

The effectiveness of Virtual Reality in reducing pain and anxiety during digital nerve block



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CLINICAL TEACHING



PODIATRY (CHIROPODY):

“The prevention, diagnosis, treatment and rehabilitation of medical and surgical conditions of the feet and lower limbs”

Australian Podiatry Association
<http://www.podiatrysa.net.au>

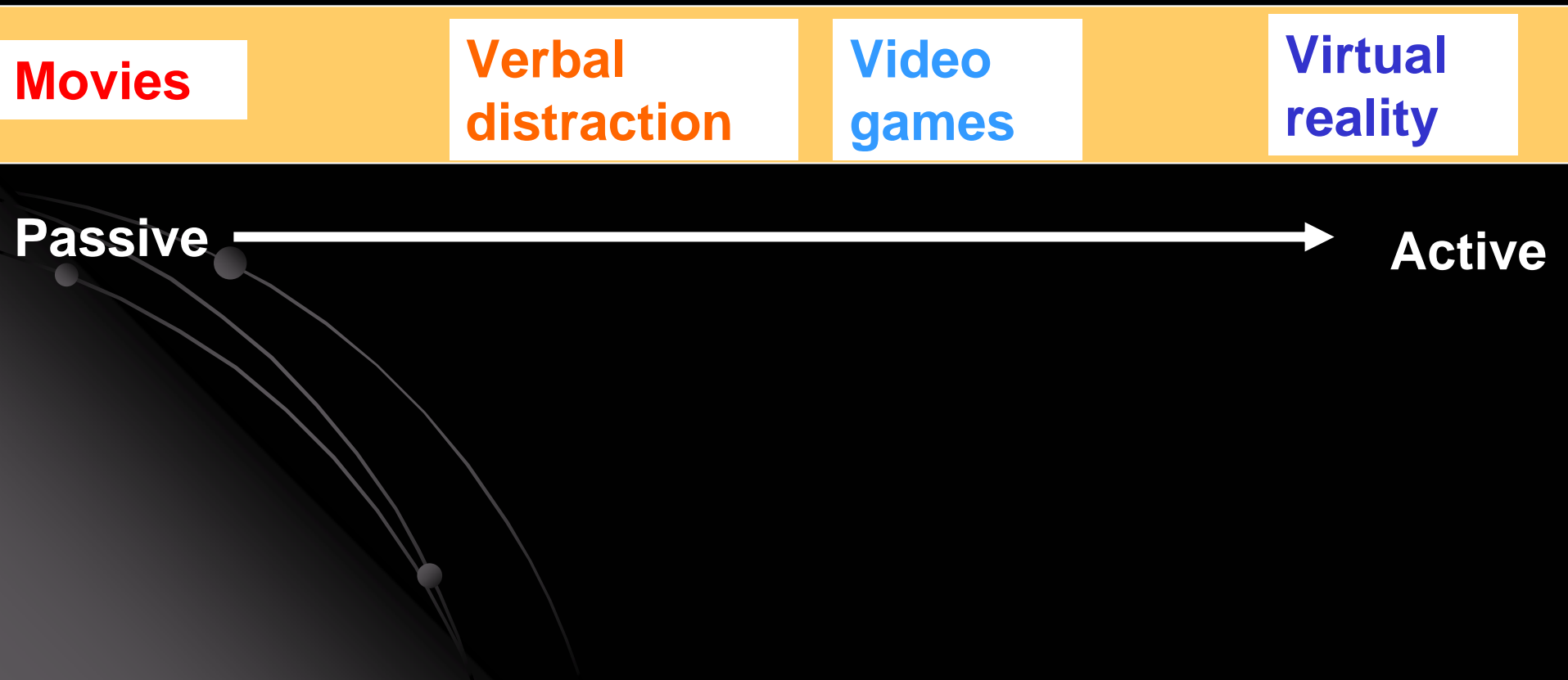
FEAR OF NEEDLES IS COMMON

- 22% adults reported fear of injections

Nir et al (2003)



