Presence through Advanced Broadcast Services - a review of TAPESTRIES WP2

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Presence to Evaluate New Media

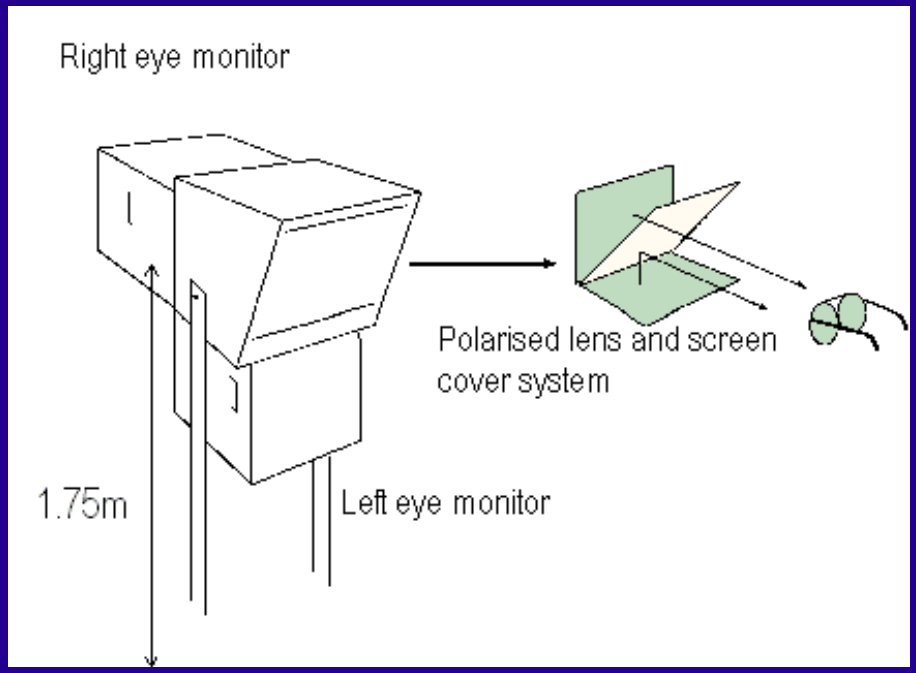
- New Evaluation Methods required for advanced broadcast services
  - measures of picture quality do not fully describe viewers' experiences of
    - »3DTV, immersive TV, large-screen HD projection TV
    - »services generate PRESENCE (e.g., Barfield, Zeltzer, Sheridan, & Slater, 1995)

Brief Overview

- Over 250 subjects tested
  - Qualitative research on 3DTV - focus groups
  - 6 Expts. with Subjective Assessment of Presence
  - 5 Expts. on Objective measures as adjuncts to Subjective Assessment of Presence
- Dissemination - Presence / Displays, and several conference presentations
- Input to design of the ***P****latform for* ***I****mmersive* ***T****V*

Display

- All the experiments reported here presented stimuli on a 20 inch stereoscopic display, time parallel presentation of left and right eye views, polarised

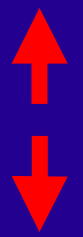


Presence and Television

- 4 Focus groups conducted
  - viewers report sensations of “being there”
    - *Presence* suitable evaluation construct
  - more presence with 3D display
    - » realism/ naturalness
    - » sensation of interactivity/ physical
      - *illusion of non-mediation (Lombard & Ditton, 1997)*
    - » involvement/ attention (Witmer & Singer, 1998)
    - » multi-dimensional?
    - » non-interactive TV - realism

Continuous Assessment

- previous subjective studies - post test ratings
- limitations?
  - no info. on temporal variation
    - scene content, extent of sensory info. Changes
  - inaccurate recall or recency effects
- applied method of continuous assessment
    - ITU-R BT 500-7
  - hand-held slider: increase in presence
    decrease in presence



