

The use of optokinetic stimulation in vestibular rehabilitation



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Learning objectives

By the end of the session participants should be able to

- Understand when incorporating optokinetic stimulation into a rehabilitation program will be beneficial
- assess for visual vertigo symptoms
- Devise a targeted exercise program for a patient with visual vertigo

Why optokinetic stimulation?

- Animal studies have shown that dynamic disturbances of vestibular function require both **visual input** and body/head movement for recovery. (Lacour et al., 1976)
- "We have observed marked improvements in both optokinetic nystagmus and posture control after 6 weeks of optokinetic stimulation." (Tsuzuku et al., 1995)
- Customized vs. customized + optokinetic stimulation
Both groups showed significant improvements for balance, vestibular symptoms, and anxiety; however visual vertigo symptoms improved ONLY with the latter (Pavlou et al., 2004)

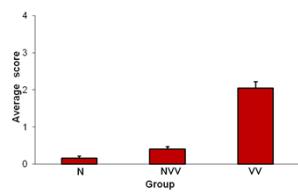
What is visual vertigo?

(Jacob et al., 1989)

- Space and motion discomfort (Jacob et al., 1989), visual vestibular mismatch (Longridge & Mallinson, 2002), motorist disorientation syndrome (Page & Gresty, 1985), **visually induced dizziness** (Bisdorff et al., 2009)
- Syndrome where symptoms are triggered or exacerbated in situations involving rich visual conflict or intense visual stimulation (Bronstein, 1995)
- Visual dependency (Guerraz et al., 2001; Bronstein, 1995)

How do we identify visual vertigo?

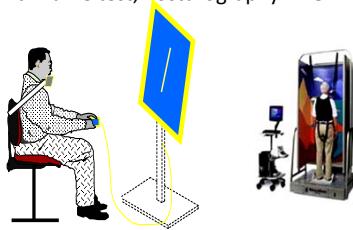
- Patient history
- Situational Characteristic Questionnaire (Pavlou et al., 2006; Guerraz et al., 2001; Jacob et al., 1989)



How do we identify SMD?

Visual dependency tests

- Rod and Frame test, Posturography : NO



Assessment of visual dependency



Rod and Disc: perceptual responses to visual motion



Testing postural responses to visual motion

How do we treat visual vertigo?

How do we treat visual vertigo?

Customised vestibular rehabilitation

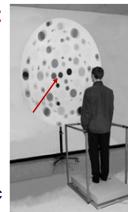
+

- Virtual reality
- Simulator-based therapy
- Visual motion DVD and other low-tech methods

Simulator-based treatment



Eyetrek



Optokinetic disc



Optokinetic drum and rotating chair



Planetarium

Visual motion DVD

- Consists of individual 2 minute sessions of the optokinetic disc or drum moving in a cw, ccw, vertical or sinusoidal direction at varying speeds
- Divided into a progressive sequence of exercises
- Patient able to progress at his/her own pace
- Total duration: 45 minutes
- Number of sessions per day: 1