DISTRACTION



DISTRACTION



DISTRACTION



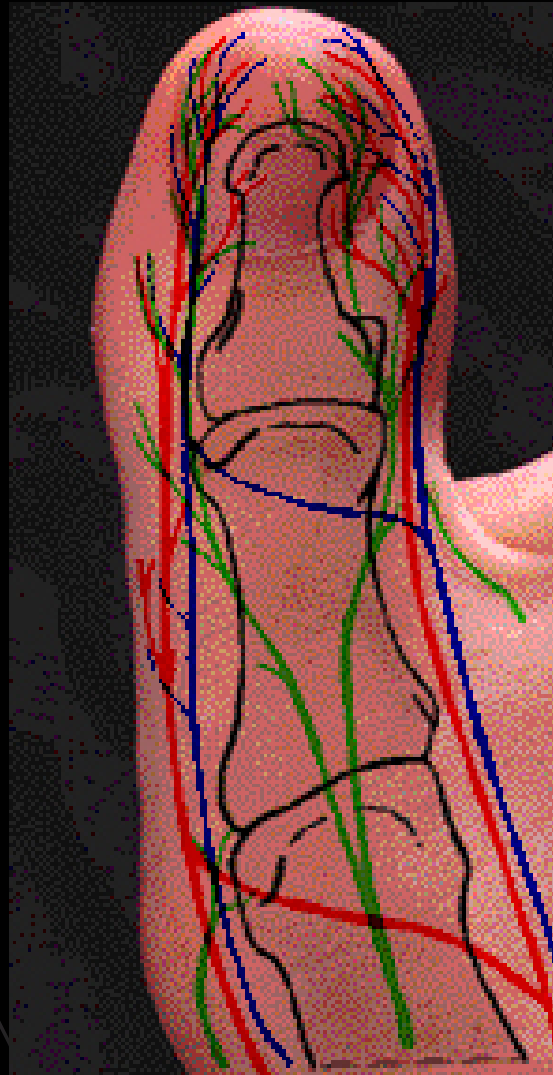
PREVIOUS RESEARCH: VR DISTRACTION

AUTHOR	N	AGE (years)	INTERVENTION	PROCEDURE	AVE VAS (cm)
Hoffman et al 2000a	2	16 & 17	VR Video game	Burns: dressing changes	VR 4.7-8 less than control
Hoffman et al 2000b	12	19-47	VR Control	Burns: Physiotherapy	VR= 2.2 Control= 4.2
Hoffman et al 2001a	1	32	VR Control	Burns: physiotherapy	VR= 1.5 (0.4-4.2) Control= 6.6 (5.3- 8.2)
Hoffman et al 2001b	2	51 & 56	VR Movie Control	Dental scaling	VR=0.6-1.2 Movie=3.3-7.2 Control=4.4-7.2
Steele et al 2003	1	16	VR Control	Post-op Physiotherapy	FACES: VR 1-3 less than control
Reger et al 2003	57	8-12	VR Screen Cartoon Control	Venipuncture	** VR = 0.9 ** Screen = 3.2 ** Cartoon = 2.5 ** Control = 2.4

AIM

- Determine if VR is effective in reducing pain and anxiety in Podiatry students receiving a digital nerve block from their peers as part of a teaching program

DIGITAL NERVE BLOCK



Bird 1998

DIGITAL NERVE BLOCK



- Needle 1:
inserted into lateral
aspect of the hallux



DIGITAL NERVE BLOCK



- Needle 2:
inserted into medial
aspect of the hallux



VIRTUAL REALITY

Head Mounted Display	IO I-glasses HV, Phrixus Technologies
Tracking system	IS-300 InertiaCube2, Intersense
Computer	Toshiba TE2300
Trigger/ mouse	Ergonomic finger track mouse



ARQUAKE



Dr Bruce Thomas
Wearable Computer Lab
University of South Australia

SUBJECTS

- Second year Podiatry students
- Undergoing digital nerve block training
- No history of migraines or epilepsy
- Written consent

SELF
REPORT

PHYSIOLOGICAL

PAIN & ANXIETY

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graph TD; A([SELF REPORT]) --> C[PAIN & ANXIETY]; B([PHYSIOLOGICAL]) --> C;
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The diagram illustrates the relationship between self-report and physiological measures in the context of pain and anxiety. Two blue ovals at the top, labeled 'SELF REPORT' and 'PHYSIOLOGICAL', have white arrows pointing down to a yellow rectangular box at the bottom labeled 'PAIN & ANXIETY'. The background is black with some faint, abstract grey lines and dots on the left side.

