Music psychology
A cognitive approach

Overview

- Objective
  - By the end of this session, you should be able to describe principles of cognitive psychology and studies which have approached music in this way

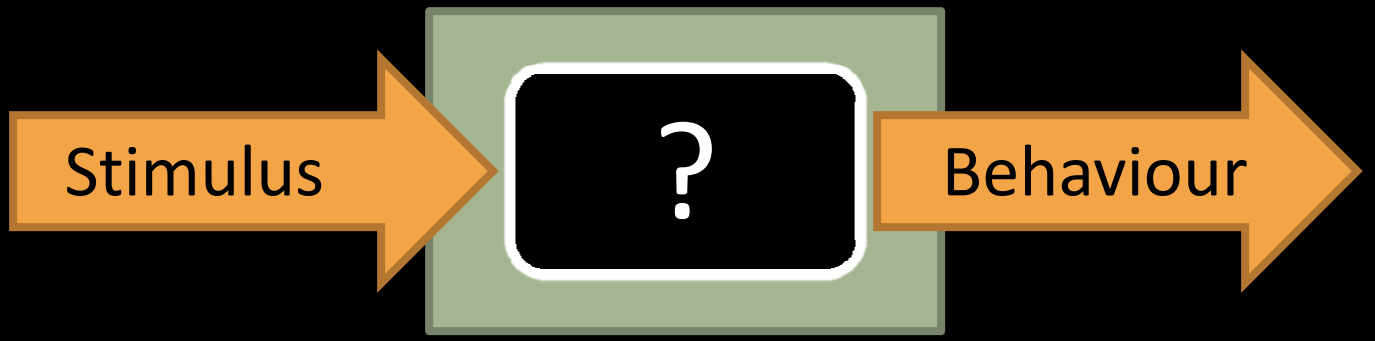
- To do that, we will
  - Explore principles of cognitive psychology
  - Acknowledge the strengths and limitations of this approach
  - Demonstrate their relevance to music psychology by looking at music cognitive psychology experiments
  - Have a go at designing a cognitive psychology experiment

Before we start

- What happens when we hear music?

Cognitive psychology

- "Cognitive revolution" in the 1960s
  - Early: introspection (reliable?)
  - Then, behaviourism ("stick to observed facts")



- "Cognitive psychology refers to all processes by which the sensory input is transformed, reduced, elaborated, stored, recovered and used" (Neisser, 1967)

Cognitive psychology

- Criticisms
  - Experimental situations are not “real”
    - True, but more conclusive because more control?
  - Experiments distort reality
    - True, but better than not testing theories?
  - Experiments can’t test everything
    - True, but why not test what we can test?
- The mainstream approach in psychology since the 60s

Cognitive psychology

- Why? A more scientific approach to psychology
  - Objective – based on observation and experimentation
  - Systematic – theory driven
  - Falsifiable – test hypotheses
  - Replicable – specified methods
  - Public – dissemination

- How?
  - Chomsky (language)
  - IT advances
  - Human factors in WWII

Cognitive psychology

- Who?
  - Experimental psychologists
    - Apply scientific method to study of cognition
  - Cognitive scientists
    - Use computer models to simulate human cognition
  - Cognitive neurologists
    - Derive theories about normal cognition based on observation of cognitive impairments
  - Cognitive neuroscientists
    - Study brain functioning through various techniques to understand human cognition (MMB_A)

Cognitive psychology

- What?
  - Perception
  - Attention
  - Memory
  - Reasoning
  - Reading

  - Music?

Perception

- Frequencies turn into perceived pitches
- Sets of frequencies turn into timbre
- Durations turn into perceived rhythmic patterns
- Pitches and rhythms combine to form melodies
- Several layers combine to form intervals, harmonies
- Harmonies create a feeling of “home” key (sometimes)
- Different keys are related and feel “closer” or more “distant”
- ...

Perception

- How do we do this?
- http://www.youtube.com/watch?v=dmoDLyiQYKw&feature=related
- http://www.youtube.com/watch?v=yHJOz_y9rZE

