




Do TETRA base station signals have a short-term impact on health and well-being?

Electromagnetics & Health Research Laboratory



Overview

- ◆ Why research into base station emissions was conducted
 - ◆ Description of the testing process
- 

Why research possible health effects from base stations?

- ◆ 2 issues:
 - Public concern
 - Small subgroup in the population report symptoms

Scientific evidence: Steward Report (2000)

- ◆ Sir William Stewart (Independent Expert Group on Mobile Phones)
- ◆ Concluded that
 - Balance of evidence indicates that mobile phone technology not harmful, but...
 - Wireless technology has developed very rapidly compared to the peer-reviewed research into its safety.
- ◆ Therefore precautionary approach recommended

Scientific evidence: mobile phone signals

- ◆ No reproducible evidence of adverse effects from GSM/3G signals (Eltiti et al., 2007, Regel et al. 2006, Rubin et al. 2006).
- ◆ Neither sensitives nor controls can detect the presence of EMFs above chance (e.g. Kwon et al. 2009)


Scientific evidence: TETRA signals

- ◆ Recent studies have investigated impact of TETRA (handsets only).
- ◆ Barker et al. 2007: no impact on blood pressure.
- ◆ Green et al. 2005: no changes to calcium physiology in the brain.



Electromagnetic Hypersensitivity (EHS)

“...my symptoms include, hot face and head, ringing in my head, bitter taste, dizziness, mouth ulcers, sore eyes, extreme wakefulness, disturbed sleep...”



Aims of the study

- ◆ To determine whether EHS symptoms are caused by exposure to radio frequency electromagnetic fields (RF-EMF) as produced by a TETRA signal, and
- ◆ To determine whether RF-EMF affect people who do not report sensitivity to electromagnetic fields.

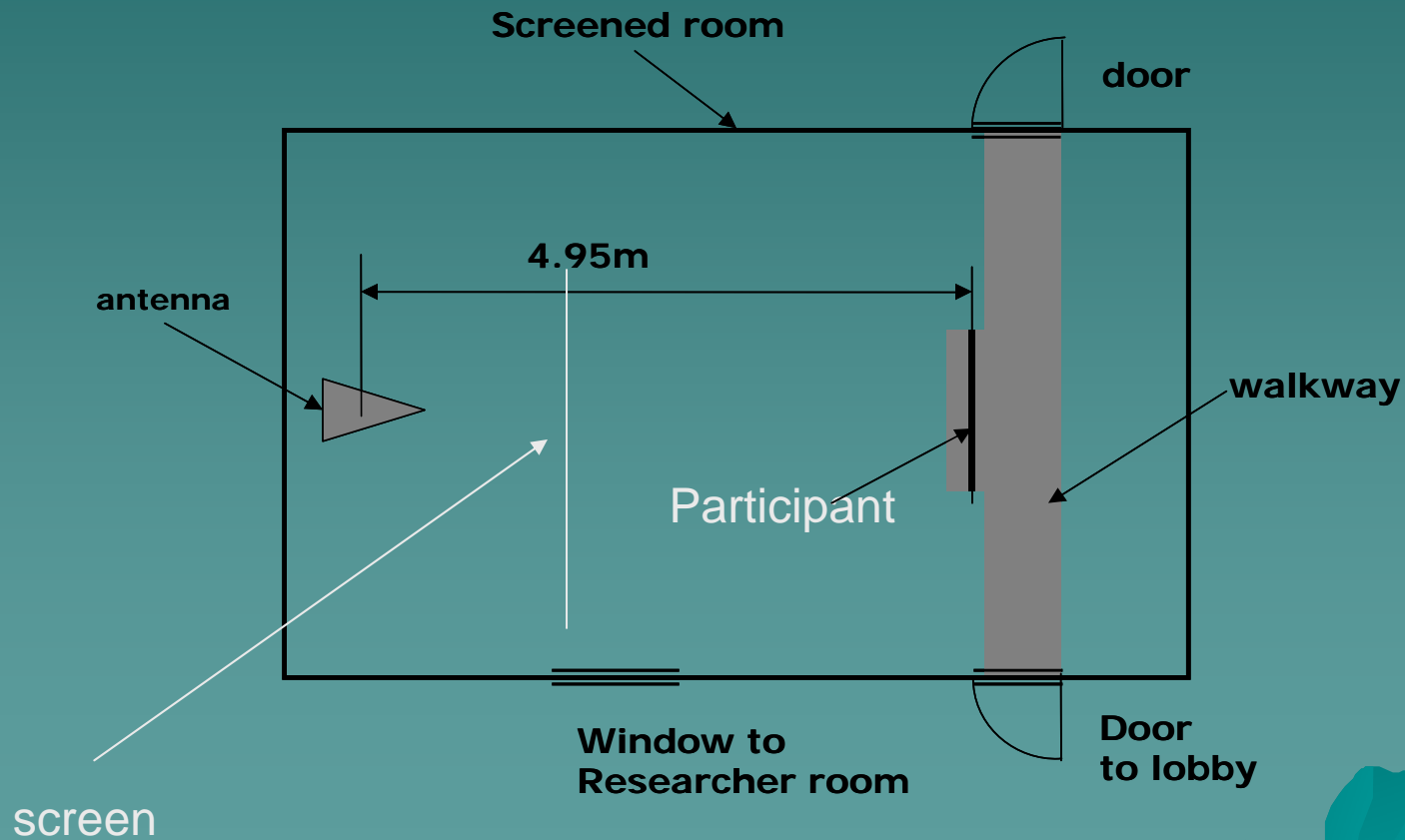
Funding

- ◆ The Mobile Telecommunications and Health Research programme (www.mthr.org.uk) has provided the funding for this study.

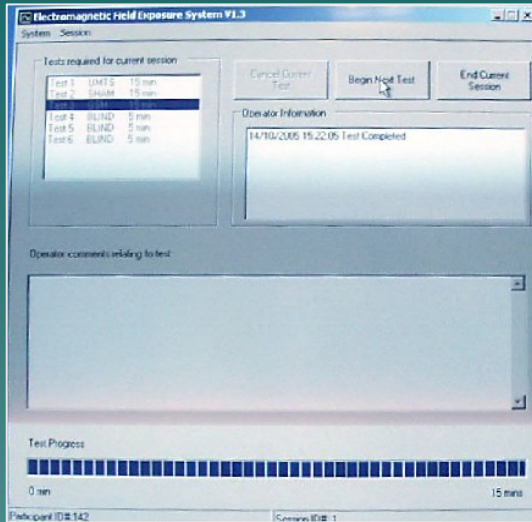
The Electromagnetics and Health Research Laboratory

- ◆ We established a screened laboratory specifically for electromagnetic and health research at the University of Essex.
- ◆ The laboratory was supplied by the National Physical Laboratory.
- ◆ A base station capable of transmitting a TETRA signal was developed and installed by Red-M.