OUTCOME MEASURES

- Demographic questionnaire
- **Self report**
 - Visual analogue scale (pain)
 - State- Trait anxiety
- **Physiological**
 - Skin conductance
 - Blood pressure and heart rate
- **Side Effects**
 - Simulator sickness questionnaire
 - Malaise scale

PRE

POST

PRE

POST

CONTINUOUS

PRE DURING POST

PRE

POST

PRE DURING POST

METHOD

Entire teaching session	Student pair	
	Random selection of VR or CONTROL	
	Receiving first	Delivering first
	Pre	
	Received digital nerve block	Delivered digital nerve block
	Post	Pre
	Delivered digital nerve block	Received digital nerve block
		Post

RESULTS

- 14 subjects
- Mean age = 20.36 ± 3.46 years
(range 18-31 years)
2 males, 12 females
- No significant difference between demographics of VR and Control groups

VAS PAIN

- No significant difference in VAS pain between VR and Control groups ($p=0.764$)

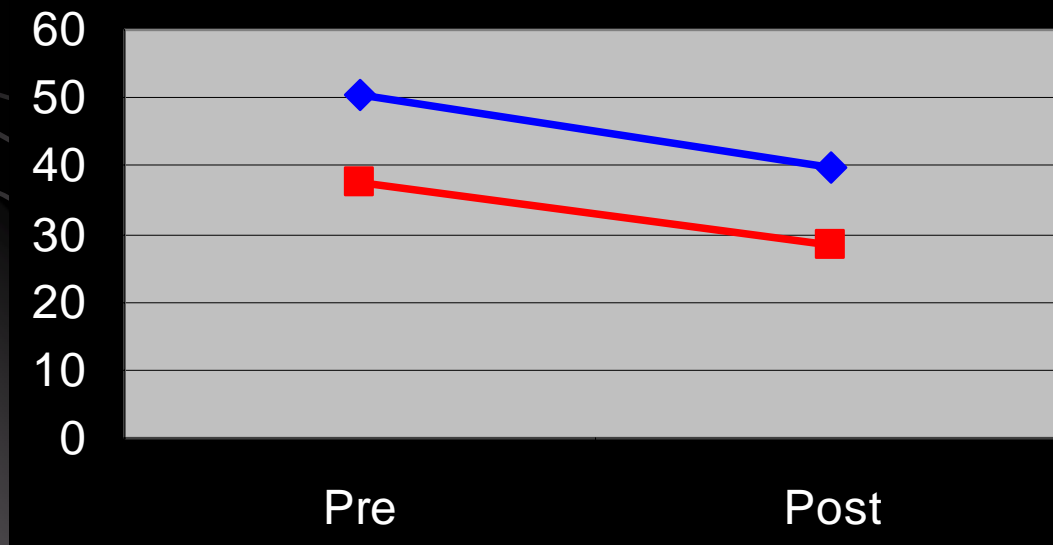
- Mean pain scores:

VR = 2.6 ± 1.07

Control = 2.9 ± 2.0

STATE ANXIETY

- Significant decrease in state anxiety post procedure in both VR and control groups ($p < 0.001$)
- No significant difference between VR and control groups ($p = 0.670$)