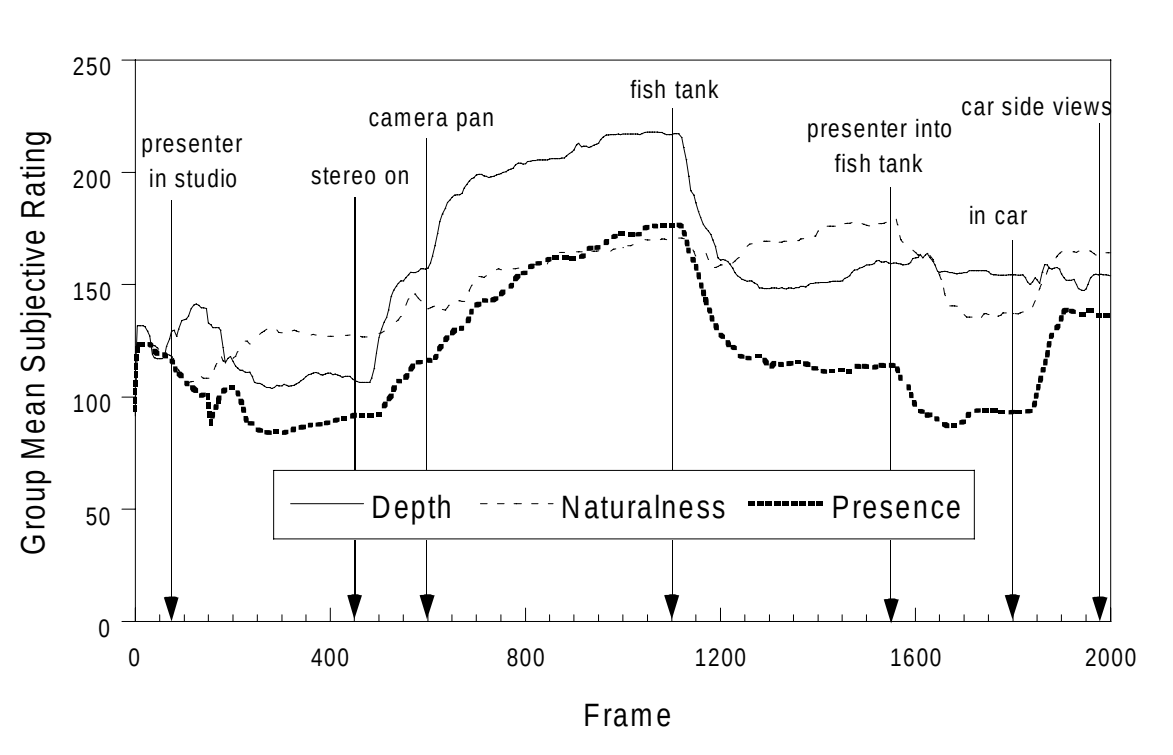
Depth, Naturalness and Presence

- Experiment at UoE and IPO
  - continuous ratings of an 8 minute section of “Eye to Eye”, stereoscopic documentary
- Depth enhances presence, more so if depth is portrayed naturally
  - Similar results obtained in different labs
  - procedure kept constant

	D	N	P
D	-	0.374	0.542
N		-	0.859
P			-

(IJsselsteijn, de Ridder, Hamberg, Bouwhuis, & Freeman, 1998)

