Final Exam

- Where: GR 4.428 (regular classroom)
- When: Tuesday August 9, 8:00-10:45 PM
- No blue books required
- Format similar to midterm
- Final exam study guide is posted on the course web page:
  
  http://www.utdallas.edu/~assmann/PSY3360/

Final Exam Review Benefit
Optional extra credit assignment

- Counts toward your participation grade.
- Due August 9 (same day as the final exam).
- Download instructions along with the final exam study guide from the course page:
  
  http://www.utdallas.edu/~assmann/PSY3360/

Linguistics: the study of language

- **Phonetics**—articulation & perception of speech sounds
- **Phonology**—patterning of sounds (*phonemes*) in a language
- **Morphology**—principles of word (*morpheme*) formation
- **Syntax**—arrangement of morphemes in sentences
- **Semantics**—study of meaning
- **Pragmatics**—language use in social context

Phonetics

- Production and perception of speech sounds
- Structure / function of larynx and vocal tract
- Universal properties found across languages
- Acoustic and articulatory properties

Phonology

- Study of sound systems within a language
- How sounds are used to differentiate words
  - Example: the vowel in “bog” versus “big”
- Unit = **phoneme**
  - Smallest meaning-differentiating units
  - Similar to letters, but some English phonemes are spelled with more than one letter (/f/ in phone)
  - Some phonemes have multiple spellings (e.g., the vowel in “cup” and “enough”)
Morphology

- How sounds (phonemes) are combined to form words; how words are constructed
- Unit = morpheme
  - smallest meaning-carrying units
  - Similar to words, but some words contain multiple morphemes (cats => 2 morphemes; cat + plural marker; “walk” => “walked” (past tense formation rule))

Syntax

- the study of how words (morphemes) combine to form grammatical sentences
- Traditional “grammar” (parts of speech: nouns, verbs, adjectives etc. and rules of sentence structure)
- Active versus passive voice in English
  “The boy hit the ball”
  “The ball was hit by the boy”

Semantics

- the study of word meaning (lexical semantics), and how words combine to form the meanings of sentences
- Kinship systems: words used to describe relatives (second cousin, brother-in-law)

Pragmatics

- Use of speech and language in social context
- Choice of vocabulary and speaking style depends on the audience and circumstances

Theories of language behavior

- Pavlov – language as conditioned responses
  - first and second symbol systems
- Lashley – complex planned behavior
  - rejection of telephone switchboard metaphor
  - central planning agency for mapping and controlling long sequences of behavior
  - The problem of serial order in behavior

B.F. Skinner

- Operant behavior:
  - operant response (naturally occurring behavior)
  - reinforcement (alters probability of response)
  - setting (situation in which behavior is emitted)
- Experimental analysis of behavior: systematic description of contingencies of reinforcement
B.F. Skinner

- **Verbal Behavior (1957)**
  - Speech and language are forms of verbal behavior whose reinforcement is mediated by other people.
  - Operant responses
  - Contingencies of reinforcement
  - Tact: a verbal operant response under the stimulus control of the environment

Noam Chomsky (1928-)

- Transformational generative grammar
- Language as system of rules
- Cartesian linguistics
- Nativism: language as a biological, species-specific trait

Abstractness of syntax

Phrase-structure grammar

S: sentence
NP: noun phrase
VP: verb phrase
N: noun
V: verb

Chomsky’s attack on Skinner

- Skinner: language is nothing more than a form of verbal behavior whose reinforcement is provided by other people.
- Language development is a form of operant learning in which randomly occurring verbal behavior is selectively reinforced.

- Chomsky: impossible to explain language acquisition as operant learning; the reinforcement is non-existent or poorly specified
- Speech input to the child is impoverished (underspecified)
- Children produce novel and complex sentences they have not previously heard

Noam Chomsky

- Universal grammar: innate structure governed by transformational rules
- Language acquisition device
- Surface and deep structure
Chomsky on language

- Noam Chomsky (1965) – all children are born with an innate capacity for language
- Language acquisition device (LAD)

Primary data (adult speech) → General language learning principles → Grammatical knowledge (rules) → Child’s speech

Language acquisition

- Eric Lenneberg (1921-1975)
  - Critical period for language acquisition?
  - Hemispheric specialization
  - Recovery from aphasia
  - “Motherese” (infant-directed speech)
  - Stages of language development

Hemispheric specialization for language

If we did not have duality of patterning, the number of expressions we could produce would be quite limited.

