

COMBINED USE OF VIRTUAL REALITY, VIDEO-OCULOGRAPHY AND SEXUAL PLETHYSMOGRAPHY IN THE ASSESSMENT OF SEXUAL PREFERENCES

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PRESENTATION OVERVIEW

- Theoretical background
- Research objectives
- Instrumentation
- Protocol
- Preliminary results
- Discussion

THEORETICAL BACKGROUND

Historical review of sexual response measurement

Male sexual response

- Penile erection: the most sensitive measure of sexual arousal (*Freund, 1963; Masters and Johnson, 1966; Zucherman, 1971; Abel et al., 1975*)
- Penile response: the only physiological response specific to sexual arousal in men (*Proulx, 1989*)
- Penile volume (phalometry) first assessed in 1963 by Freund
- Penile circumference gauges (plethysmography) then developed (*Bancroft, Jones, & Pullan, 1966; Barlow, Becker, Leitenberg, & Agraas, 1970; Fisher, Gross, & Zuch, 1965*)
- Circumferential measures currently most commonly used (*Howes, 1995*)

Female sexual response

- Masters and Johnson (1966) demonstrate a relation between blood surge in the vagina and sexual arousal.
- In 1974 and 1975 the first versions of the vaginal photoplethysmographs were pioneered (*Geer, Morokoff and Greenwood, 1974; Sintchak and Geer, 1975*)
- Most frequently used method to measure blood flow in the vagina (*Meston, 2000*).

THEORETICAL BACKGROUND

Male VS female sexual responses

Category specific sexual arousal mode in males

- Changes in penile response to stimuli enable classification of participants according to stated sexual preferences (*Freund, 1963; McConaghy, 1967*).
- Heterosexual men express disgust at male stimuli whereas homosexual men express neutrality toward female stimuli (*Freund et al. 1973*)
- No convincing evidence of bisexual arousal pattern (*Freund, 1974*)

THEORETICAL BACKGROUND

Male VS female sexual responses

Non-category specific sexual arousal mode in women

- Lack of correspondence between sexual orientation, and subjective and physiological arousal (*Meston, 2000; Chivers, Rieger, Latty & Bailey, 2004*).
- Lesbians and heterosexual women respond to female and male stimuli, with a stronger intensity for heterosexual stimuli (*Chivers et al., 2004*)
- Female sexuality is considered more flexible, following a bisexual model, without having a higher percentage of homosexual experiences than men (*Chivers et al., 2004*)

RESEARCH OBJECTIVES

- Increase the external validity of experimentation on human sexuality
- Have a better control over stimuli parameters
- Test with new combinations of measurement techniques: i.e. sexual plethysmography and ocular measurements
 - Allows access to perceptual and cognitive processes involved in sexual arousal
- Demonstrate sexual responses elicited by virtual characters
- Obtain preliminary results on sexual preferences

INSTRUMENTATION

Description and operation of the vaginal photoplethysmograph

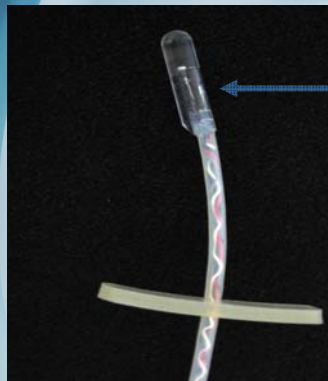
- The VPA (Vaginal Pulse Amplitude) measures variations in blood flow with every heartbeat; the higher the amplitude, the more blood there is (*Geer et al., 1974*).
- The VPA is known as the most sensible and accurate tool to measure sexual arousal (*Geer et al., 1974; Heiman, 1977; Meston & Gorzalka, 1995, 1996a, 1996b, as cited in Meston, 2000*).



Figure 1 : VPA vaginal photoplethysmograph by Limestone

INSTRUMENTATION

Description and operation of the vaginal photoplethysmograph



Acrylic probe emits an infrared or incandescent light that is reflected by the capillary bed and vasocongested vaginal wall. Blood flow variations are sent as external signals by a photosensitive detector (*Levin 1992*).

Positioning device used to standardize insertion (*Laan, Everaerd & Evers, 1995*)

Figure 2 : Vaginal probe

INSTRUMENTATION

Penile plethysmograph PPG

- Standard penile plethysmograph gauge (PPG)
- Measures the variations of penile circumference
- Preftest equipment
- PPG and VPA measurements are synchronized with eye-tracking measurements and virtual reality simulator



Figure 3: Penile plethysmograph gauge and Prefest equipment

INSTRUMENTATION

Immersive vault, CAVE type and Electrohome Marquee 8500 projectors

- Four networked computers
- Stimuli projected on 1 to 3 walls simultaneously

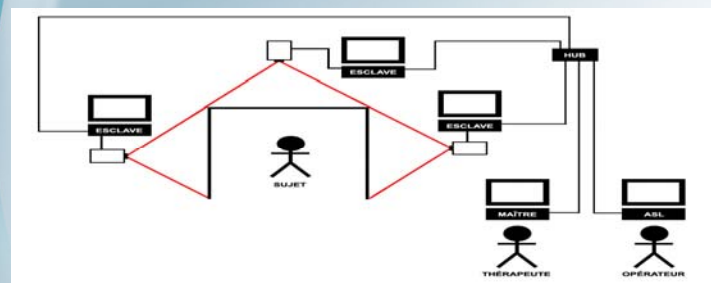


Figure 4: General functioning of the immersive vault.