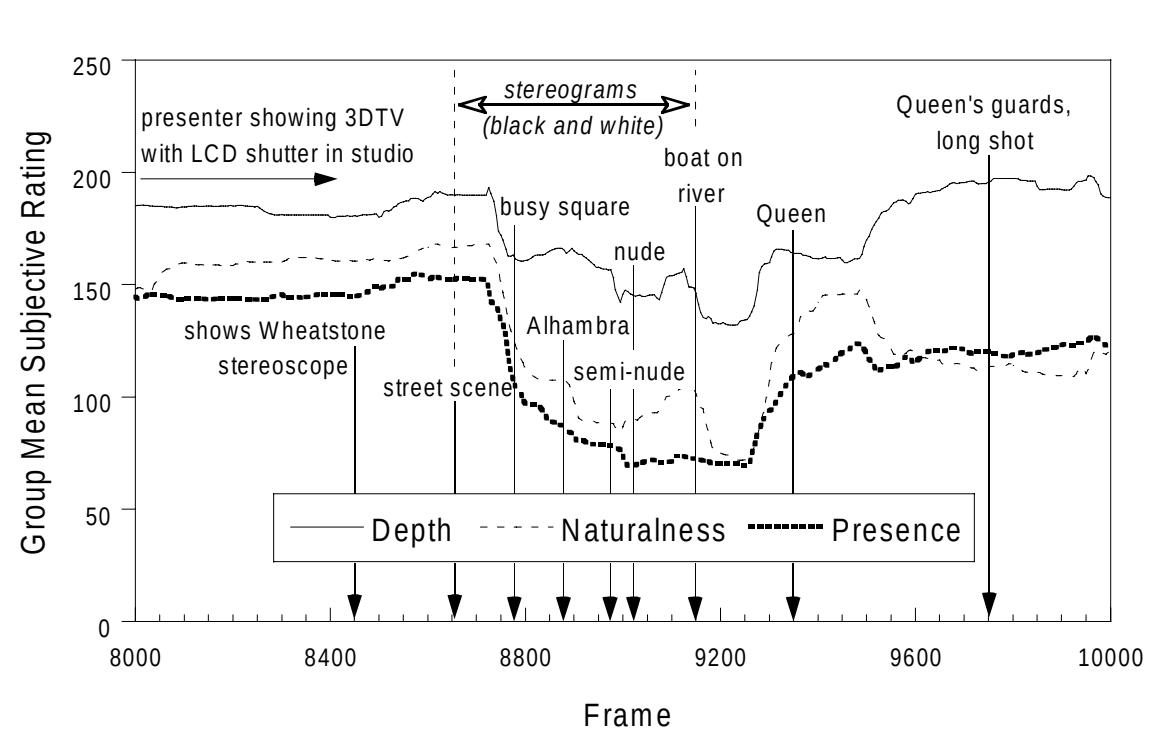
Depth, Naturalness and Presence



n = 18

- Sensory information
- Prior Experience?
- Ecological validity?

Depth, Naturalness and Presence



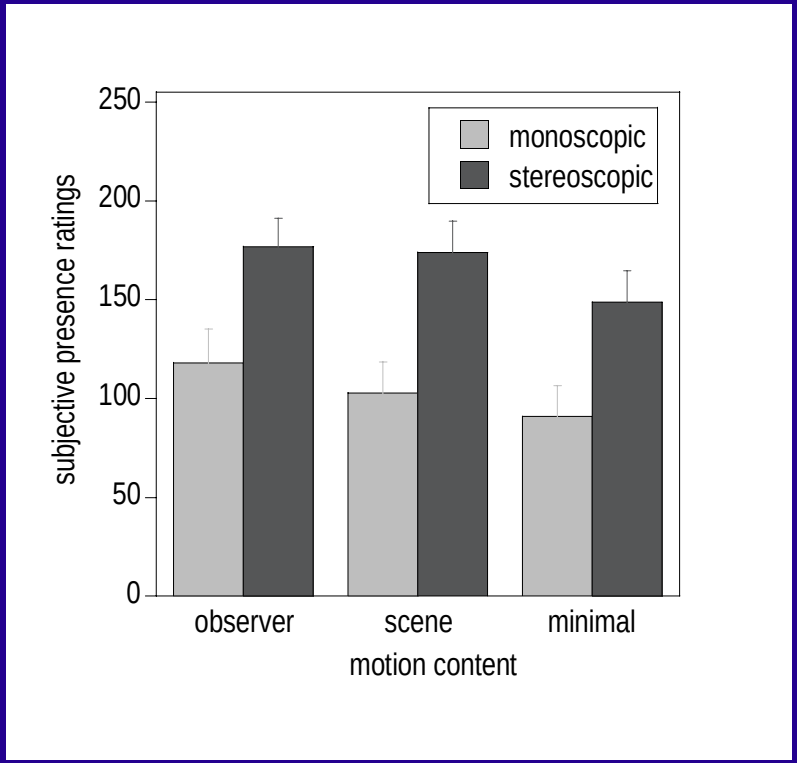
n = 18

- Stable when no change in content/ sensory info.