Testing room plan



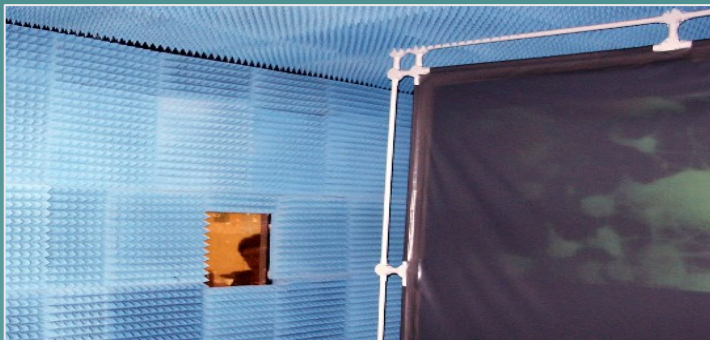
Testing in progress



An example of the computer running a Session 1.



Participant ready to be tested



Screen in the testing room and window through to experimenter's room.



Participant reporting how they are feeling.



Characteristics of the signal

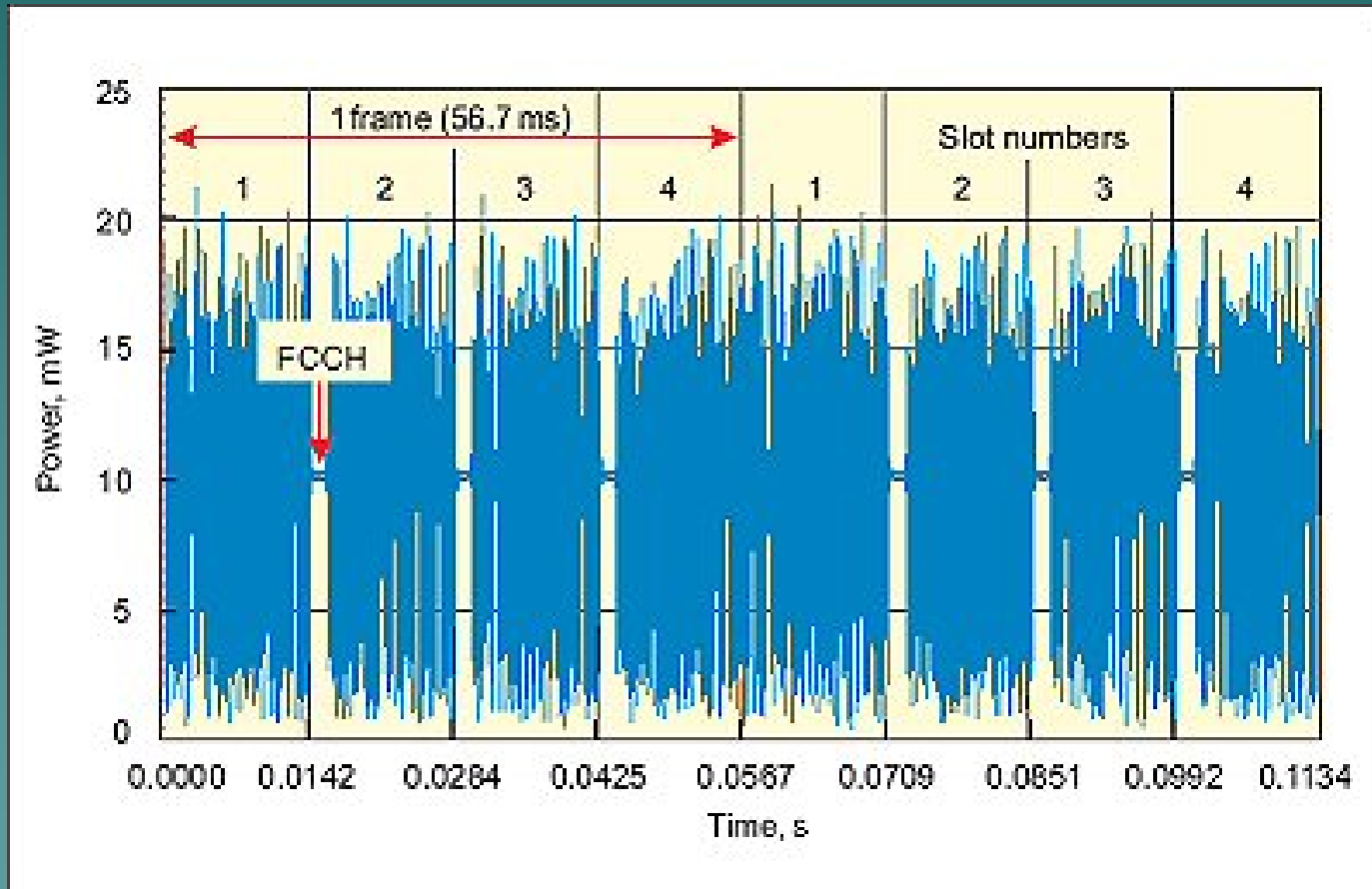
- ◆ The signal:
 - The version in use for this project was Release 1 (ETSI spec 390 392-2).
 - Frequency is 420MHz.
 - Properties of the signal are modeled on Airwave TETRA system which is used by emergency services.

Characteristics of the signal cont.

◆ Waveform:

- There is a marked difference in the waveform depending on whether or not traffic is carried by the transmission due to the presence/absence of frequency correction in the bursts.
- Frequency Correction Channel (FCCH) is only present under 'no traffic' conditions.
- A ratio of timeslot occupancy of 50:50 was therefore applied to enable an equal balance of the two states for the purposes of the study.

TETRA BASE STATION WAVEFORM



Study Design

- ◆ Data collected over 3 sessions.
- ◆ Session 1: open provocation tests.
- ◆ Sessions 2 and 3: double-blind tests.



Method

- ◆ A double-blind provocation study
- ◆ Participants:
 - 132 sensitives and
 - 132 control
- ◆ Exposure conditions:
 - TETRA signal (420MHz @ 10mW/m²)
 - Sham (no signal)

Measures

- ◆ Physiological measures:
 - Heart rate
 - Blood volume pulse (blood pressure)
 - Skin conductance
- ◆ Subjective well-being:
 - Visual Analogue Scales
 - List of 57 symptoms
- ◆ Cognitive measures:
 - Memory
 - Attention

Inclusion criteria for sensitives

- ◆ Self-report experiencing symptoms associated with one or more objects that emit an EMF signal e.g.:
 - Base station signals (TETRA/3G/GSM)
 - Mobile handset signals (Airwave/other)
 - DECT phones
 - Wifi
 - Power lines, other electrical devices.

Inclusion criteria for controls

- ◆ Not sensitive to objects emitting electromagnetic fields.



Exclusion criteria

- ◆ Outside range of 18 to 80 years
- ◆ Brain injury
- ◆ Pace maker
- ◆ Diagnosed mental illness
- ◆ Claustrophobia/epilepsy
- ◆ Any other physical impairment/illness that may interact with the results.