VR

Pre = 50.2 ± 14.5

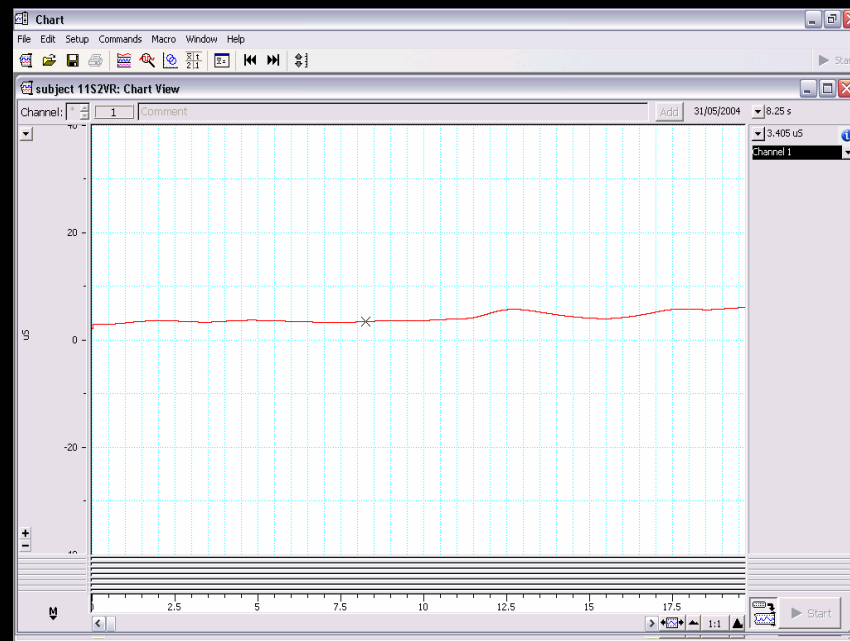
Post = 39.6 ± 11.0

Control

Pre = 37.6 ± 14.2

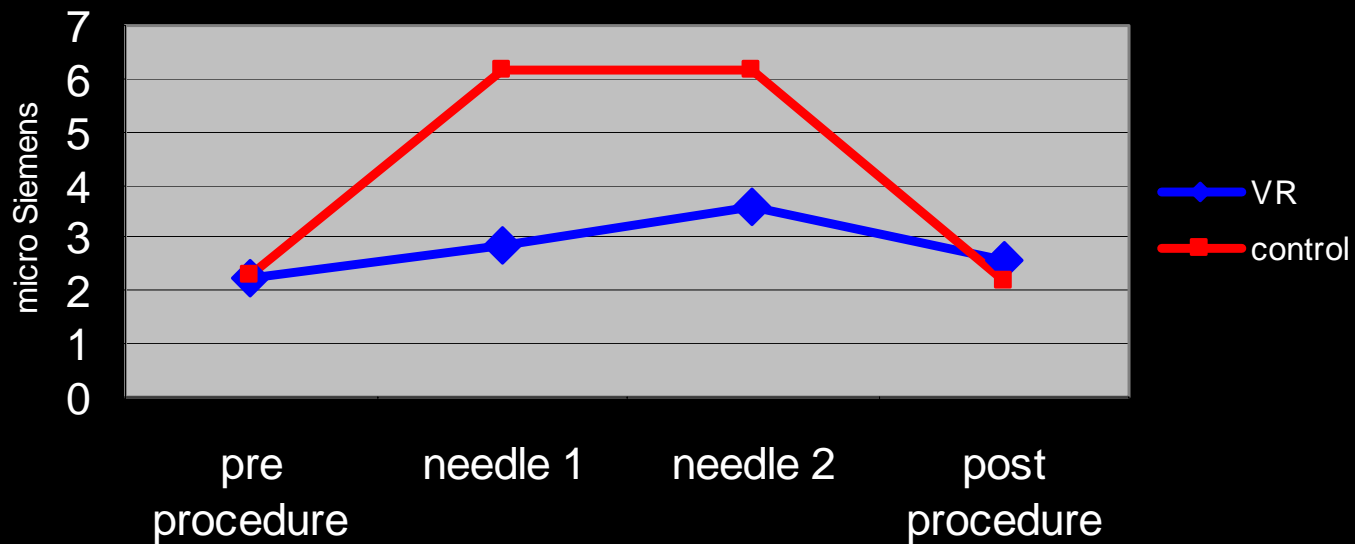
Post = 28.6 ± 9.1

SKIN CONDUCTANCE



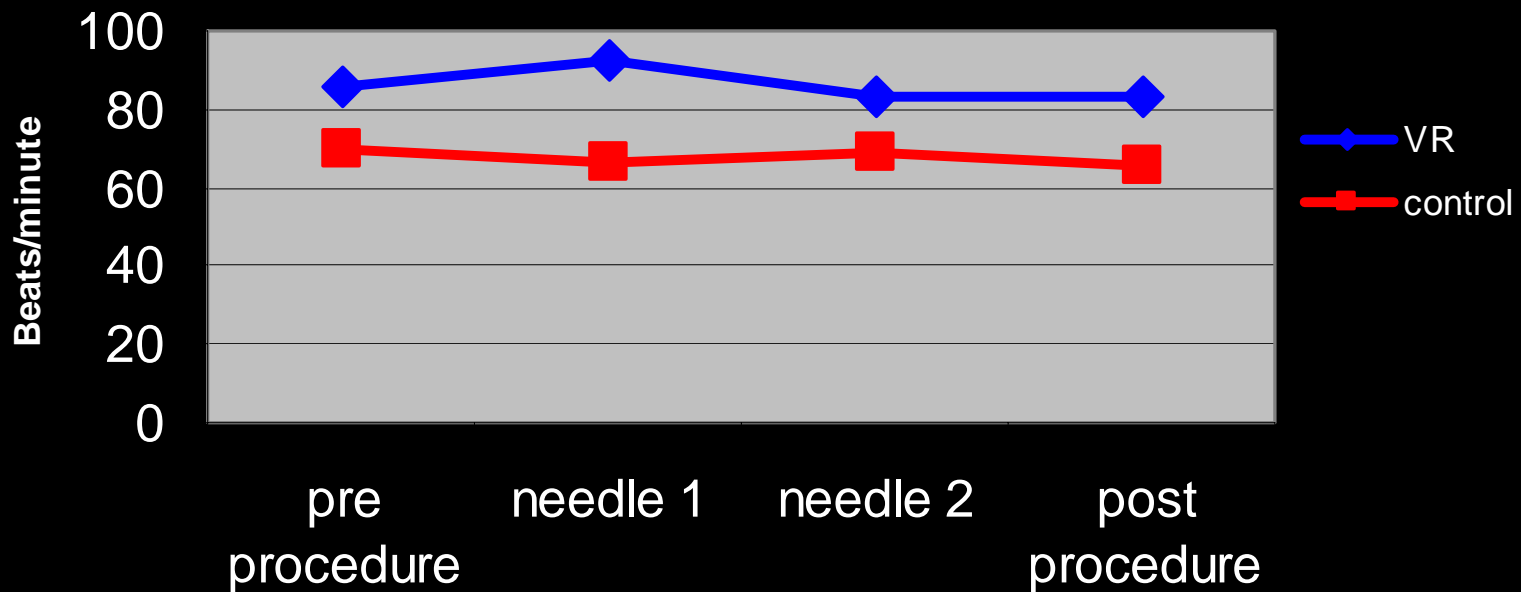
SKIN CONDUCTANCE

- No statistically significant difference between VR and control groups ($p = 0.345$)
- Clinically significant change > 0.05 microSiemens
(Schwartz 2003, Sigmon et al 1996)



BLOOD PRESSURE AND HEART RATE

- No significant difference between VR & Control at baseline, needle 1, needle 2 or post procedure ($p > 0.05$)