- averages OK for sections with limited change in sensory information
- independent manipulations of sensory information required

Effects of Sensory Information

- Stereoscopic & Motion parallax cues affect presence ratings

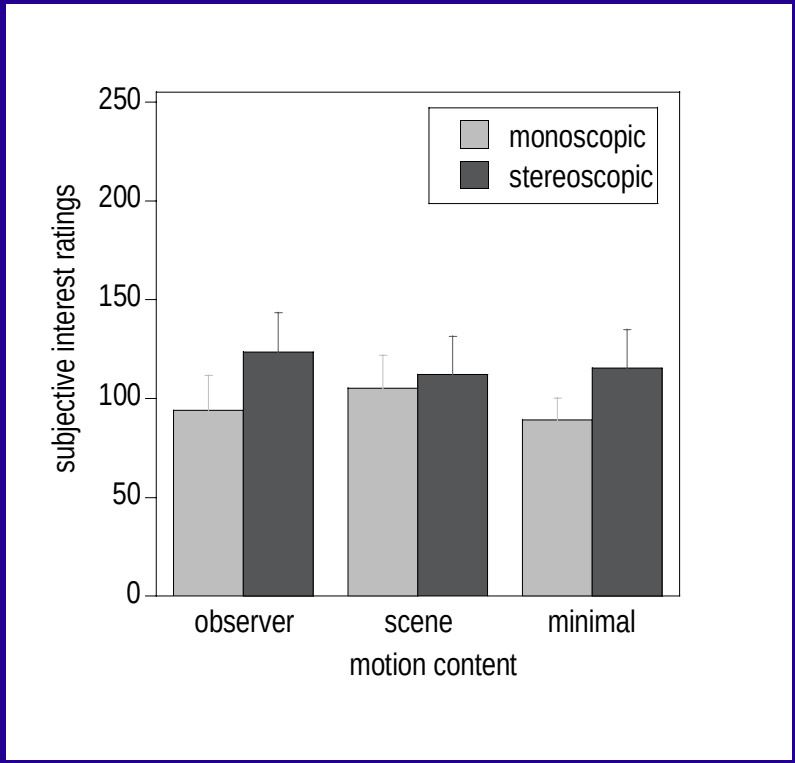


- n = 12
- 30 second sequences
- viewing condition varied
- motion content controlled
- presented continuously
- presence assessed continuously
- stereo and motion act additively

(Freeman, Avons, Pearson, & IJsselsteijn Presence, 1999)

Result due to novelty or interest?

- Interest ratings not affected similarly by stereoscopic & motion parallax cues

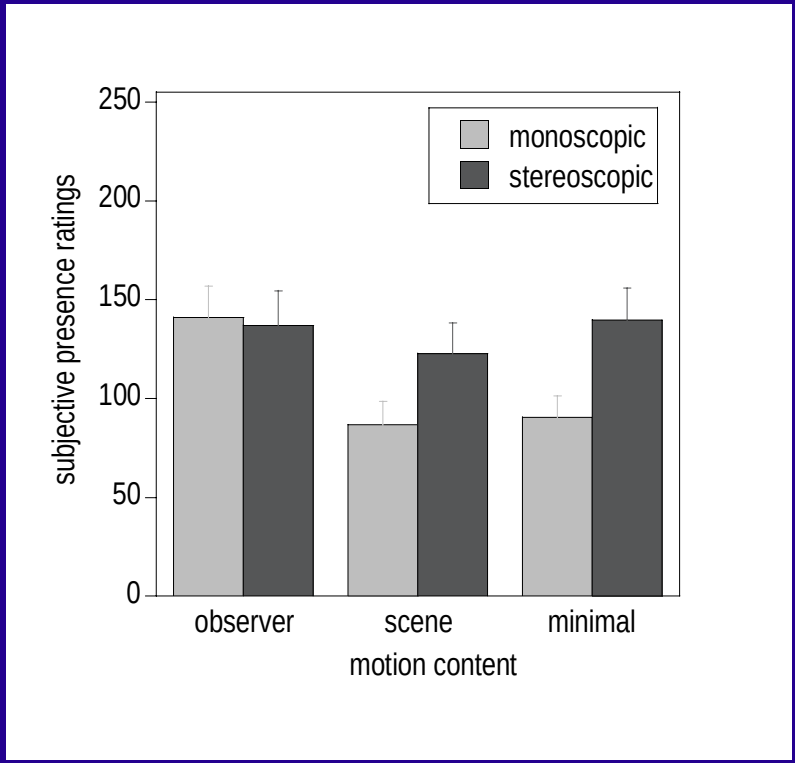


- n = 12
- same stimuli / procedure
- interest could encompass novelty, narrative
- interest assessed continuously
- presence and interest are distinct measures