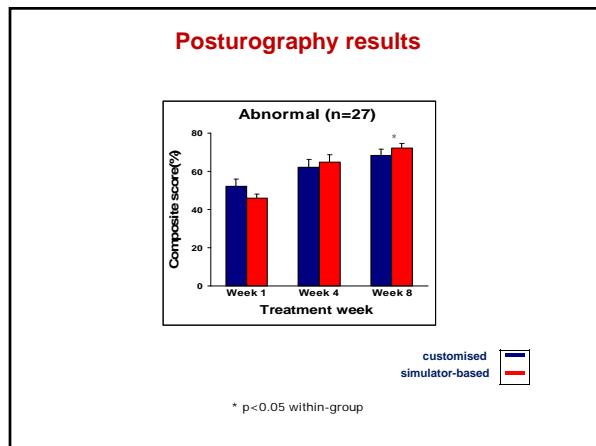
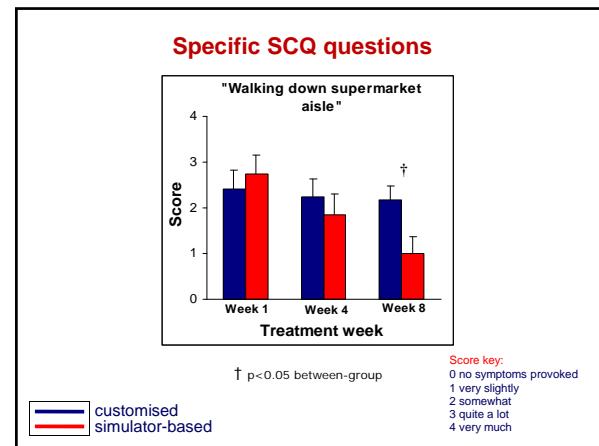
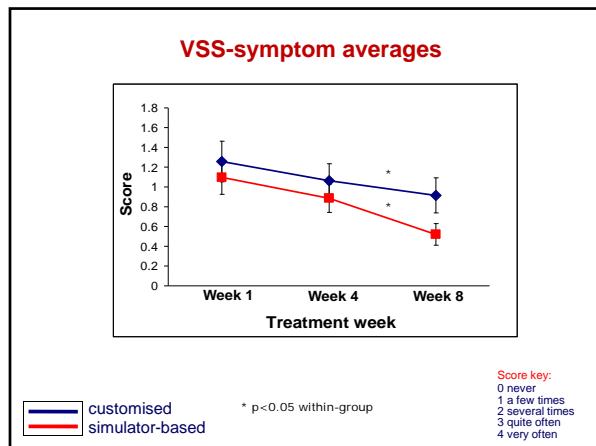
Patient assessment

A. Questionnaires

- **Vertigo symptom scale (VSS)** (Yardley et al., 1992)
- **Situational characteristics questionnaire** (Jacob et al., 1989, Guerraz et al., 2001)

B. Balance tests

- **Posturography** (Equitest)



Summary

- Balance and dizziness improved significantly in both groups
- Visual vertigo improved significantly only with simulator-based therapy

Overall trend: simulator-based treatment showed greater improvement

Issues arising from simulator based study

- Use of multiple equipment
- Frequency of treatment sessions
- Provision of optokinetic stimulation via a "low-tech" DVD in isolation

How do we treat visual vertigo?

Customised vestibular rehabilitation +

- Virtual reality
- Simulator-based therapy
- Visual motion DVD and other low-tech methods

How do we know low-tech works?

Study: High-tech Optokinetic Boule vs. Low-tech Visual motion DVD

- Investigated the benefit of customized exercises in combination with visual motion provided via machine-based equipment or via a DVD
- Patients attended once weekly or did a non-supervised home exercise program for eight weeks
- Regardless of treatment type all groups had customized DVD and customised vestibular rehabilitation exercises to do at home

(Pavlou M, Bronstein AM, Davies RA, 2011 manuscript under review)

Optokinetic Boule

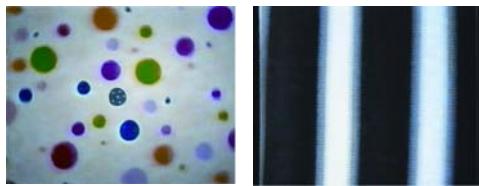
- Provides full field visual motion in Y and Z axis
- Direction and speed can be controlled
- Progressive sequence of exercises practiced
- Each individual exercise: 2 minute duration
- Progressively greater number of exercises with increasing complexity included in each session
- Total session duration: 45 minutes



Stimulopt image

Visual motion DVD

- Video sample



Patient assessment

A. Questionnaires

- Situational characteristics questionnaire (SCQ) (adapted from Jacob et al., 1989; Guerraz et al., 2001)
- Vertigo symptom scale (VSS) (Yardley et al., 1992)
- Becks depression and anxiety inventory (BDI, BAI) (Beck et al., 1979; Beck and Steer, 1990)

B. Balance tests

- Posturography (Equitest)
- Functional Gait Assessment (Wrisley et al., 2004)