INSTRUMENTATION

Immersive vault, CAVE type and Electrohome Marquee 8500 projectors

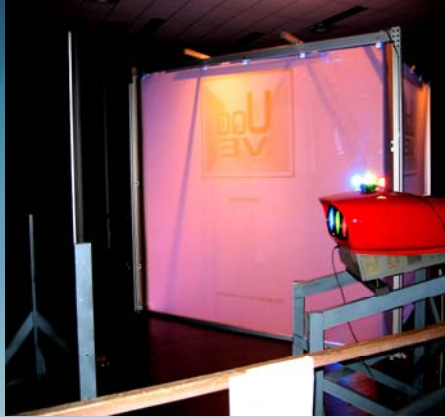


Figure 5: Projectors modified by Hi Rez Projections Inc..used with a 1280X1024 resolution and a refresh rate of 85 Hz.



Figure 6: Participant in the immersive vault during the projection of a 3D stimulus

INSTRUMENTATION

Ocular tracking system ASL Eye-Trac 6000 Head Mounted Optics

- The corneal reflection of an infrared light source measured and compared to the location of the center of the pupil allows precise identification of where the participant is looking

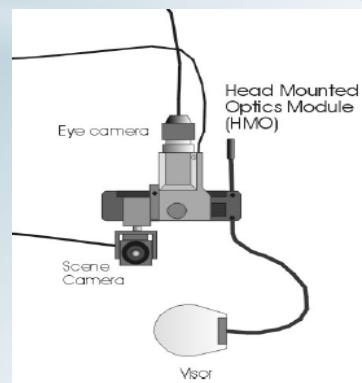


Figure 7: ASL Eye-Trac 6000 Head Mounted Optics

INSTRUMENTATION

Nuvision 60GX stereoscopic glasses and ASL oculomotor tracking device

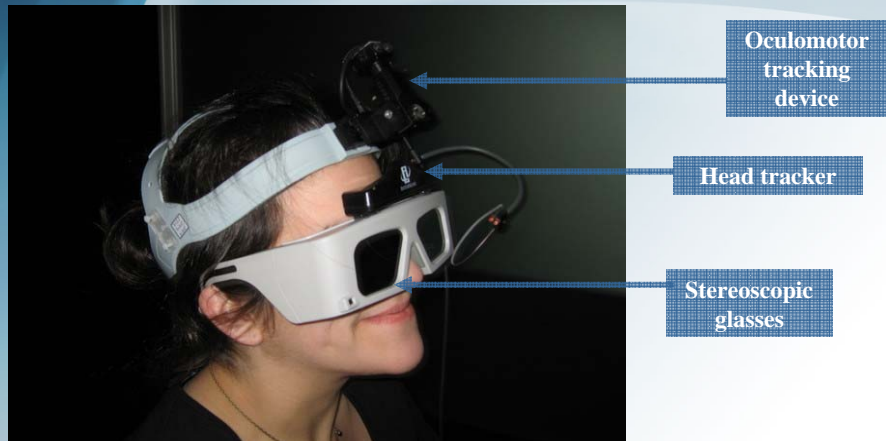
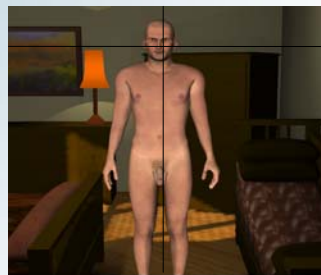
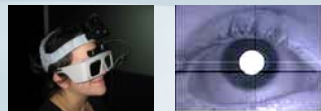


Figure 8: Participant wearing the stereoscopic glasses and the IS900 Intersense head tracking device mounted on the glasses

INSTRUMENTATION

Tracking eye movements in immersion

- The scene viewed is continuously modified according to the participant's 6 degrees of freedom (DOF) variations to head movements.
- The crosshair depicts the point of regard (POR) of the participant in immersion
- Allows the experimenter to simultaneously observe what the participant sees

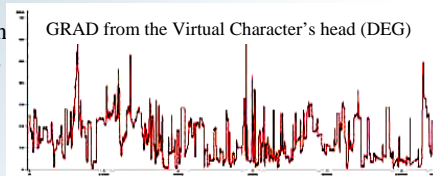
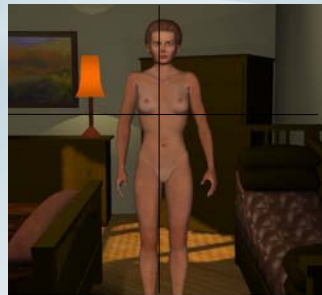