(Freeman *et al.*, Presence, 1999)

Check on Presence Results

- Presence ratings changed after stimuli rated for interest



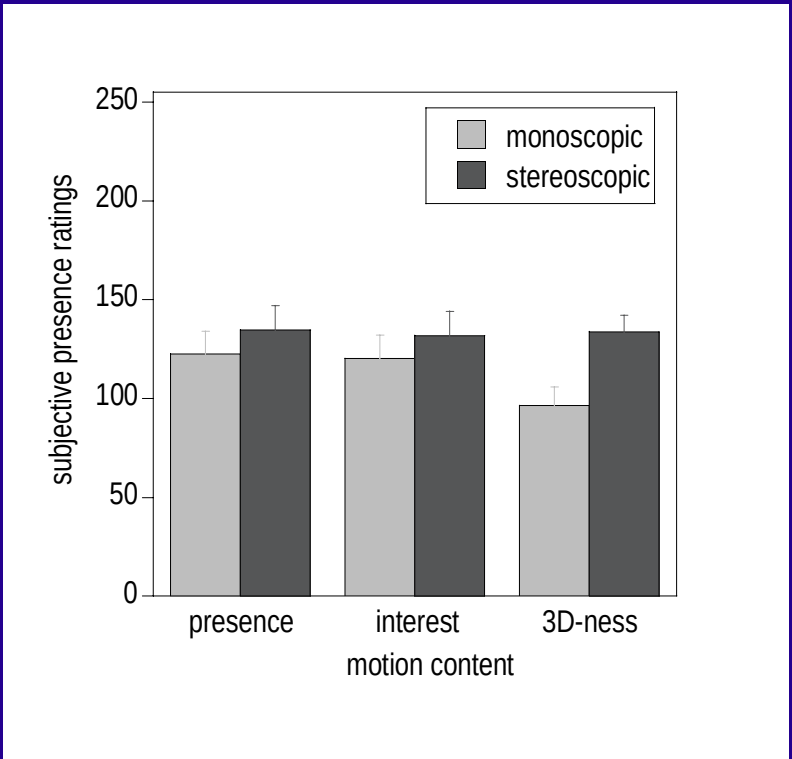
- n = 12
- same stimuli / procedure
- Effect of prior experience?
- Or unstable measure?

  - unlikely

(Freeman *et al.*, Presence, 1999)

Effect of Prior Experience

- 3 groups given different practice session:
  - presence, 3D-ness, interest



- n = 72
- 3 min. practice rating stimuli for attribute
- then rated stimuli for presence
- Group trained on 3D-ness rated mono stimuli as lower presence
- Subjective ratings potentially unstable

(Freeman *et al.*, Presence, 1999)

Instability of subjective ratings

Because?

- Presence usually a universal feature of awareness - graded ratings?
- Rating scales - what is minimal presence?
- Verbal descriptors - may develop, but non-expert observers do not have them now.

  (e.g., for Olfaction - Barfield and Danas, 1996)
- Sensation vs. Knowledge - cautious?
- Attentional factors/ interest

Subjective Measures useful, but Objective adjuncts required

Objective Approach

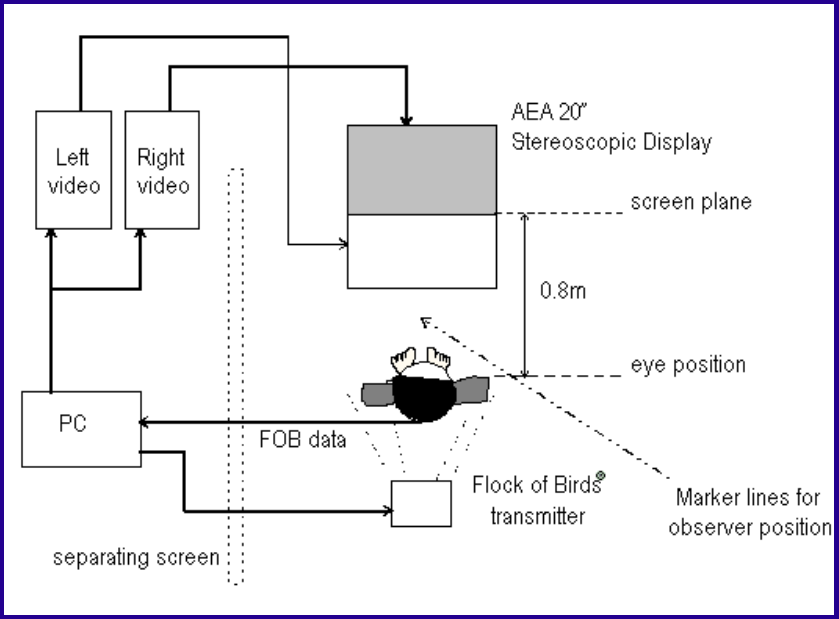
- Behavioural Realism
  - as display better approximates environment it represents, responses tend to those observable in the environment
  - derived from Sheridan (1992), Held and Durlach (1992)
  - issues: (i) awareness of exhibiting behaviour might enhance presence (Heeter, 1992), (ii) some observers can exhibit response, but report low presence (Slater *et al.*, 1998)
- not Task Performance
  - less info can improve task performance & reduce presence (Ellis, 1996)
  - task complexity can confound presence measures (Slater *et al.*, 1998)
  - awareness of task: increase motivation?