Open Provocation Test

TETRA Signal

[15 minutes]

2min

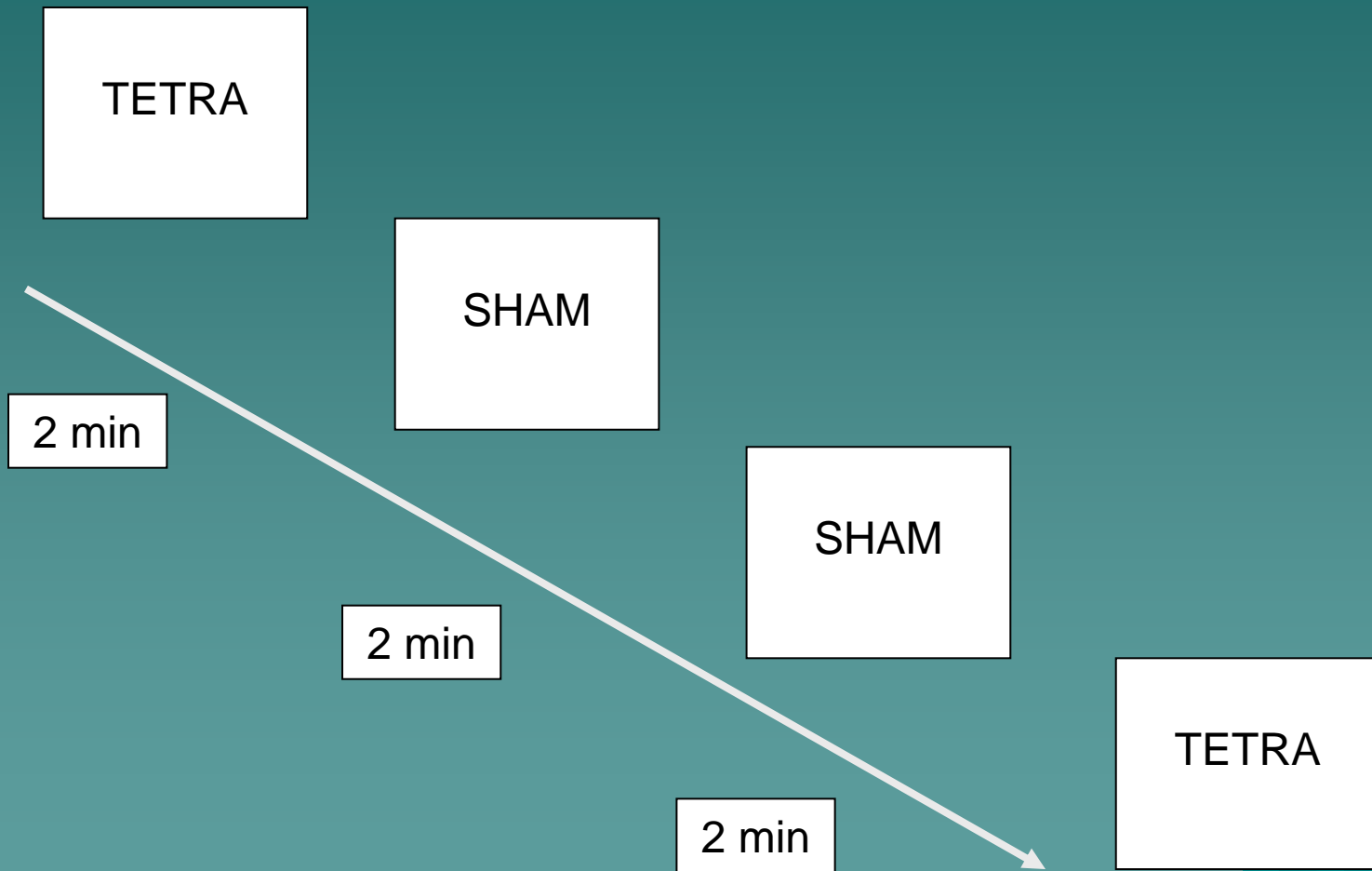
Sham
(no signal)

[15 minutes]

Short double-blind trials

- ◆ After the open provocation test we conducted a short-duration double-blind test to establish if participants could tell when the base station was on and when it was off.
- ◆ Four 5-minute trials.

Quick double-blind test




Sessions 2 – 3 protocol

- ◆ Each session follows the same protocol:
 - 50-minute exposure.
 - Only one exposure condition is administered.
 - Cognitive tests.
 - Participants were asked to judge whether the base station was on over the 50-minute period just experienced.

Session 2 – 3 protocol cont.

- ◆ After participants completed their session they went back into the reception room for debriefing and were given a set of follow-up questionnaires to complete and return.
- ◆ The follow-ups provided data that tracked symptom patterns over a 6-day period after testing.

Results

- ◆ Can people detect electromagnetic signals?
 - ◆ Does short-term exposure to TETRA base-station signals affect physiological responses?
 - ◆ Does short-term exposure to TETRA base-station signals affect subjective well-being?
- 



Can people detect electromagnetic signals?

TETRA
[5 min]

TETRA
[5 min]

Sham
[5 min]

Sham
[5 min]

Sham
[50 min]

TETRA
[50 min]

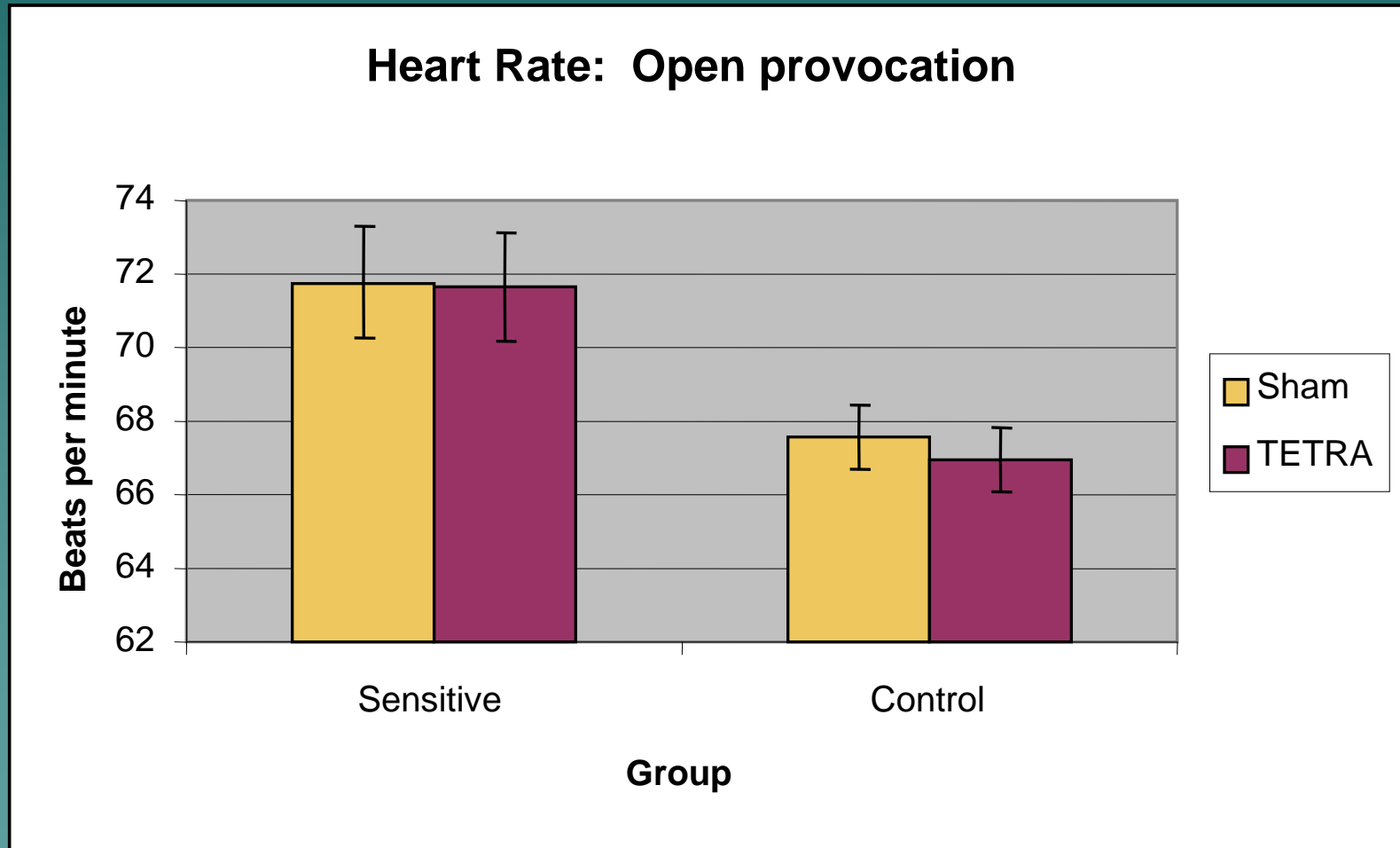
Can people detect electromagnetic signals?