INSTRUMENTATION

Editing virtual measurement points and zones

- Our method performs gaze analysis by the way of virtual measurement points (VMP) and zones (VMZ) placed on objects of interest (*Duchowski and Vertegaal, 2000; Renaud et al., 2002, 2003*)
- Using the combination of head (6 DOF) and eye (x, y) movements, we calculate the point of regard (POR) in the environment
 - The gaze radial angular deviation (GRAD) from the VMP can thus be determined





PROTOCOL

Experimentation

Participants:

- 6 heterosexual males (average age 26.8 years)/ 4.1 s.d.
- 4 heterosexual females (average age 22.8 years)/ 1.5 s.d.

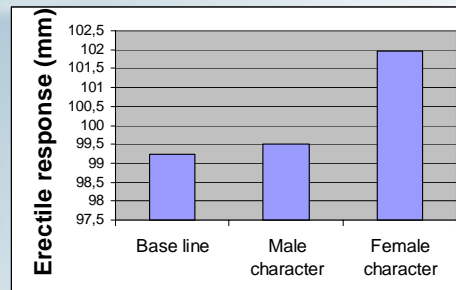
Projection of stimuli (180 seconds each)

- Neutral video (establish sexual response baseline):
 - 3D high resolution adult male virtual character
 - 3D high resolution adult female virtual character
- Participants were seated in the immersive vault but could move their heads freely to explore the environment
- Sexual and oculo-motor responses were recorded

PRELIMINARY RESULTS

Average sexual responses for male participants

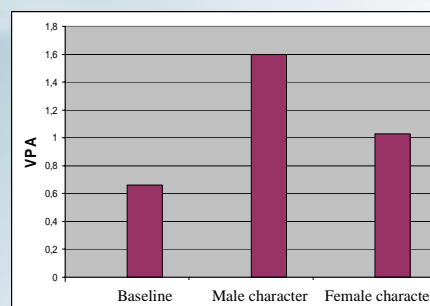
- Male participants presented a significantly stronger sexual response to the female virtual character than to the male one
- ($t(5) = 2.73, p = .041$).



PRELIMINARY RESULTS

Average sexual responses for female participants

- Female participants tended to present a stronger sexual response to the male virtual character than to the female one
- (*N.S.* 4 participants)



PRELIMINARY RESULTS

Gaze behavior (POR) deviation

Male participants

- Male participants presented a significantly closer scrutinization of the female character compared to the male. The scrutinization was also less fluctuating:

- Face

Average POR ($t(5) = 2.079, p = .038$)

POR SD ($t(5) = 4.02, p = .01$)

- Breast

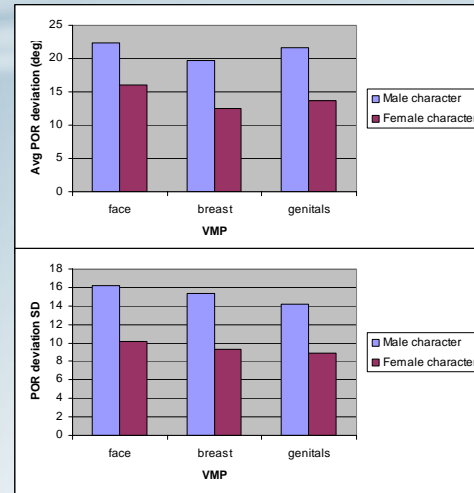
Average POR ($t(5) = 3.31, p = .021$)

POR SD ($t(5) = 3.38, p = .02$)

- Genitals

Average POR ($t(5) = 5.32, p = .003$)

POR SD ($t(5) = 2.63, p = .046$)



DISCUSSION

Possible limits of the method

- Preliminary results seem to follow previous results reported in studies, but further research with a larger sample is needed
- Sensibility to movement: fluctuation in data
- Importance of physiological responses in assessing sexual preferences are less determinant in women than in men (Chivers et al. 2004)
- Standardization of method in progress:
 - Sexual assessment and ocular measurements methods
 - Stimuli, data interpretation, questionnaires, participants

DISCUSSION

Advantages and possible uses of the combined method

- More accurate clues as to sexual preferences because of ocular, subjective and physiological correlations
- Interactivity : instantaneous adaptation of the virtual environment
- Development of realistic stimuli respecting ethical concerns (virtual characters: delinquent stimuli)
 - Variable control
 - Visual reference marks
 - Targeting of adapted stimuli
- Probe/gauge comfort: allows measures on a long lapse of time
- Clues for future intervention and treatment of sexual delinquents, couples, individuals suffering from sexual dysfunction or paraphilias

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