Postural Responses

- Examined utility of postural responses to moving video as indicators of presence
  - visual proprioception
    - » standing up straight
  - postural adjustments to moving video
    - » involvement and vection

Visual Proprioception (1)

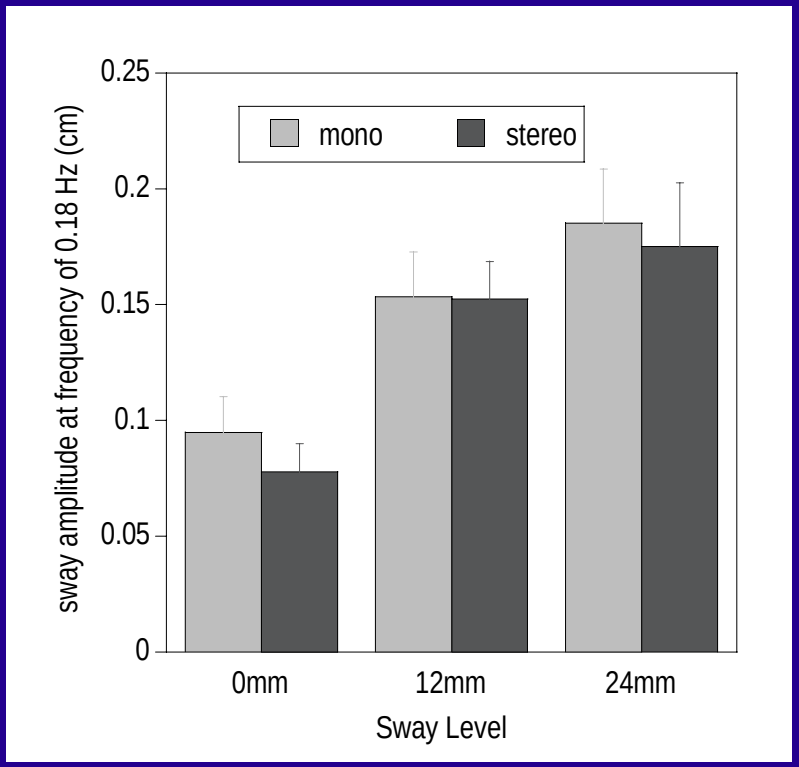
- Based on Lee and Lishman (1975)
  - room swing simulated by camera swing
- Measured postural response with Flock of Birds Magnetic Tracker



- *Lab set-up*
- 28 ^{o} X 18.5^{o} visual angle display
- basic result of more postural instability in dark than light shown in piloting

Visual Proprioception (2)

- Series of experiments to establish utility of visual proprioception for display evaluation



- Effect of camera motion
- No effect of stereoscopic presentation
- Not a good indicator of presence, as not affected by viewing condition