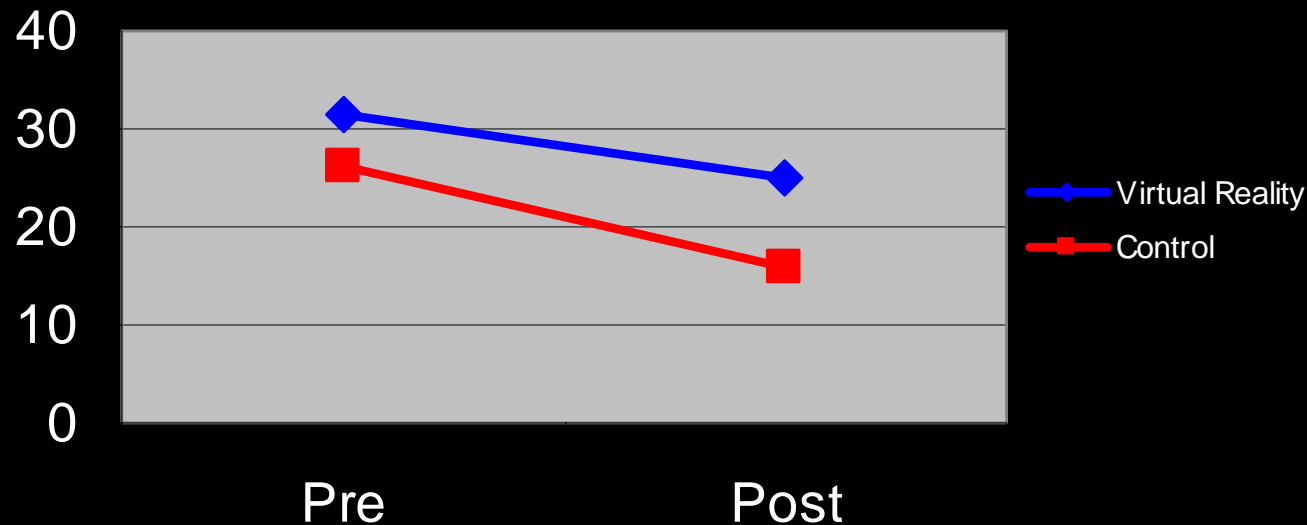


SIMULATOR SICKNESS QUESTIONNAIRE

- Kennedy et al (1993)
- Total simulator sickness score
- Subscales:
 - Nausea, Oculomotor, Disorientation
- VR and control
 - Pre and post procedure

SIMULATOR SICKNESS

- Significant decrease in Total SSQ post procedure in both VR and control groups ($p = 0.009$)
- No significant difference between VR and control groups ($p = 0.495$)