Perception

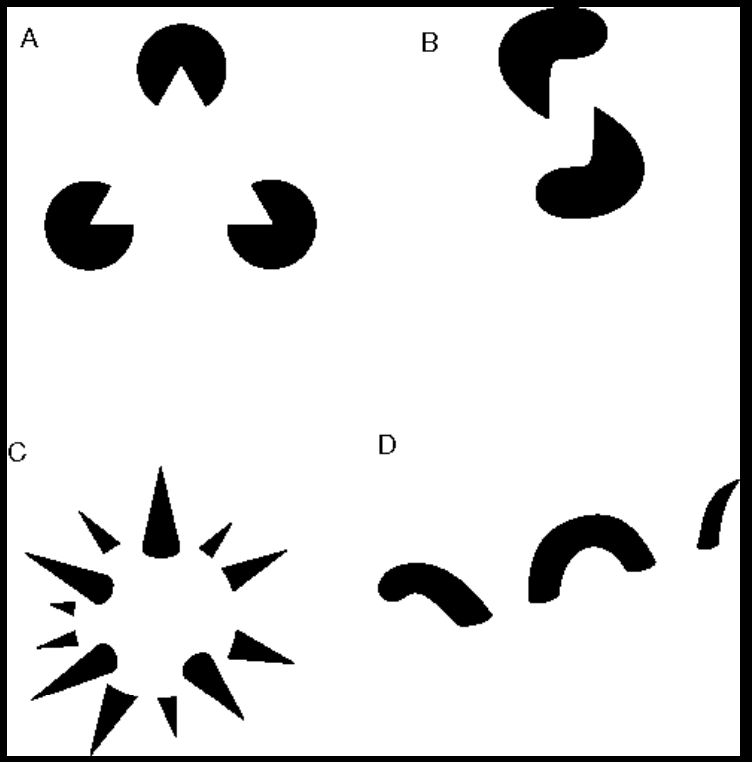
- "Gestalt psychology"

"Virgin Mary" toast fetches $28,000

• The principle: top-down processing influences bottom-up processing

•Prior knowledge of the world influences our perception of patterns

Perception



- We match what we perceive to
  - what we know
    - Face perception very strong
    - Recognise tunes we know
  - what is most likely
    - Group sounds by how they are usually grouped in music we've heard before – know what a "strong" beat sounds like
  - what is most simple (bottom-up)
    - Group sounds by proximity, "path of least resistence"
    - Inferences about object continuation

Perception

- Perception of relatedness of pitches – ratings
- Classic study: Krumhansl and Shepard (1979)
  - Context (scale of C) followed by probe (tone)
  - How well does the tone complete the sequence? (1-7)

  - C > tonic triad > diatonic > chromatic – hierarchy
  - Some people have internalised the hierarchy more
  - Perception related to internal representations

- Today: ERP paradigm?

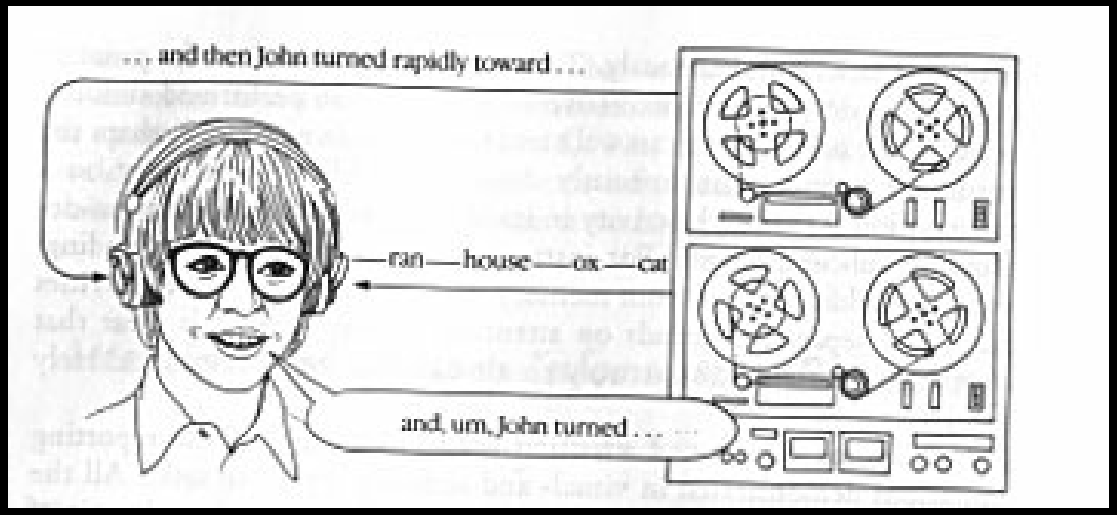
Perception

- Ambiguity in perception
- A role in music and emotions (my next music psychology lecture)
- Pattern in the stimulus or created in the black box? Or both?
- http://www.youtube.com/watch?v=khrx-zrG460

Attention

- Selective processing
  - What was my last sentence?
  - What was did the previous bullet-point say?
  - How tight are your shoe-laces?
  - Are you breathing in or out?
- Attention takes possession of an item
  - Listening to a single conversation in a busy room
- Item captures attention
  - The cocktail party effect