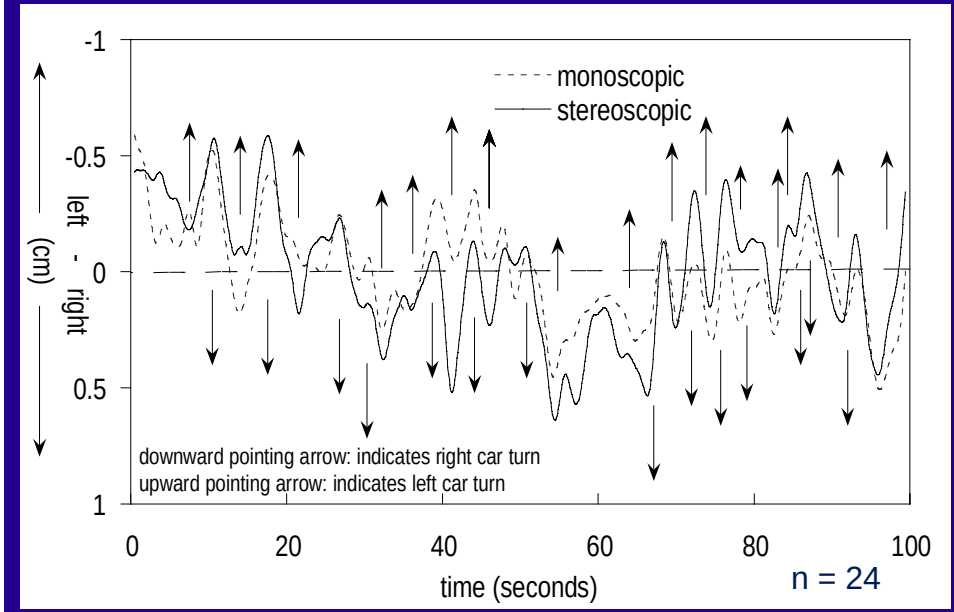
n = 24

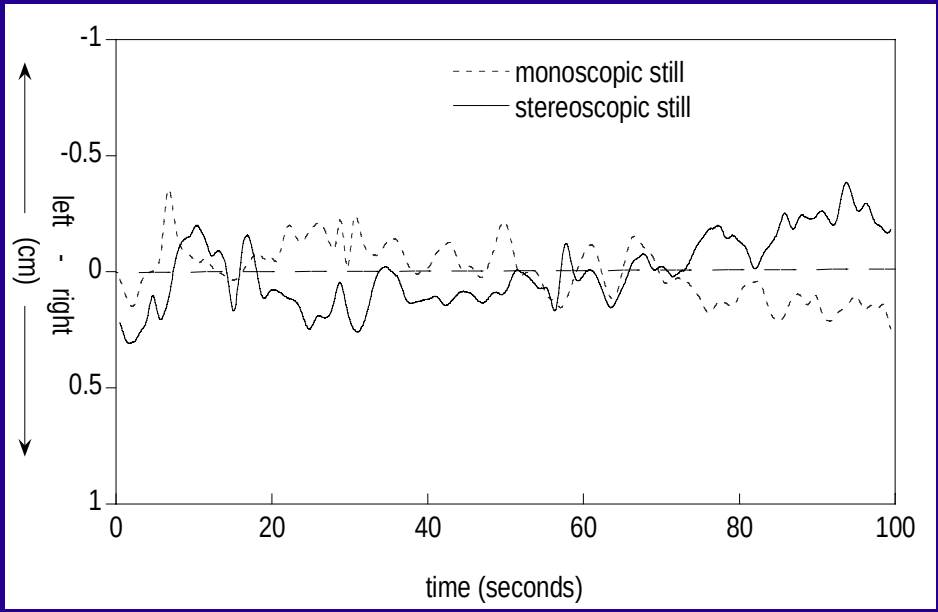
Adjustments to Moving Video (1)

From Freeman, Avons, Pearson and Meddis (submitted)

- Observers shown 100 second stimuli of (i) rally car going round a track, and (ii) stationary track (mono and stereo, with audio)
- instructed to stand still and posture monitored
- post-test subjective ratings taken after each stimulus
  - » presence
  - » involvement
  - » vection
  - » sickness

Adjustments to Moving Video (2)