- ◆ Neither the sensitive nor the control group could detect the signal at above a chance level.
- ◆ 2/48 sensitives and 3/132 controls were correct on all 6 trials. This is what is expected by chance.

*Does short-term exposure to TETRA
base-station signals affect physiological
responses?*

- ◆ Open provocation results...

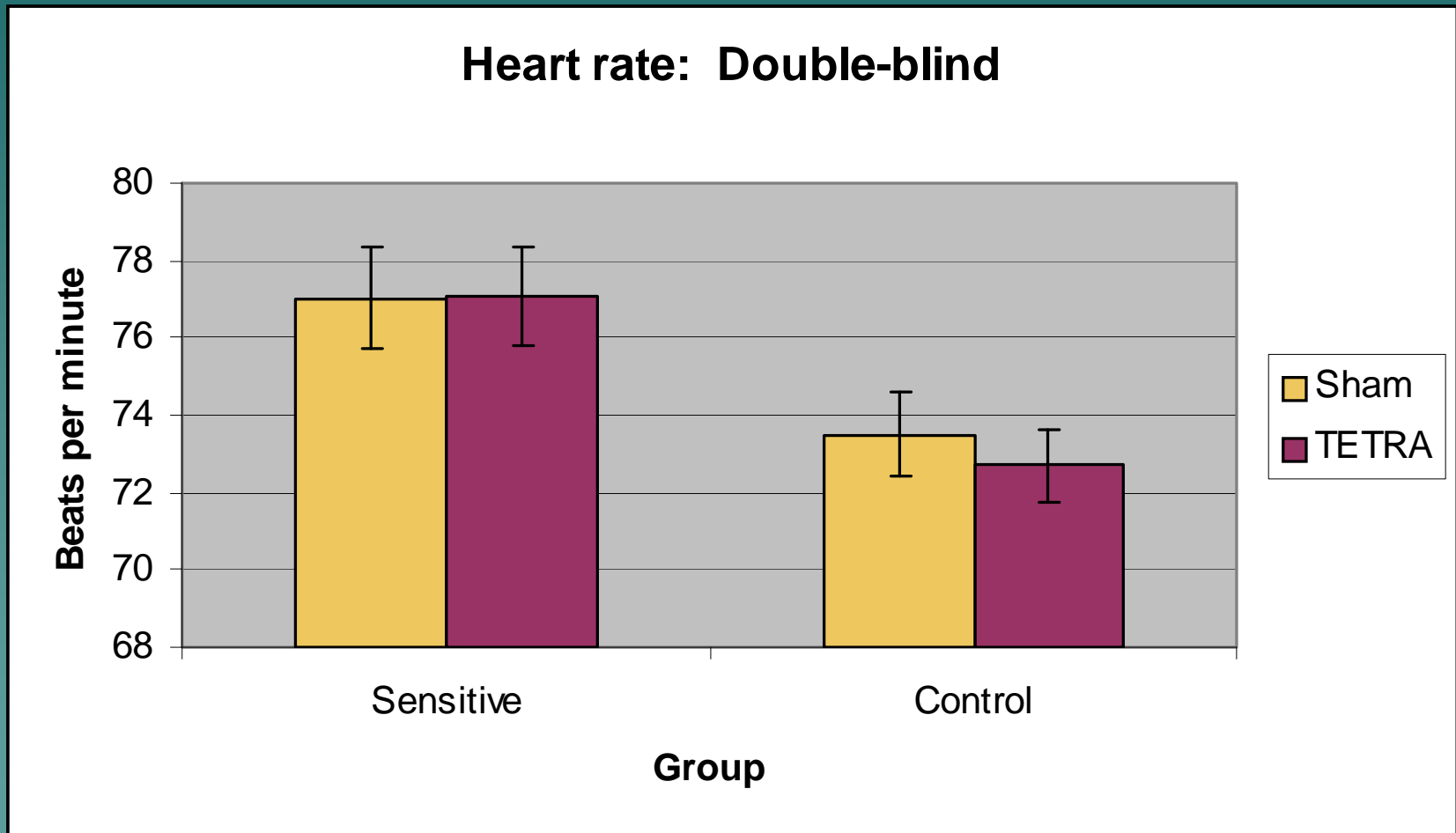
Open provocation: Physiological measures



Does short-term exposure to TETRA base-station signals affect physiological responses?

◆ Double-blind results...