Attention

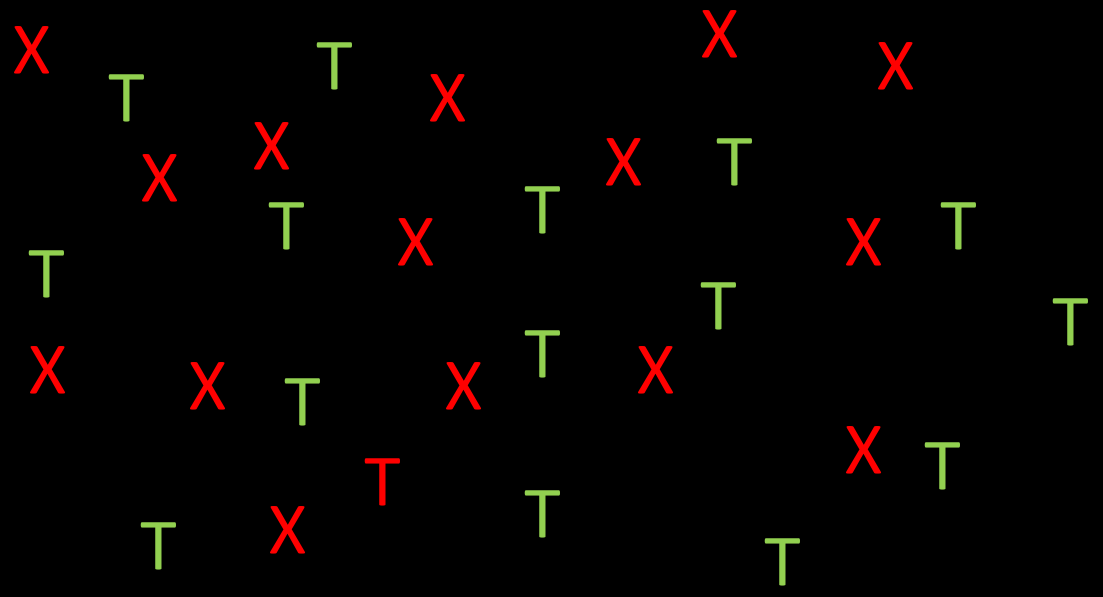


- Why so selective?
  - Limited resources

- What do we know?
  - Focussed attention task (1950s)
    - When focus on one stream, know very little about the other
  - Divided attention task (1960s)
    - Semantics can interfere (dog – six – fleas // eight – scratch – two)
  - We process things we're not paying attention to (1970s)
    - Electric shocks paired with words in unattended stream generate galvanic skin response

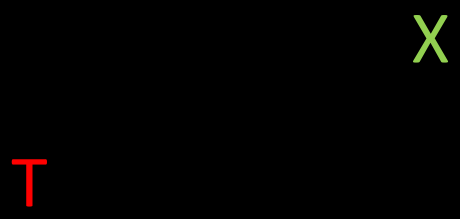
Attention

- Using reaction times in cognitive research
- Spot the red T



Attention

- Using reaction times in cognitive research
- Now spot the red T

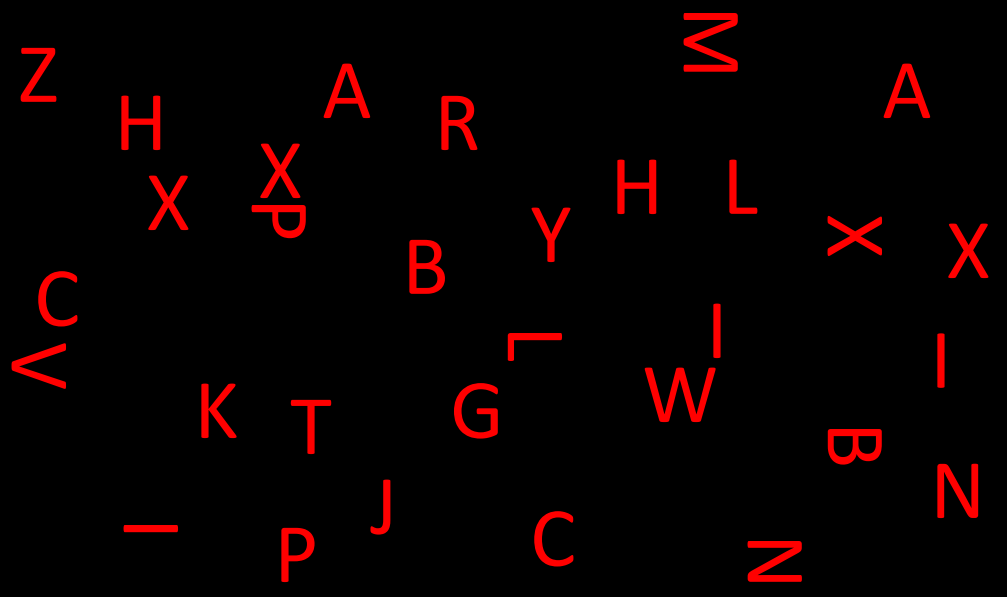


Less distracters makes the search faster

- “really?!”