Each word would have to be a single sound unit. We might be able to produce perhaps 100 such units, but then the capacity of our vocal apparatus to create new items would be used up.

Duality allows us to continue to create new words as needed and combine them into new sentences. Because we can produce so many words, AND combine them in unlimited ways, duality provides productivity.

Behaviorist themes

- Most behavior is learned, with minimal role of genetics
- All species, including humans, learn by the same principles
- The same principles apply to childhood and adult learning
- Mental events and processes do not explain or cause behavior
- Language is just another form of learned behavior
- Challenged by ethologists
- Task-specific forms of learning
- Challenged by Piaget
- Challenged by cognitive theorists
- Challenged by linguists (Chomsky)

The demise of radical behaviorism

- Chomsky’s attack on Skinner
- Intervening variables
- Rise of cognitive psychology
- Social and developmental psychology
- Psycholinguistics
- Information processing models
- Connectionism
- Cognitive science
- Behavioral neuroscience
Turing test

- Alan Turing (1950)
- Q: Can machines think?
- A: Only if they pass the Turing test.

Key Terms

<table>
<thead>
<tr>
<th>Darwin and natural selection</th>
<th>anthropomorphism</th>
<th>ethology</th>
<th>Tinbergen</th>
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<td>adaptive radiation</td>
<td>Morgan’s canon</td>
<td>sign stimulus</td>
<td>Lorenz</td>
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<td>Malthus</td>
<td>imprinting</td>
<td>Von Frisch</td>
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<td>genotype and phenotype</td>
<td>Lamarck</td>
<td>critical period</td>
<td>honeybee waggle dance</td>
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Natural selection

1. Variation exists in behavioral traits
2. Some of that variation is heritable
3. More individuals are born than leave offspring for future generations
4. Certain behaviors make individuals better adapted to their environment. These individuals survive longer and leave more offspring than those with less successful traits

Key Terms

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<tr>
<th>Behaviorism</th>
<th>Operant conditioning (Skinner)</th>
<th>discrimination</th>
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<tr>
<td>Suchenov</td>
<td>Skinner box</td>
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<td>Excitation and inhibition</td>
<td>contingencies of reinforcement</td>
<td>extinction</td>
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<td>unconditioned stimulus/response</td>
<td>spontaneous recovery</td>
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<td>Thondike’s law of effect</td>
<td>conditioned stimulus/response</td>
<td>reinforcement schedules</td>
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Key Terms

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<tr>
<th>Freud and psychoanalysis</th>
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<tr>
<td>free association</td>
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<td>rationalization</td>
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<td>catharsis</td>
<td>projection</td>
<td>wish fulfillment</td>
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<td>Charcot</td>
<td>hysteria</td>
<td>unconscious motivation</td>
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<td>posthypnotic suggestion</td>
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<td>libido</td>
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Peirce and James

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<th>Semiotics</th>
<th>Modes of reasoning</th>
<th>Properties of consciousness</th>
<th>James-Lange theory of emotion</th>
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<td>operational definition</td>
<td>latent learning</td>
<td>Lashley</td>
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<td>stimulus – response</td>
<td>cognitive map</td>
<td>Breland &amp; Breland</td>
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Levels of linguistic analysis

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Piaget's stages of development

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<th>Sensorimotor</th>
<th>Object permanence</th>
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<tr>
<td>Pre-operational</td>
<td>Conservation task</td>
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<tr>
<td>Concrete Operational</td>
<td>Abstract problem solving</td>
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<tr>
<td>Formal Operational</td>
<td>Hypothetico-deductive reasoning, metacognition</td>
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Measurement of Intelligence

| Galton (sensory acuity, head size, reaction time) | Scatterplot | Spearman (g-factor, s-factor) |
| Binet-Simon tests | Normal distribution | Stern (intelligence quotient) |
| Mental age vs. chronological age | Regression to the mean | Multiple intelligences (Gardner) |

Theories of language

| Pavlov | Chomsky | Skinner |

Theories of learning

| Pavlovian conditioning | Operant conditioning |
### Theories of animal behavior

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