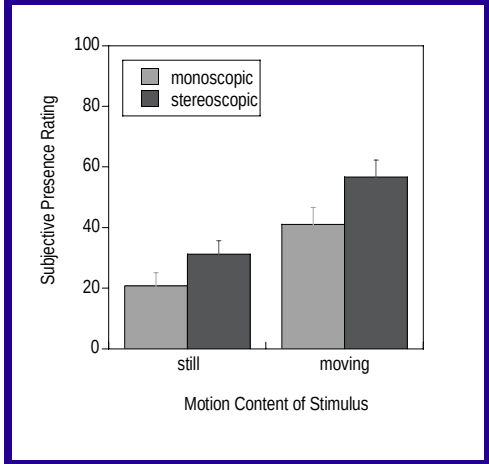


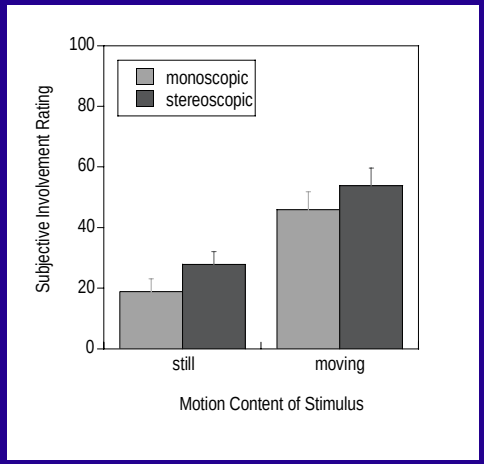


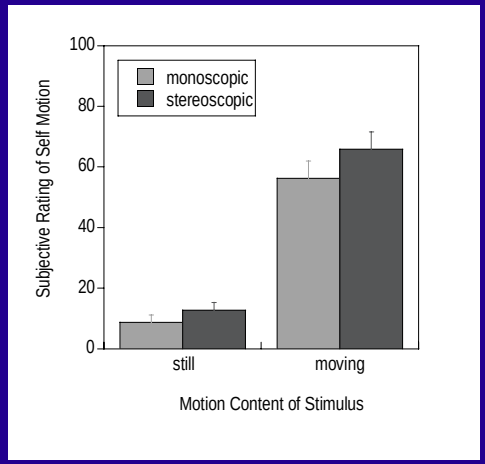
- postural response observed to moving stimuli
- stronger response with stereoscopic presentation (p=0.06)
- not a proprioceptive response - moved in direction of car, against direction of optic flow → vection/ involvement

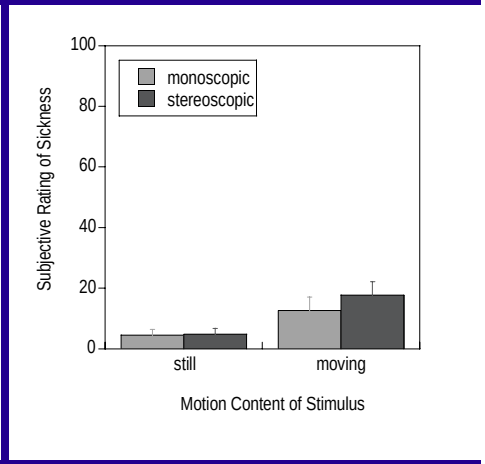
Adjustments to Moving Video (3)

- Subjective Ratings
  - significant effects of viewing condition and motion on presence and involvement, but not vection or sickness









- Across groups of observers, postural responses show similar pattern of results to presence ratings

Adjustments to Moving Video (4)

- Relation between objective and subjective
  - To be useful as indicators of presence, postural measures must not only exhibit same pattern of results, but also correlate (across-subjects) with presence ratings
  - Stereoscopic enhancement of lateral motion (moving - still) correlated with viewing condition enhancement (stereo - mono) of subjective ratings for moving stimulus
    - *no significant relation found across subjects*
      - » presence $r(22) = 0.025$
      - » involvement $r(22) = 0.280$
      - » vection $r(22) = 0.150$

Adjustments to Moving Video (5)

- Conclusions
  - increasing realism of display (3D) increased postural responses and subjective ratings of presence
  - weak support for use of postural responses to moving video for display evaluation, and possibly as indicators of presence
  - postural responses can not be taken as direct substitutes for subjective presence ratings

Conclusions

- Presence is a useful evaluation metric for advanced broadcast services
- Subjective ratings of presence potentially unstable, but still useful
- Objective corroboration required
  - » *behavioural realism approach proposed*
- More research required to identify appropriate behaviours to use as indicators of presence
  - » expand to include social behaviours in recognition of importance of interactive contributions to presence