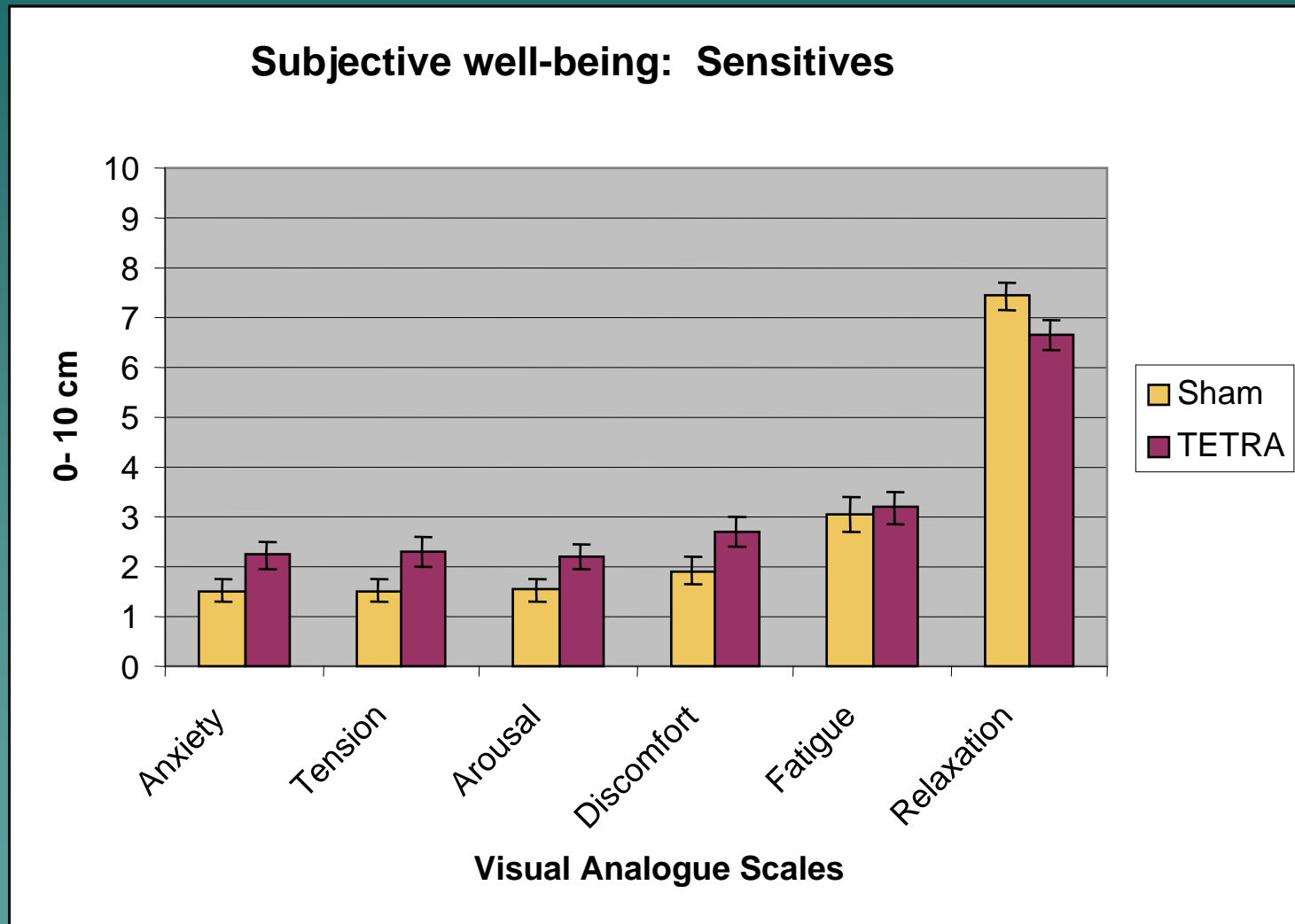
Double-blind: Physiological measures



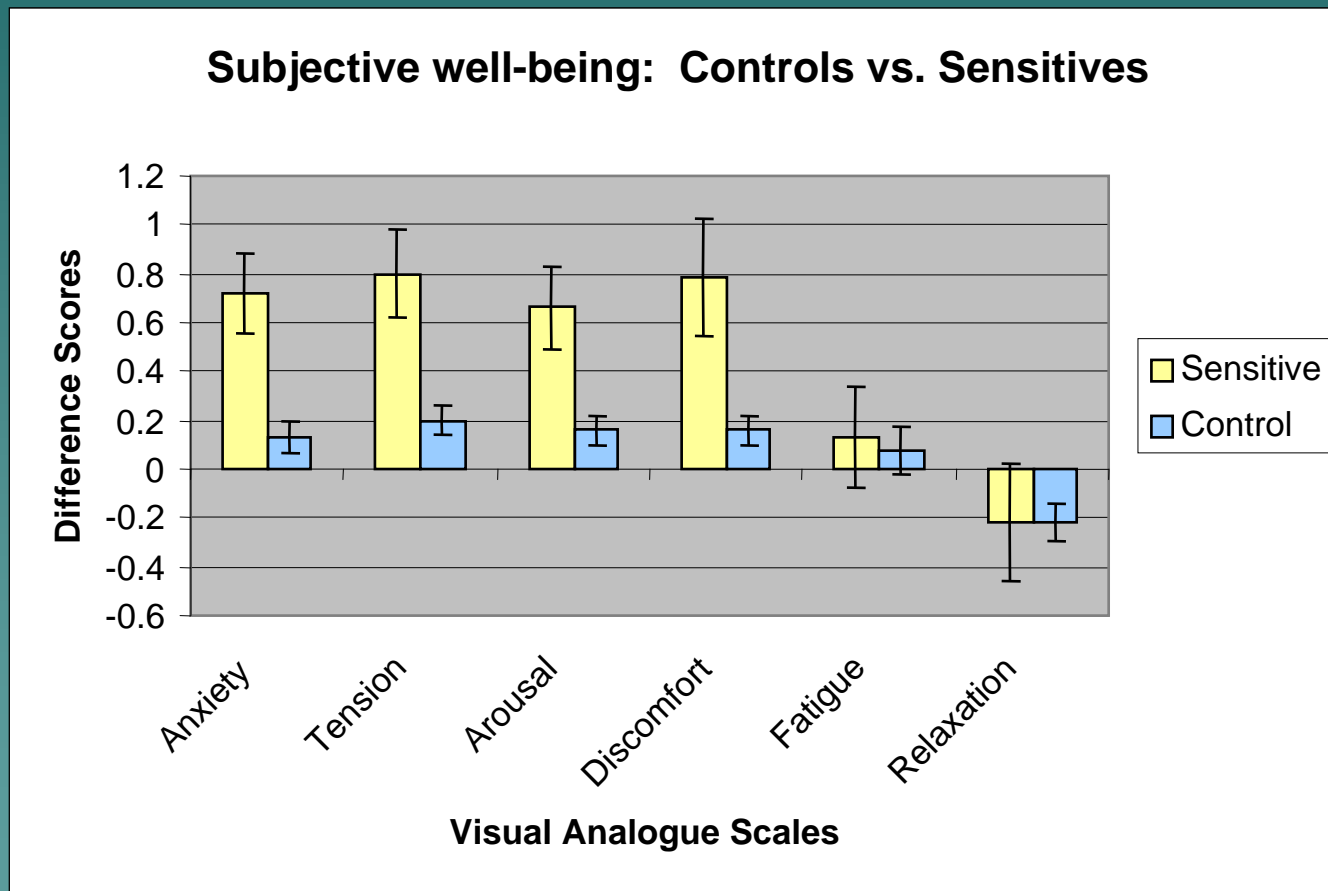
Does short-term exposure to TETRA base-station signals affect subjective well-being?

◆ Open provocation results...

