Therapeutic effects of large-field visual virtual immersion on balance control in unilateral vestibular patients
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INTRODUCTION | VR-based balance rehab. relevance?

CLINICAL TRIAL - PATIENTS
- Unilateral vestibular patients (42-80 y.o.; 3 m., 4 f.)
- Visually-induced dizziness (afarexia, chronic recurrent dizziness, vestibular neuritis)
- 8 weeks rehab. period = 1 or 2 rehab. session per week included in the patients care process
- Ethics validation (CPP - voluntary informed patients)

VISUAL STIMULI
- Large-field (panoramic) visual virtual flows
- Standardized optokinetic stimulus
- 8 Optic flows STIM. : 3D scrolls (Up, Down) + 2D Rotations (Clockwise, Counterclockwise) + 3D Radial expansion.
- 6 flows SPEED (speed ratio from 0.3 to 28 A.U.)
- Scenario optimized for efficiency on patient - visual-flows constraints increase throughout the therapeutic session: flows pattern (scroll, radial and rotation), stimulation speed increase, gaze anchoring on the visual reference (with/without).

GAZE ANCHORAGE (GA)
- Visuo-spatial reference
- With GA: session 1-4; Without GA: session 5-8
- With session 9; Without session 10

PROTOCOL
- 1 Trial = Visual stimulation
  - Next = Flow - Rest = 23 sec.
- 1 Series = 8 stim. (8 trials)
  - 5 different 10/20-30 visual flows
- 1 Session = 6 Speed
  - 6 stim. X Speed = 48 trials
- 2 Gaze Anchorage cond.
  - Secs. 1-4: With GA
  - Secs. 5-8: Without GA
- 18 trials + 8 trials (18 trials X 8 = 144 trials in 15min.)
- Trial stim. duration: 10 min.

METHODS | The PIVVIT project (Plateforme d’Immersion Visuelle Virtuelle Thérapeutique)

RESULTS | VR immersion → Visual perturbation → Balance restoration

Gaze anchorage = Visual-vestibular adaptation occurs despite vestibular deficits

Data recording and analysis
- Balance control: Center-of-Pressure (Wiifit board, 100 Hz) → CoP Trajectory length → Disequilibrium indicators (lost of balance control, falls)
- Gaze behaviour (Eye-Head-body) stability: BlueGain EOG, 100Hz) → EOGy trajectory (preliminary results)
- (Questions-Responses: subjective estimation of the “balance comfort” in every day life tasks)


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