whether or not a linear relationship existed between the year of presentation and mean age at onset.

Results
Mean age at onset among the 469 patients was 54.0±14.0 years; 316 (71%) patients were diagnosed between the fifth and seventh decade of life. No trend towards a later onset of Menière's disease was found (ß=0.15; 95% confidence interval: -0.21 to 0.51;). The mean age at onset for 'definite' and 'possible' Menière's disease was 53.0±14.1 years and 55.9±13.5 years, respectively (mean difference 2.9 years, 95% confidence interval: -5.85 to -0.41).

Conclusions
Menière's disease has a peak incidence between 40 and 69 years. We did not find a trend for a late onset of Menière's disease. The age at onset was higher in patients diagnosed with 'possible' than in those with 'definite' Menière's disease.

Embodied Perspective-Taking Selectively Disrupted by Aberrant Self-Motion

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It has been shown that spatial perspective-taking involving imagined changes in one's spatial orientation is facilitated by vestibular stimulation inducing a congruent sensation of self-motion. We evaluated whether aberrant and conflicting vestibular stimulation could induce the opposite effect, i.e. impairing perspective-taking performance. Participants (N = 16) undertook either an "own body transformation" (OBT) task, requiring speeded spatial judgments made from the perspective of a schematic figure, or a control task requiring reconfiguration of spatial mappings from one's own visuo-spatial perspective. These tasks were performed both without and with aberrant vestibular stimulation by whole-body Coriolis motion, according to a repeated measures design, balanced for order. Vestibular stimulation impaired performance during the first minute post stimulus relative to the stationary condition ($p<.05$). This disruption was task-specific, affecting only the OBT task but not the control task. This disruption dissipated by the second minute post-stimulus. Our experiment thus demonstrates selective temporary impairment of perspective-taking by aberrant vestibular stimulation, implying that uncompromised vestibular resources are necessary for efficient perspective-taking. This finding is consistent with a vestibular input to multisensory processing underlying bodily and social cognition, and provides an account for the particular difficulties that patients suffering sudden vertigo may encounter navigating crowded social situations.

Can Balance Disorders Moderate Our Cognition? Creation and Validation of a New Questionnaire

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Vertigo affects up to 36% of the population (Gopinath et al., 2009). Patients with vertigo frequently complain of associated symptoms such as difficulties in attention, memory, space perception or mood. Currently, there is no satisfactory questionnaire to understand why some patients appear to have more symptoms than others. Instead, the majority of the current questionnaires focus on physical repercussions, impact on daily life or the mood disorders of the patient. In the present study, we created and validated a new internet-based questionnaire. The Neuropsychological Vertigo Inventory (NVI) evaluated seven different components of cognition: attention, memory, emotion, space perception, time perception, vision and motor abilities. Our aim was to investigate links between vertigo, and the physical, cognitive and emotional symptoms. We first tested the NVI on 212 participants (108 vertigo and 104 without), and analysed the validity of the questionnaire with Validation Confirmatory Analyses and Cronbach's Alpha. In the second phase, we performed exploratory analyses using the original data. This showed that there were no significant differences between the vertigo and non-vertigo participants for space and time perception cognitions. However, there were significant differences for attention, memory, emotion, vision and motor cognitions.

Sudden Sensorineural Hearing Loss and its Impact on Tinnitus Perception

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Sudden Idiopathic Sensorineural Hearing Loss (SISHL) has a significant impact on overall well-being. Tinnitus is often a dominant complaint.

Patients and investigations

6/2012 – 3/2014, 100 patients were treated for SISHL at the ORL Dept. University Hospital Hradec Kralove, Czechia (ORL HK). Tinnitus was investigated by tinnitometry, Numeric Rating Scale (NRS) and Tinnitus Severity Index Questionnaire (TSI).

The presentation aims to study the tinnitus perception after initial corticotherapy (IC) and a rescue therapy by means of rheohaemapheresis (RF) and MicroWick™ system (MW).

Results

72 % of patients experienced tinnitus, mostly non-specific, with the TSI total score 13/60 pts. and NRS 4/10. One month after treatment termination, both IC and RF group demonstrated improvement of tinnitus (median 2 pts. for Q11 and 1 pt. for other Qs of the TSI), while after the MW worsening was observed in all Qs.

Conclusion

Initial IC had a positive effect on tinnitus, with no additional effect after RF, and worsening with MW.

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Meniere's, Migraine and Motion Sickness

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Pathologies of the vestibular system influence motion sickness susceptibility (MSS). Bilateral vestibular deficits lower MSS, Vestibular Neuritis or BPPV have little overall effect, whereas Vestibular Migraine appears to elevate it [1]. However, less is known about MSS in Meniere's disease (MD), a condition in which many patients experience vestibular loss and migraine symptoms. We conducted an online survey through the Meniere's Society's public website. The survey posed diagnostic and disease questions before addressing frequency of headaches, migraines, visual display dizziness (VDD), syncope, social life and work impact of dizziness (SWID4) and motion sickness susceptibility (MSSQ). The two groups were: diagnosed MD individuals with hearing loss (n=751) and non-MD individuals in the control group (n=400). The MD group showed significantly more headache and migraine symptoms, increased VDD, higher SWID4 scores, and increased syncope. MSS was higher than controls after the development of MD in adulthood but not before, nor in childhood. VDD, SWID4 and MSSQ in adulthood were the strongest predictors of MD. We demonstrate that current MD specifically increases MSS which is unlikely to be related to migraine alone.

[1] Golding JF, Gresty MA. Pathophysiology and treatment of motion sickness. Current Opinion in Neurology, 2015; 28:83-88.

Chronic Symptoms after Vestibular Neuritis are not related to impairment of the high frequency vestibulo-ocular reflex

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Recovery after acute vestibular neuritis (VN) is variable with around half of patients reporting persistent symptoms of dizziness and vertigo long after the acute episode. A central unanswered question is whether chronic symptoms are associated with impairment of the high frequency vestibulo-ocular reflex (VOR) of the anterior and posterior semicircular canals. Twenty patients who had experienced an acute episode of VN at least three months earlier were included in this study and were assessed with the high-frequency video head impulse test (vHIT) of all six canals, the bithermal caloric irrigation, Dizziness Handicap Inventory (DHI) and Vertigo Symptoms Scale short-form (VSS). Of these twenty patients, twelve felt they had recovered from the initial episode of acute VN, whereas eight did not and reported elevated DHI and VSS scores. However, we found no correlation between DHI or VSS scores and the ipsilesional vHIT gain, vHIT gain asymmetry or caloric paresis. These findings suggest that chronic symptoms of dizziness following VN are not associated with impaired high-frequency VOR gain of the anterior or posterior semicircular canals.