Measuring Interpretation

A direct method to detect communicative performance as related to design variables.

A
Experiment Design

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Goals

Variables & Hypotheses: Methods for proposing a variety of hypotheses for investigation

Measurement: production of objective, repeatable measures to describe and compare communicative performance

Theory

Cognitive Process model: User centered approach focuses on species-wide human competencies for processing and knowing experience rather than subject matter or cultural codes.

Focus on symbolic and perceptual modes: The use of multiple modes has become common in communication.

Operational definitions: user reception is defined as Memory (recall or recognition), subdivided into Retention, Comprehension (level of synthesis), and Interpretation (organization of recall).

Knowing: integration of perception and thought

Input
Comparison · Perception
Match
No Match
Perceptual projection (imagining)
Thought (conceptual (calculation)
Inference (concept formation)
Recognition, Knowing: Spontaneous (cued) recollection

Experience of Knowing: resolution of confusion, readiness to act
• Supports affect and action in real time.
• Cues spontaneous, holistic recollection

Cognition Measures

Integration: Primary cognitive act (phenomenological success)
• Identification (success)
• Processing time (latency)
• Confidence (sense of knowing)

Retention: Long term memory
• Recollection
• Recognition

Comprehension: Level of synthesis
• Completeness of retention
• Level of synthesis

Interpretation: Gestalt Integration
• Selectivity of memory
• Pattern of memory cues

Methods

Computer generated Experiment:
• Standard platform, for presenting communications and testing responses.
• Can be used in experiments or in situ, incorporated into existing communication.
• Fully self-contained, self-evident, requiring little or no experimenter guidance.
• Objective measures, not subject to manipulation, requiring little reliance on self-reports.

Protocol

Computer generated Experiment:
• Standard platform, for presenting communications and testing responses.
• Can be used in experiments or in situ, incorporated into existing communication.
• Fully self-contained, self-evident, requiring little or no experimenter guidance.
• Objective measures, not subject to manipulation, requiring little reliance on self-reports.

Exper. 1

Cognitive Integration and Semantic Relations:
Forty 8 sec. to 12 sec. movies were created by montage-ing video and speech sound clips. The relations between them were varied according to semantic criteria, from directly related to unrelated.

After each movie was shown, subjects were asked if video and speech clips together made sense together (integration), if they were confident of their judgment (confidence). Responses and latencies were recorded.

After all movies were shown, 10 movies subjects integrated were re-viewed. Subjects were asked if videos and texts were directly or indirectly related, and asked to verbally describe the movie (protocol analysis).

1. Setup

Background
• Age
• Sex
• Education
• Language

Tutorial
Description
Examples
• Practice

Key Practice
• Reaction time

2. Movies

Show Movie (40)
• Integrate Modes
Latency
• Confidence
Latency

3. Review Tutorial

Tutorial
Description
Examples
• Practice

4. Review

Show Movie (10)
• How Integrated
Latency
• Verbal description

Exper. 2

Integration, Memory, and Temporal Relations:
Twenty movies with varying semantic relations (see experiment 1) were shown with varying time shifts between video and speech tracks ranging from synchronized to overlaps up to a gap of 1 second between the end of one track and beginning of the next.

After each movie subjects were asked if video and speech clips made sense together (integration), if they were confident of their judgment (confidence). Responses and latencies were recorded along with the delay states.

After all movies were shown, subjects were given memory tests, being asked to correctly match corresponding video and speech clips. Correctness and latencies were recorded.

1. Setup

Background
• Age
• Sex
• Education
• Language

Tutorial
Description
Examples
• Practice

Key Practice
• Reaction time

2. Movies

Show Movie (20)
• Integrate Modes
Latency
• Confidence
Latency
• Ease
Latency
• Content
Latency

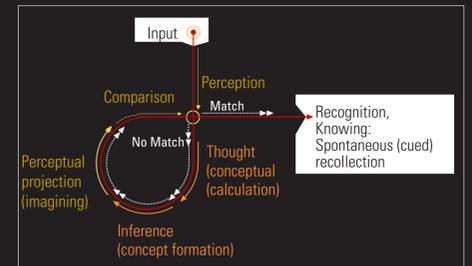**3. Review Tutorial.**

Tutorial
Description
Examples
• Practice

4. Review

Show Movie (20)
• Match
Correctness
Latency

Key
• user input
  data collection

Measuring Interpretation

B
Data and Findings

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Data Collection

The experiment is computerized: programmed in Macromedia Director© using the V-12 Database Engine© to create data records of each event including the movies shown, responses, and latencies , as well as all relative timings (accurate to 10 msec.). Each movie with responses, baseline trial is written as an record. Thus, any event can be tabulated against all others.

Thus all responses (except verbalizations) can be directly imported into a statistical analysis program (SPSS© was used) without requiring re-coding.