Open provocation: Visual Analogue Scales



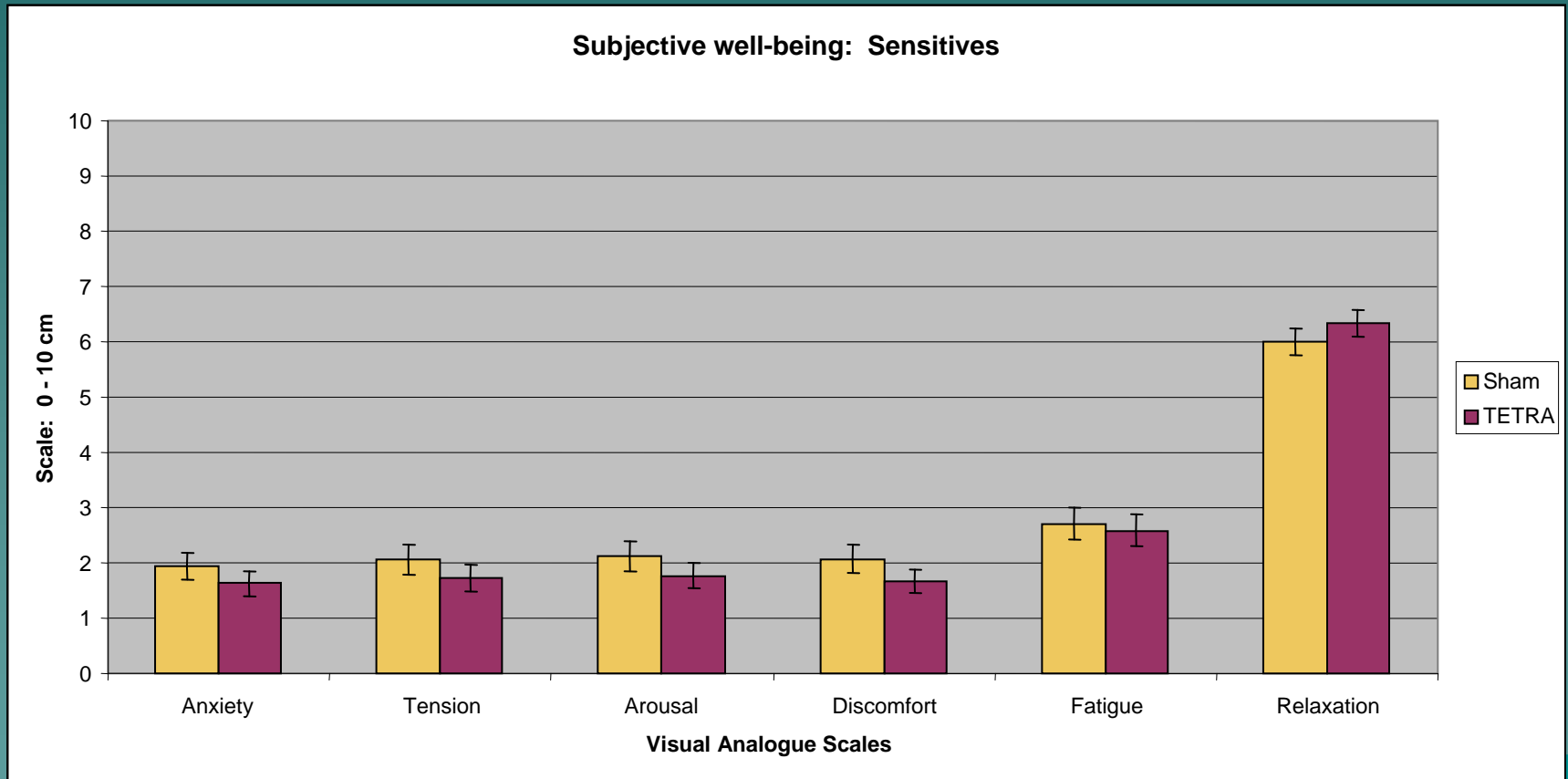
Open provocation: Subjective well-being cont.



*Does short-term exposure to TETRA
base-station signals affect subjective
well-being?*

◆ Double-blind results...

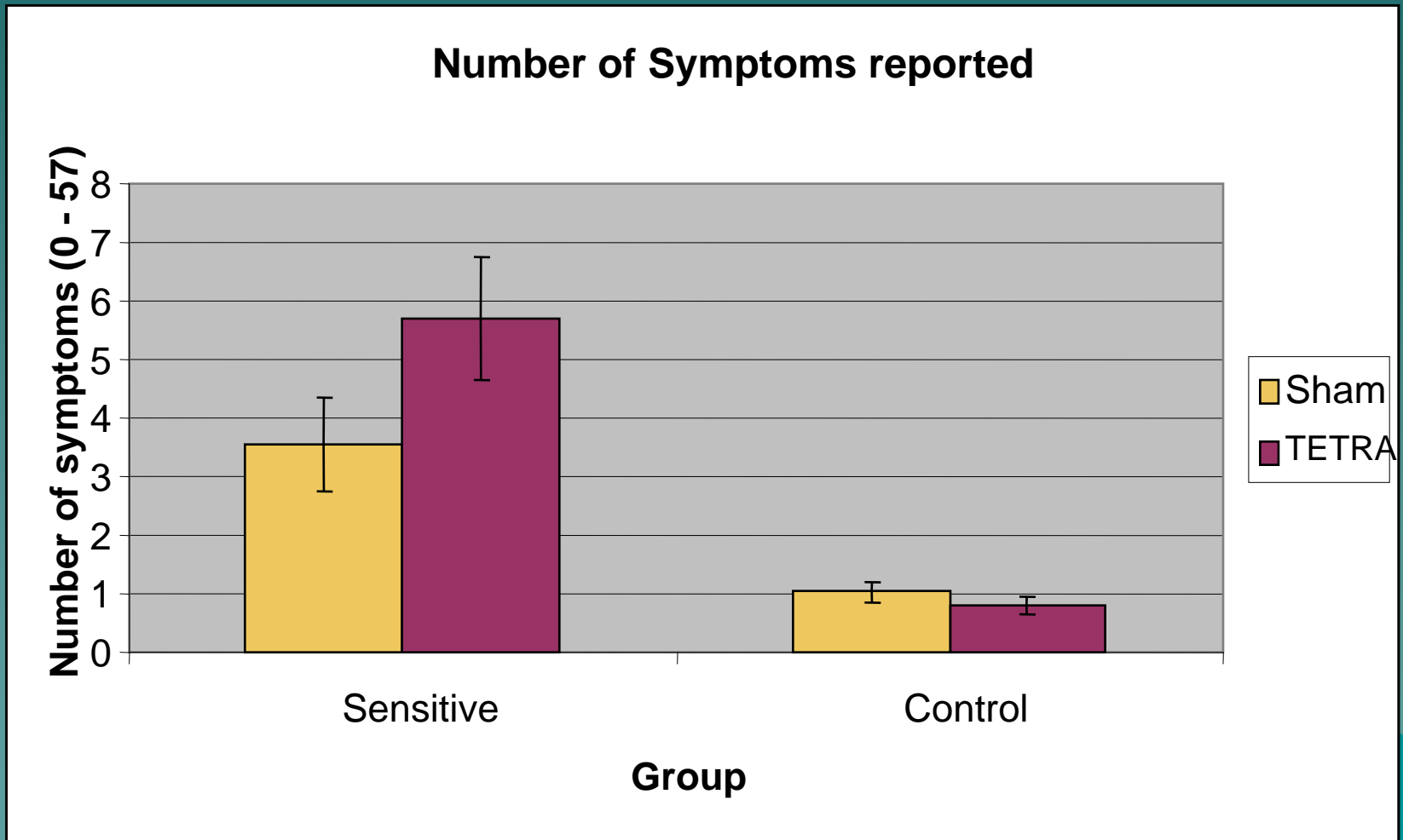
Double-blind: Subjective well-being



Does short-term exposure to TETRA base-station signals affect total number of symptoms experienced?