Patient assessment

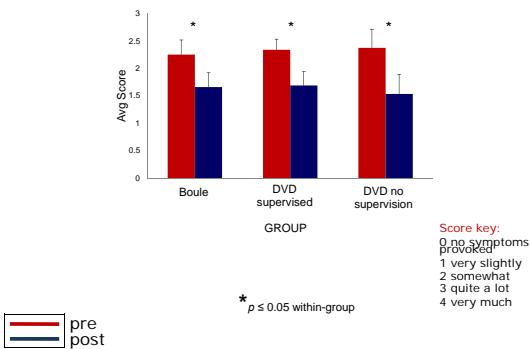
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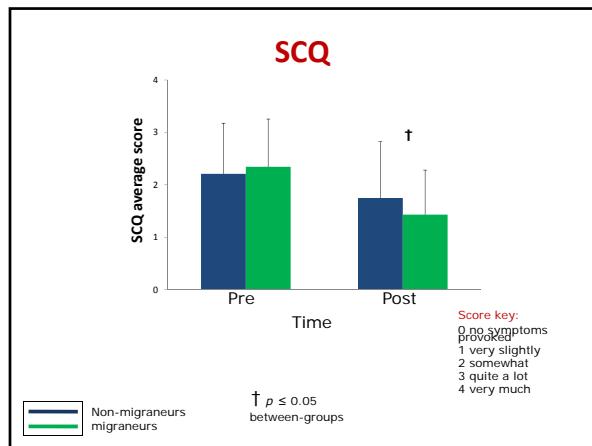
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B. Balance tests

- Posturography (Equitest)
- Functional Gait Assessment (Wrisley et al., 2004)

SCQ





Easy access to machine-based treatment?

- Use of a DVD with visual motion

OTHER ALTERNATIVES:

- Machines used for treatment can be easily modified or cheaper alternatives are readily available.
- Equipment is not necessarily space consuming
- Busy web pages, Google images, www.youtube.com

Case study 1

- A 49 year old lady diagnosed with vestibular migraine is referred to you for vestibular rehabilitation and management of visual vertigo symptoms.
- No abnormalities on vestibular function tests
- Symptoms last 7 years but reports that headaches have been under control for the last two years on beta-blocker. "Dizzy" symptoms are improved but "still there". Main issue at time of appointment is visual vertigo.
- She also reports difficulty focusing when reading or watching television and swimminess when bending over or looking over her shoulder.
- Work involves travelling over four hours daily by train and bus – she is currently not driving on highways.
- Has already completed a vestibular rehabilitation programme described as including "eye exercises"

Case study 1

- Vertigo symptom Scale: VSS-S 1.4/4; VSS-A 2.2/4
- SCQ: 3.47/4
- HAD: Anxiety 6/21; Depression 3/21
- FGA: 19/30
- Posturography: 21/100

Case study 1

Clinical assessment:

Sitting:

- EO and EC vertical/horizontal head movements: reduced speed and ROM; 2/3 for swimminess symptoms
- VOR adaptation exercises: no visual blurring or difficulty focusing but practiced very slowly and 2.5/3 swimminess symptoms
- Horizontal pursuit provoked 2.8/3 for nausea
- Saccades, look over the shoulder, bending over: 2.3-2.8/3 for nausea and swimminess

Standing:

- Foam, N BOS, EC: 2.8/3 swimminess, disorientation, nausea; moderate A-P sway observed

WHAT DO YOU DO?

Question

- What would you do differently if migraines were not controlled?
- What would you do if only visual vertigo symptoms present?

Conclusion

- Optokinetic stimulation is particularly beneficial for visual vertigo symptoms and should be included as part of a comprehensive customized exercise program in patients with visual vertigo.
- Exposure to optokinetic stimulation should be gradual, progressive, and structured
- Low-tech methods are beneficial and should be considered. Listen to your patient and be creative with regards to using the low-tech methods available to you.

Future Research

“Optimal”

- type of optokinetic stimulation
- supervision
- treatment duration
- combined treatment strategies?

THANK YOU