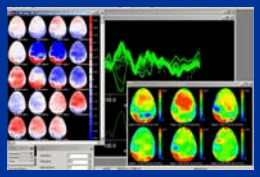


NEUROSCIENCE FOR ARCHITECTS - EXPERIMENTAL DESIGN

NewSchool of Architecture and Design | San Diego CA | June 04 2007

What is the **main hypothesis**?

A room with a window view of a natural setting might have restorative influences

What are the **conclusions**?

Patients assigned to rooms with windows looking on a natural scene had shorter postoperative hospital stays, received fewer negative evaluative comments in nurses' notes, and took fewer potent analgesics than patients in similar rooms with windows facing a brick building wall.

ULRICH_1984 | ABSTRACT

Background information | History of the question/problem

American and European groups preferred views of natural outdoor scenes compared to urban views without natural elements

Vegetation, especially water, sustain interest and attention more than urban views

Natural views may foster restoration from stress and anxiety

ULRICH_1984 | INTRODUCTION

A hypothesis is an idea about the natural world that can be tested through an experiment. A scientific hypothesis is subject to scientific evaluation and must be falsifiable, which means that they can be proven to be incorrect.

HYPOTHESIS

MAIN: A room with a window view of a natural setting might have restorative influences

SUBSEQUENT #1: Views to the outside may be especially important to individuals who have a consistent schedule and spend the majority of their time in the same room

SUBSEQUENT #2: A window view may affect the emotional state of a patient, which might affect recovery

SUBSEQUENT #3: No differences would be seen on the day of the surgery, on the first recovery day, or on the final two days in the analgesic intake between the two groups

ULRICH_1984 | HYPOTHESES

How did they study the questions/problems?

Retrospective study > Old hospital records (between 1972 and 1981) were obtained and studied

ULRICH_1984 | METHOD

What was the setting of the experiment?
Suburban Pennsylvania hospital (200 beds) between May and October (when the trees have foliage)

Patients were located in double occupancy rooms with windows either looking out to a grove of trees or to a brown brick wall

The rooms were identical in terms of dimensions, window size, arrangement of beds, furniture and other major physical characteristics.

ULRICH_1984 | METHOD

Who were the participants in the experiment?
46 cholecystectomy patients grouped into 23 pairs (15 female and 8 male)

What type of subjects?
Exclusion criteria: patients younger than 20 and older than 69, patients who developed serious complications, and those with a history of psychological disturbances.

ULRICH_1984 | PARTICIPANTS

Independent Variable
In an experiment, the condition that is manipulated by the experimenter to examine its impact on the dependent variable.

Room with a view of trees
versus
room with a view of a brick wall

ULRICH_1984 | PROCEDURE

Dependent Variable
In an experiment, the measure that is affected by manipulation of the independent variable.

1. Number of days of hospitalization
2. Number and strength of analgesics each day
3. Number and strength of doses for anxiety each day
4. Minor complications
5. All nurses' notes relating to a patient's condition or course of recovery

ULRICH_1984 | PROCEDURE

Confounds (or extraneous variables)
Anything that affects a dependent variable that may unintentionally vary between the different experimental conditions of a study.

- Patients were matched by gender, age, weight, smoker/nonsmoker, nature of previous hospitalization, year of surgery, and floor level (2nd level – room color)
- Tried to account for variability between doctors
- Tried to account for changes in procedures
- The same nurses were assigned to patients in both conditions (view of trees v. view of brick wall)

ULRICH_1984 | PROCEDURE

Basic Statistics

p is an estimate of the probability that the result has occurred by statistical accident.

$p < 0.01$ mean there is more than a 99% likelihood that a specific event will occur, or in other words, less than 1% probability that the result has occurred by accident.

In most research they will accept $p = 0.05$ as significant results.

ULRICH_1984 | RESULTS

More positive nurses' notes were made about patients with the wall view though not statistically significant.

No difference was seen between the two groups in terms of anti-anxiety medication used

Patients with the tree view had less minor complications as calculated by a weighted score than patients with the wall view though not statistically significant

ULRICH_1984 | INSIGNIFICANT RESULTS

Patients with window views of trees had shorter hospital stays than those with views of the brick wall (7.96 days compared to 8.70 days per patient, $p = 0.025$)

More negative nurses' notes were made about patients with views of the brick wall (3.96 compared to 1.13 per patient, $p < 0.001$)

In days 2 through 5 patients with the tree view took fewer moderate and strong pain doses but more weak doses, such as aspirin ($p < 0.01$)

ULRICH_1984 | SIGNIFICANT RESULTS

What did they conclude from their results?