MALAISE SCALE

1

2

3

4

5

6

**NO
SYMPTOMS**

**ANY
SYMPTOMS
BUT NOT
NAUSEA**

**MILD
NAUSEA**

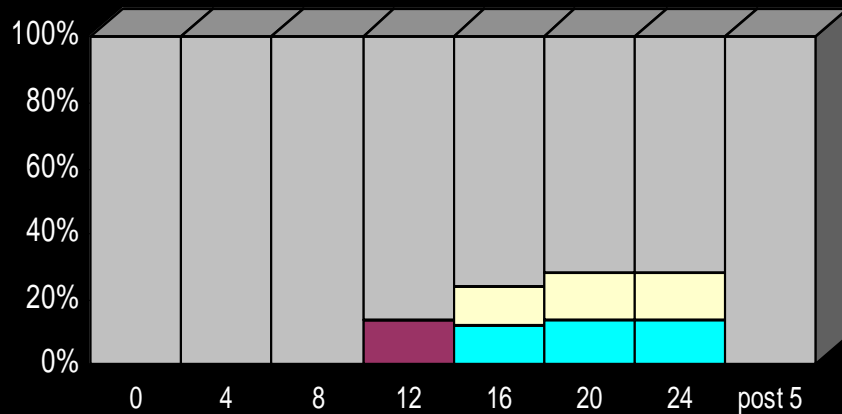
**MODERATE
NAUSEA**

**SEVERE
NAUSEA**

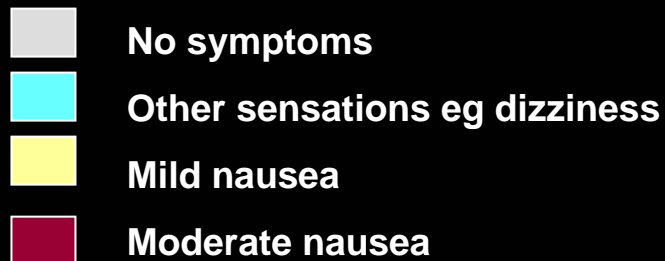
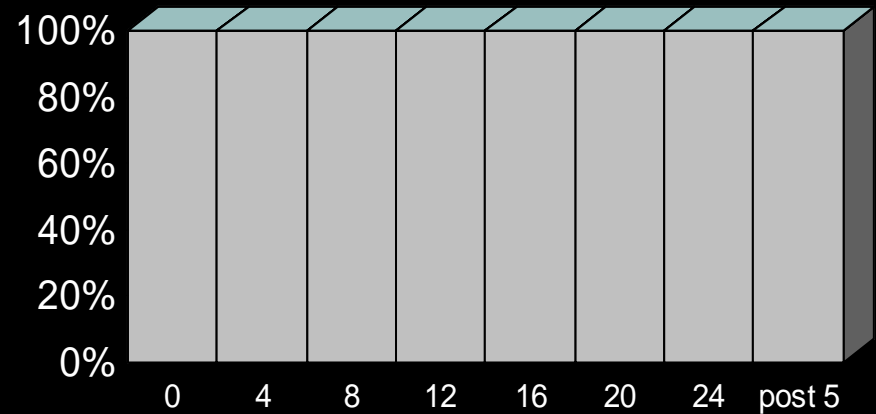
**BEING
SICK**

MALAISE SCALE

VIRTUAL REALITY




CONTROL



SO.....

IS VR A USEFUL
DISTRACTION TECHNIQUE
IN THIS TEACHING
SETTING?



VR vs CONTROL

- PAIN

- SKIN CONDUCTANCE

Statistical vs clinical difference

- MALAISE SCALE

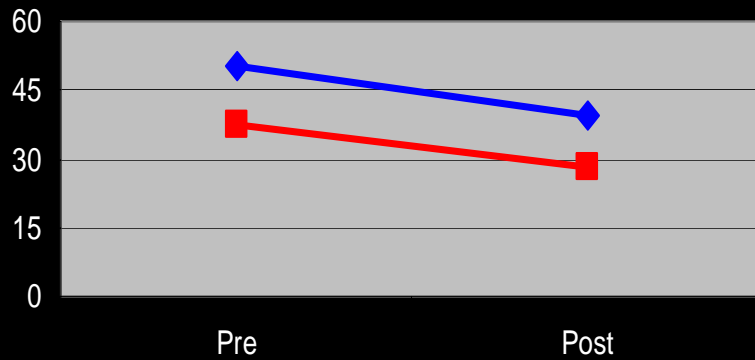


ANXIETY

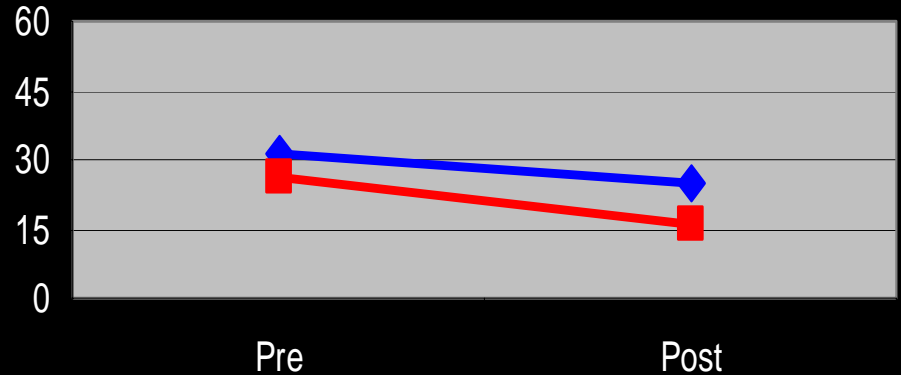
Entire teaching session	Student pair Random selection of VR or CONTROL	
	Receiving first	Delivering first
	Pre State Anxiety- 52.14 ± 15.57	
	Received digital nerve block	Deliver digital nerve block
	Post State Anxiety- 41.29 ± 10.74	Pre State Anxiety- 35.71 ± 10.37
	Deliver digital nerve block	Received digital nerve block
		Post State Anxiety- 26.86 ± 6.20
	6/7 VR	1/7 VR

SIMULATOR SICKNESS


ANXIETY



SIMULATOR SICKNESS



WHERE TO FROM HERE?

- Change design of teaching tutorial
 - Data collection completed: TAKE 2
 - Watch this space.....
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VIRTUAL REALITY FOR DOGS

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