◆ Open provocation results...

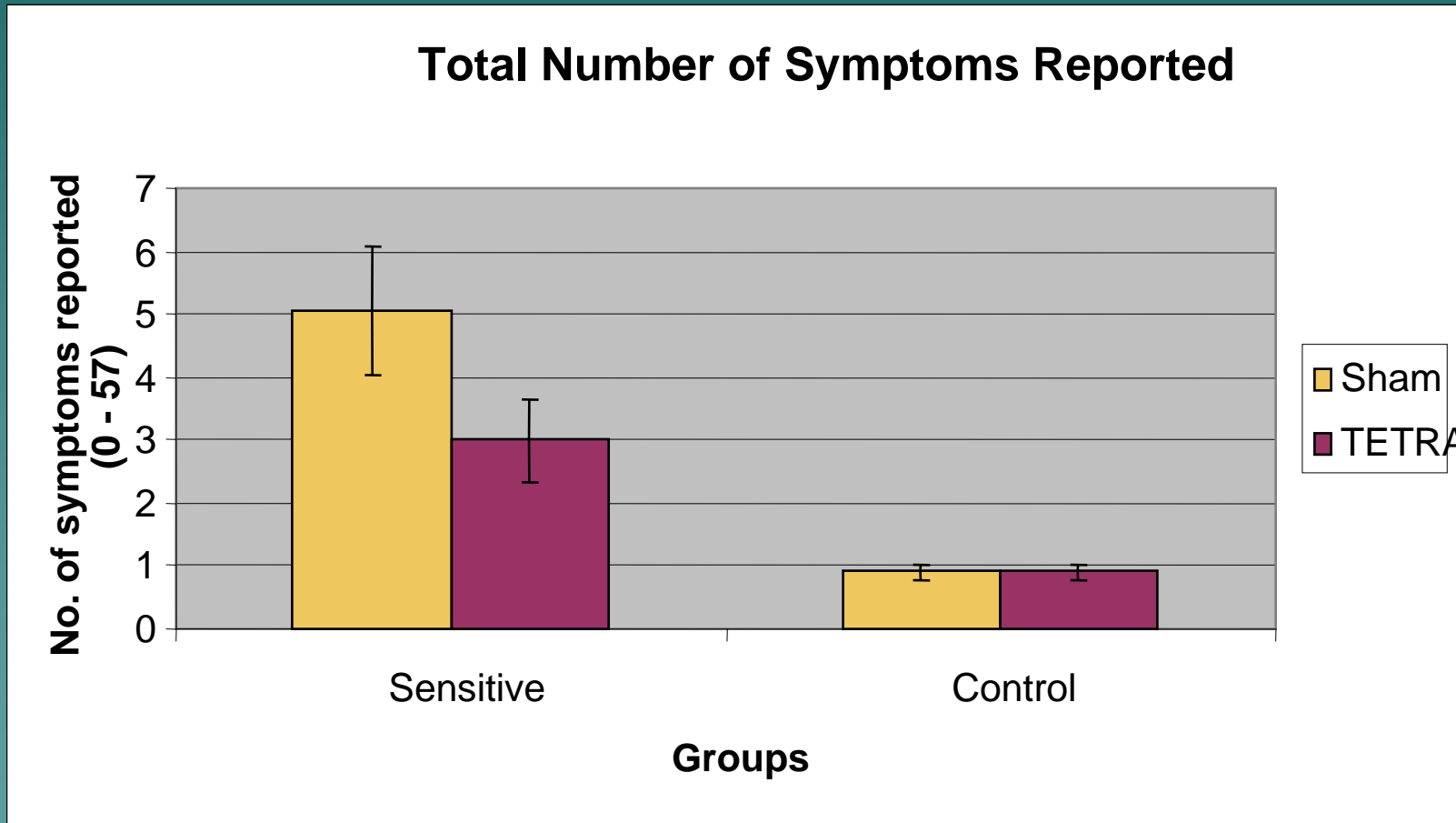
Open provocation: total number of symptoms experienced



Does short-term exposure to TETRA base-station signals affect total number of symptoms experienced?

◆ Double-blind results...