Patients with the tree view had shorted postoperative stays, fewer negative nurses' evaluations, took fewer moderate and strong analgesic doses, and lower scores for minor complications

Findings suggest that the natural scene (the trees) had therapeutic influences

ULRICH_1984 | DISCUSSION

What did they conclude from their results?

Patients with the tree view had shorted postoperative stays, fewer negative nurses' evaluations, took fewer moderate and strong analgesic doses, and lower scores for minor complications

Findings suggest that the natural scene (the trees) had therapeutic influences

ULRICH_1984 | DISCUSSION

The researchers will acknowledge problems with their study in the discussion.

It should be noted that the "built" view or the brick wall was comparatively monotonous

Results cannot be applied to other patient groups (only to short term patients who probably are having uses with anxiety v. long term patients who are having problems with low arousal or boredom)

Results cannot be applied to all built features

ULRICH_1984 | SHORTCOMINGS

Future studies/questions

Could a built view such as a "lively city street" have therapeutic effects similar to those of a nature scene?

ULRICH_1984 | FUTURE STUDIES

Strengths?

Weaknesses/limitations?

Do you support the author's conclusions?

Variables that you might substitute or add?

How could this research influence the design process?

What additional research needs to be done to strengthen the author's findings?

ULRICH_1984 | CRITIQUE

- Experiments
- Correlational Studies
- Descriptive Studies

TYPES OF RESEARCH STUDIES

Experiment

"A research method for testing causal hypotheses in which variables are both measured and manipulated."

EXPERIMENTS

Dr. Smith wants to examine whether a new drug increases the maze running performance of older rats. Just like aging humans, older rats show signs of poorer memory for new things. Dr. Smith teaches two groups of older rats to find a piece of tasty rat chow in the maze. One group of rats is given the new drug while they are learning the maze. The second group is not given the drug. One week after having learned the maze he retests the rats and records how long it takes them to find the rat chow.

EXPERIMENT EXAMPLE

Independent variable

The independent variable was the presence or absence of the drug. This was the variable being manipulated by the researcher.

Dependent variable

The dependent variable was the length of time it took the rats to remember where the rat chow was after one week. This was the measure of the subjects' response.

EXPERIMENT EXAMPLE

A researcher wanted to see whether a new way of teaching English was superior to a more traditional approach. The researcher selected two Thursday night classes at a local community college. In one class the instructor used a traditional method, the second instructor used the newer approach. The researcher then assessed students language ability after they had completed the program.

CONFOUNDS EXAMPLE

1. One teacher may have been a much better instructor than the other.

2. The researcher did not establish the level of ability of the two classes at the outset.

One class may have had students with a higher level of language skills than the other.

The control and experimental group should be very similar to one another at the outset. Thus, any differences at the end cannot be attributed to any preexisting differences.

CONFOUNDS EXAMPLE

Correlational Studies

"A research method that examines how variables are naturally related in the real world, without any attempt by the researcher to alter or change them."

CORRELATIONAL STUDIES

1. That there is a correlation between the two variables

2. Time order – that the presumed cause came before the presumed effect

3. Rule out alternative explanations

ESTABLISHING CAUSALITY

Descriptive Studies

"A research method that involves observing and noting the behavior of people or other animals in order to provide a systematic and objective analysis of behavior."

DESCRIPTIVE STUDIES

Participant observation:
A type of descriptive study in which the researcher is actively involved in the situation.

Naturalistic observation:
A passive descriptive study in which observers do not change or alter ongoing behavior.

TYPES OF DESCRIPTIVE STUDIES

A researcher who wants to examine aggressive behavior in male and female youngsters may watch children in the school playground, and record the number of aggressive acts boys and girls display.

EXAMPLE OF A DESCRIPTIVE STUDY

What are drawbacks to this type of study?

1. The researcher has no control over the setting.
2. Subjects may not have an opportunity to display the behavior the researcher is trying to observe because of factors beyond the researcher's control.
3. The topics of study are limited to only people's overt behavior.

EXAMPLE OF A DESCRIPTIVE STUDY

Subjective Measures

- Observational Techniques
- Asking-based Methods
- Psychophysiological Measures
- Response Performance Measures

MEASUREMENT (DATA COLLECTION) TECHINIQUES

Asking-based Methods

- Questionnaires
- Surveys
- Interviews
- Case Studies

ASKING-BASED METHODS

Psychophysiological Measures

A research method that examines how changes in bodily functions are associated with behavior or mental state.