In experiment 1, for example, 120 sessions with 60 records each (40 movies, 10 review, 12 baseline) resulted in over 7,000 records.
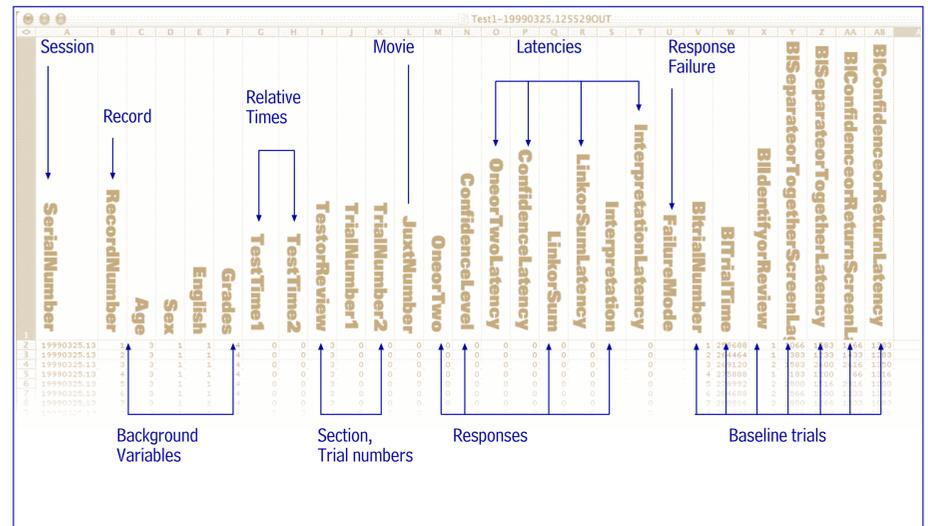
Statistical Analysis

SPSS was used to aggregate and analyze data applying ANOVA and nonlinear regressions.

"Movie scores" were created indicating the relative latency and response scores for each movie. From these, a number of different analyses could be made.

The routine collection of complete data allowed for the testing of null and control hypotheses, and for the speculative exploration of novel ideas about relations (e.g., does the time difference between the first showing of a movie and its review showing affect memory?).

Table 3.17. Frequencies in Review Records

	Integration Scores	Confidence Scores	Integration Latency Scores	Confidence Latency Scores	Linkage Scores	Linkage Latency Scores
Mean	1.000	2.092	2053	962.0	1.590	2280
Standard Deviation	0.000	.3133	477.3	223.2	0.1916	461.2
Variance	.000	9.816E-02	227852	49802	3.671E-02	212699
Skewness		.535	1.138	0.784	-0.139	1.425
Kurtosis		.822	1.415	1.047	0.251	2.243

Frequency distributions of Movie Scores

Findings

Strong and significant results were found.
The methods yielded both strongly significant and insignificant results, allowing many hypotheses to be either accepted or rejected.

The fundamental findings, indicating that subjects functioned cognitively in very similar and predictable ways were strong and unequivocal, indicating that the cognitive process model is highly and demonstrably relevant to comprehension across a broad population. The lack of differences between sexes, ages and educational levels further indicates the potential for designing according to cognitive principles.

Where results were equivocal, the operational clarity of the experiments supported reanalysis using other relations and in some cases suggested new experiments to be tried.

Some results were expected but others were surprising. For example, in experiment 2, where movies were integrated relative timing of video and speech had little effect, but among movies that were not integrated, relative timing had a major effect, though not the one we would intuitively expect. The lowest memory was for those movies in which the video and speech were simultaneous, and memory rose markedly with temporal shifts that disrupted presentation.

Taken as a whole, the experimental findings indicate a basic platform that can be extended and used to test many different hypotheses to develop a broad body of findings based on commensurable methods and data gathering.

Much of the data gathered is well isolated from subject and self-reporting biases. Even where self-reporting is used, there are redundant non-subjective measures that can be used to check and redefine subjective reports.
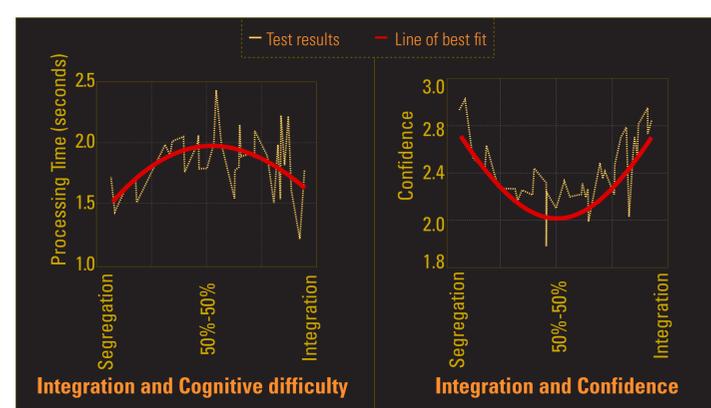
Regressions of Latency against Integration and confidence
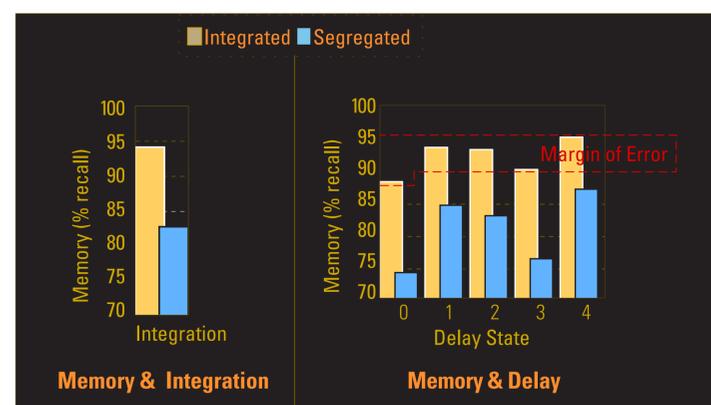
Integration is the important variable affecting recall.

Perceptual challenges (interference) have a secondary, independent effect.

Further Resources

Dissertation:
Cross mode Communication in Multimedia

available from
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