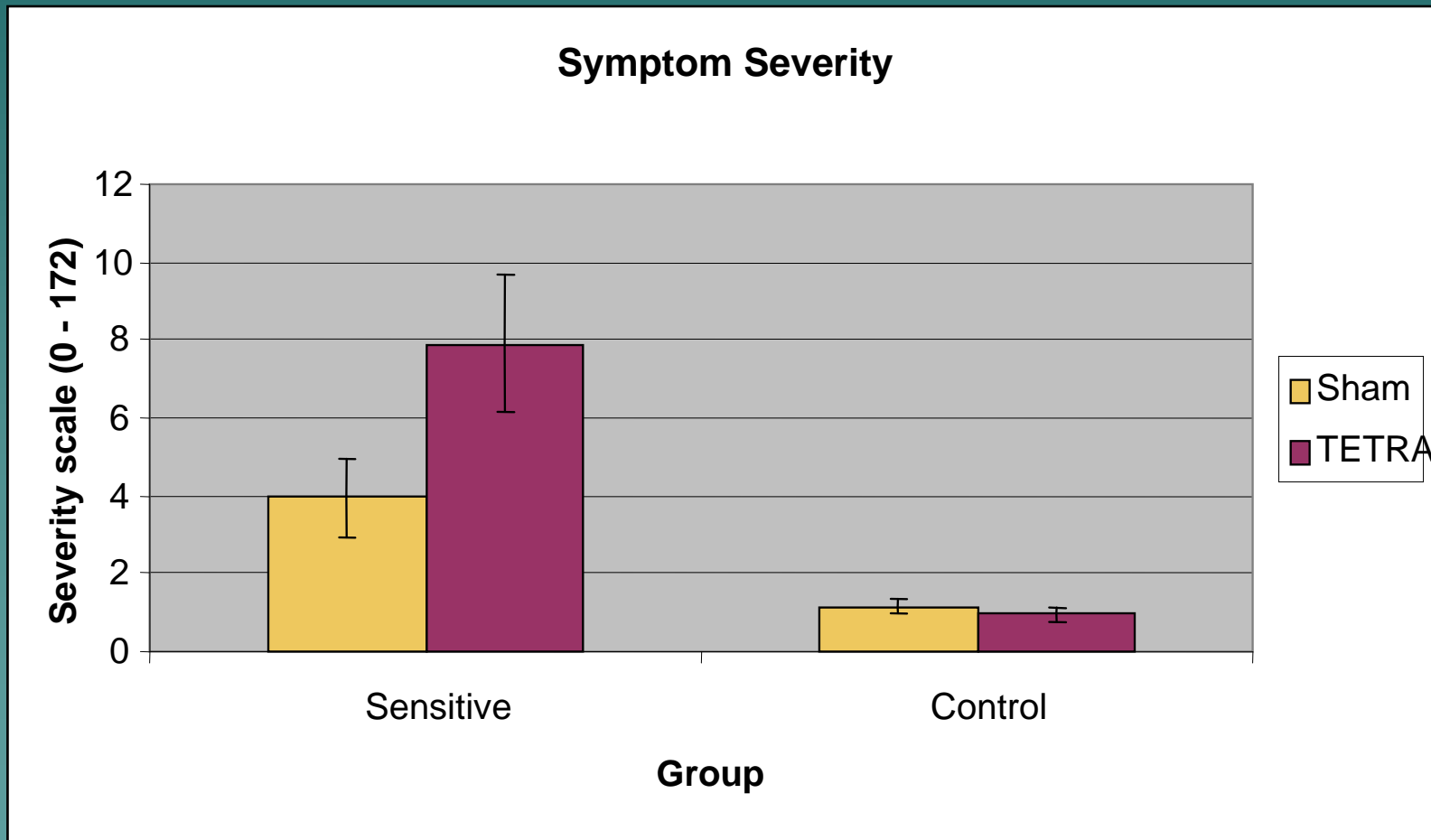
Double-blind: Total number of symptoms



Does short-term exposure to TETRA base-station signals affect severity of symptoms experienced?

◆ Open provocation results...

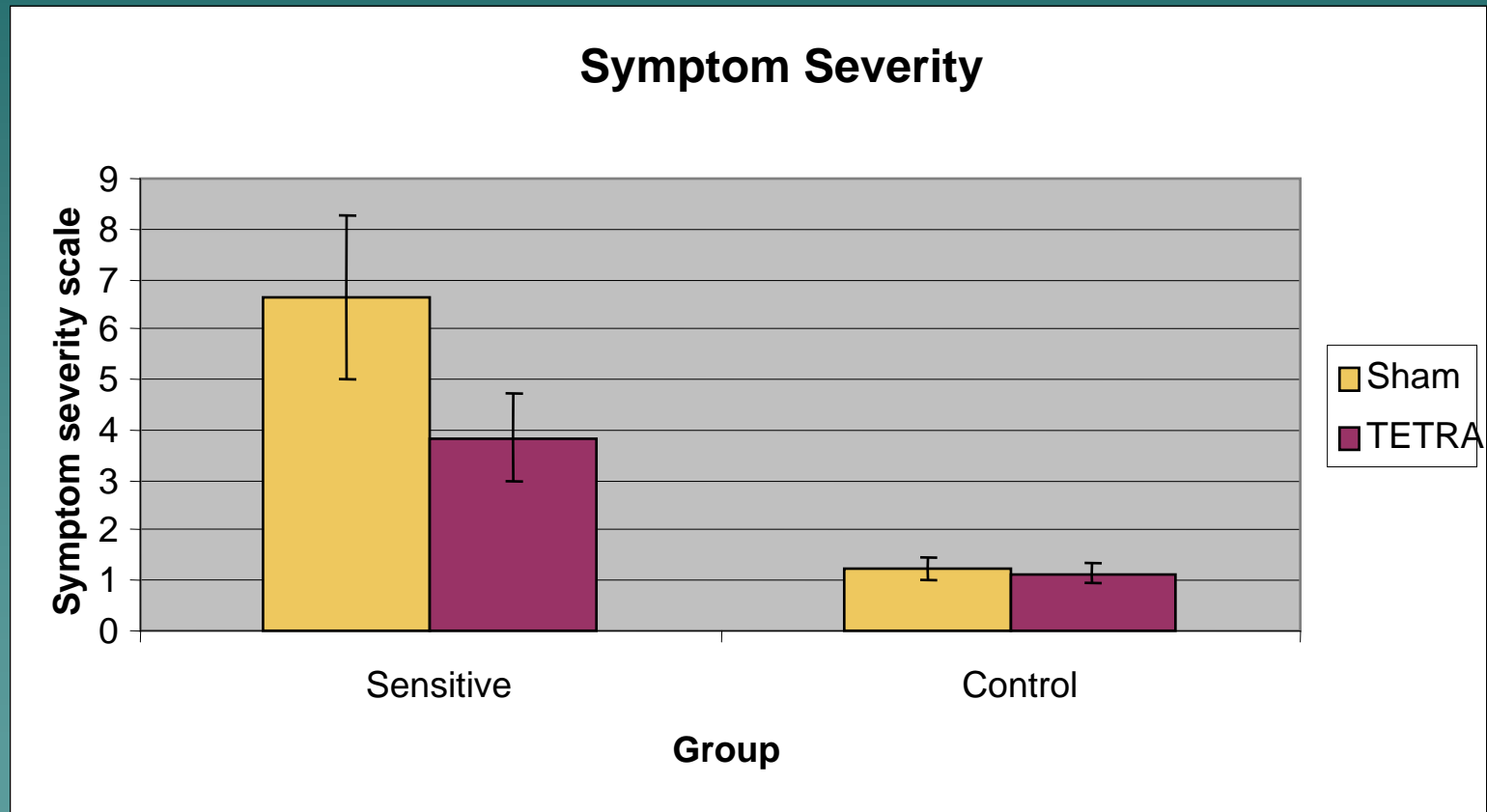
Open provocation: Symptom Severity



Does short-term exposure to TETRA base-station signals affect severity symptoms experienced?

◆ Double-blind results...

Double-blind: Symptom Severity



The Research Team

- ◆ Elaine Fox *Experimental Psychologist*
- ◆ Riccardo Russo *Experimental Psychologist*
- ◆ Stacy Eltiti *Experimental Psychologist*
- ◆ Denise Wallace *Experimental Psychologist*
- ◆ Anna Ridgewell *Experimental Psychologist*
- ◆ Kelly Garner *Experimental Psychologist*
- ◆ Stuart Walker *Electrical Engineer*
- ◆ Terence Quinlan *Electrical Engineer*
- ◆ Sandra Dudley *Physicist*
- ◆ Francisco Sepulveda *Biomedical Engineer*
- ◆ Sithu Maung *Medical Doctor*
- ◆ Roger Deeble *Electronic Technician*
- ◆ Red-M *Development of Exposure Simulation*

THANK YOU