PSYCHOPHYSIOLOGICAL MEASURES

- Cardiovascular Measures
- Skin Measures
- Ocular Measures

PSYCHOPHYSIOLOGICAL MEASURES

Response Performance Measures

A research method in which researchers quantify perceptual or cognitive processes in response to a specific stimulus.

RESPONSE PERFORMANCE MEASURES

Objective Measures

- Psychophysiological Measures
- Response Performance Measures
- Electrophysiology
- Brain Imaging

MEASUREMENT (DATA COLLECTION) TECHINIQUES

Electrophysiology

A method of data collection that measures electrical activity in the brain.

ELECTROPHYSIOLOGY

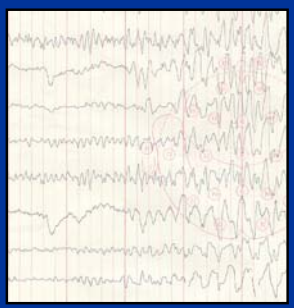
- Electroencephalography (EEG)
- Magnetoelectroencephalography (MEG)

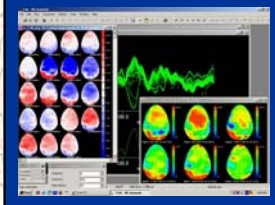
- Computerized Axial Tomography (CAT)
- Positron Emission Tomography (PET)
- Single Photon Emission Computed Tomography (SPECT)

- Magnetic Resonance Imaging (MRI)
- Functional MRI (fMRI)

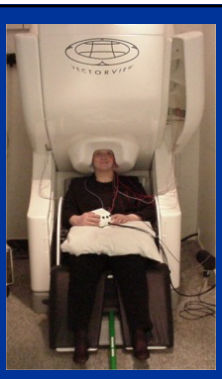
BRAIN IMAGING

ELECTROENCEPHALOGRAPHY (EEG)

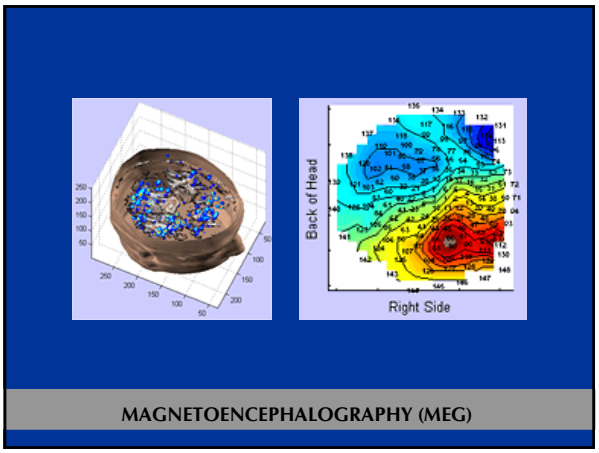




ELECTROENCEPHALOGRAPHY (EEG)



MAGNETOENCEPHALOGRAPHY (MEG)



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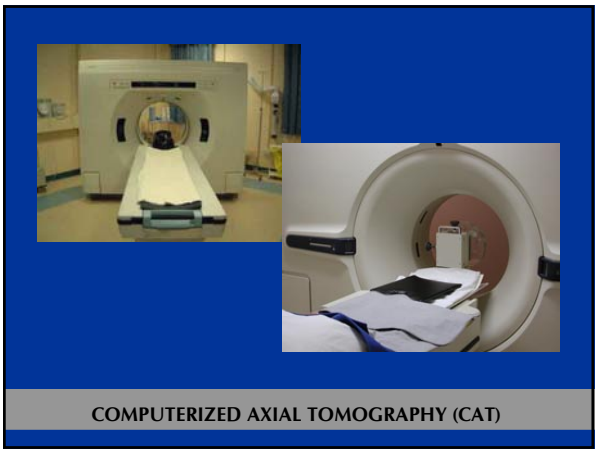
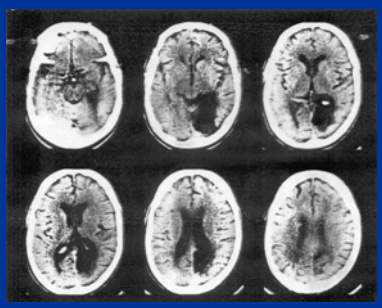
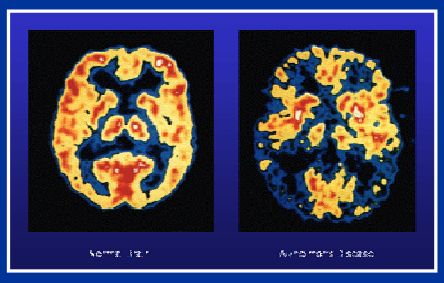


COMPUTERIZED AXIAL TOMOGRAPHY (CAT)

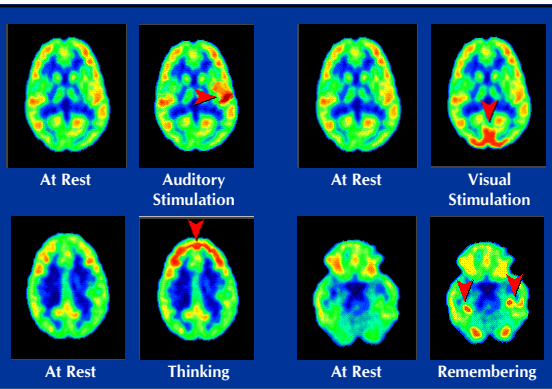


COMPUTERIZED AXIAL TOMOGRAPHY (CAT)

POSITRON EMISSION TOMOGRAPHY (PET)

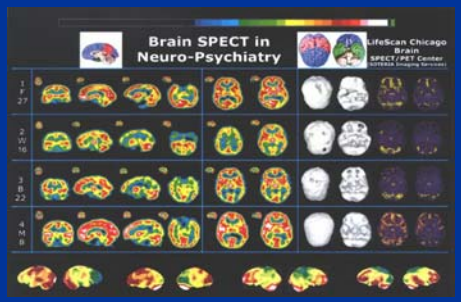


POSITRON EMISSION TOMOGRAPHY (PET)



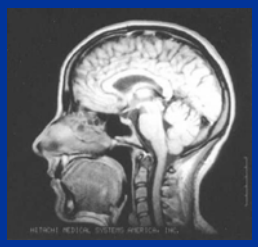
POSITRON EMISSION TOMOGRAPHY (PET)

SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY



SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY

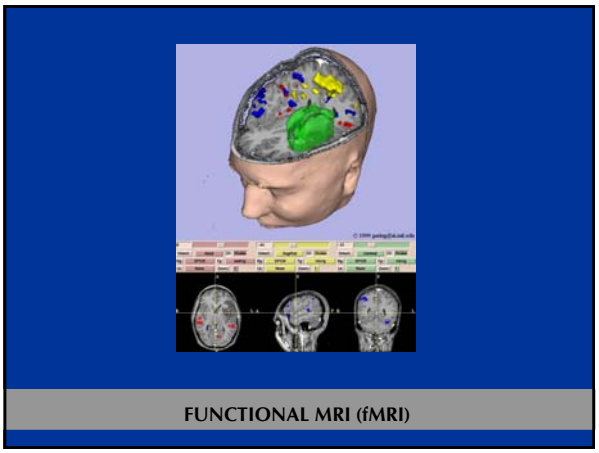
MAGNETIC RESONANCE IMAGING (MRI)



MAGNETIC RESONANCE IMAGING (MRI)

MAGNETIC RESONANCE IMAGING (MRI)

FUNCTIONAL MRI (fMRI)



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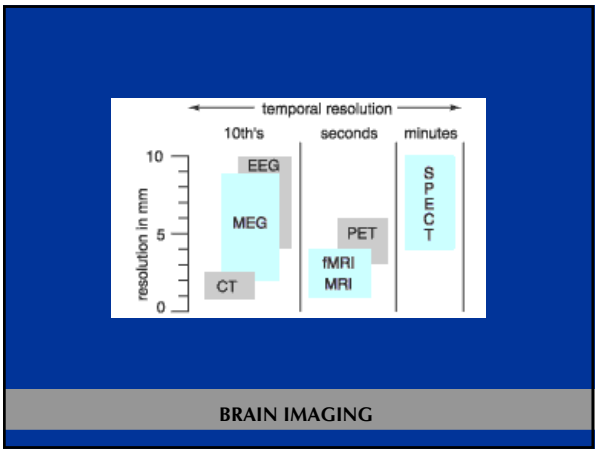

BRAIN IMAGING