Attention

- Using reaction times in cognitive research
- Now spot the red T



Items which closely match the description are entered into STM during search

Targets that are perceptually grouped because they are similar are rejected/selected together

Attention

- In music, Bigand et al. (2000)
  - The ability to selectively attend to two simultaneous tunes and spot errors

  - More difficult than when listening to them separately
  - Non-musicians selectively attended to one or the other
  - Musicians produced false alarms when “dissonant”, so integrated the two into one perceptual structure
  - Effect of previous exposure to the “combination”

Attention

- How strong is the focus?
  - *Be* by John Featherstone (Resonance)

Memory

- How do we study memory?
  - Self-report?
  - Priming
    - Nurse – doctor // Nurse – bread (Meyer and Schvaneveldt, 1971, *JEP:G*)
  - Recall vs. recognition
  - Context-dependent memory
    - Divers study (Godden and Baddeley, 1975, *BJP*)
  - Different types of memory (implicit vs. explicit)
  - Conditioning
    - Hand-shake study (Claparede, 1911, *Arch Psychol*)
    - Goldfish study (Brandon and Bitterman, 1979, *Animal Learning and Behaviour*)

Memory

- Cohort theory of lexical access
  - Marslen-Wilson & Tyler (1980)
  - Word recognition is achieved through the successive reduction in the number of possible word candidates as each new phoneme of an incrementally processed word is perceived

  - C – chocolate? cerebellum? cranberry? cloud?...
  - CA – caramel? call? Cappucino? car?...
  - CAT – cat! (category?)
  - ...

Memory

- Cohort theory
  - A very robust theory of word recognition
  - Narrow down the “cohort” of possible words until only one matches
  - Larger cohort, more possibilities initially
  - More frequent words will be at the “front” of the cohort (“higher initial activation”)

  - Gating paradigm – increasing larger segments of the target stimulus are presented incrementally across trials
    - Not just the word, the context helps achieve word recognition before all other possibilities have been eliminated (Van Petten et al., 1999)

Memory

- Cohort theory in music – gating paradigm
  - Dalla Bella, Peretz and Aronoff (2003)
    - 1, 1-2, 1-2-3, 1-2-3-4, ...
    - Similar patterns in melody recognition as with words
    - Familiar melodies recognised faster – higher initial activation
  - Schulkind, Posner and Rubin (2003)
    - Participants recognised melodies on notes which were at phrase boundaries, ends of sequences, or accented beats
    - Effect of structural role of notes in a melody → points of interest facilitated recognition → insight into how melodies are stored

Reasoning

- Based on the ability to abstract and apply rules

- In music?
- http://www.youtube.com/watch?v=ne6tB2KiZuk

Reading

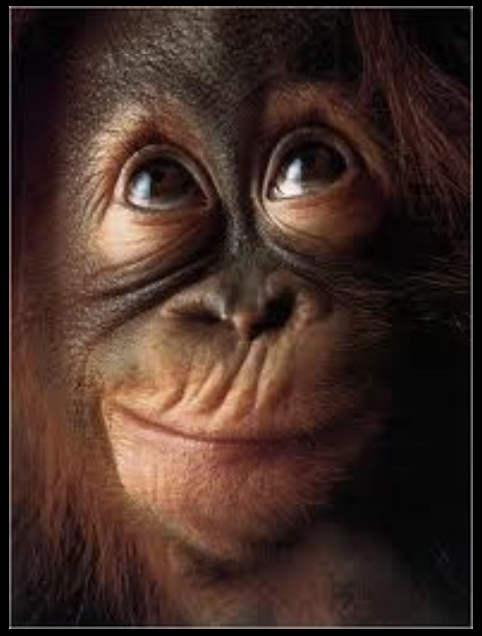
- Expectations guide our reading – eye-tracking
  - Harry intimidated Helen because he was very tall
  - Harry intimidated Helen because she was very shy
  - Harry intimidated Helen because there was never a smile on his bearded face
    - Featherstone and Sturt (2010)
  - Expectations facilitate reading (speed up on “he”)
- Automatic corrections
  - it deosn’t mttaer in waht oredr the ltteers in a wrod are, the olny iprmoatnt tihng is taht the frist and lsat ltteer are in the rghit pcale

Reading

- Eye-tracking in music: sight-reading
  - Truitt et al. (1997)
  - Experiment
    - 8 pianists, size of effective visual field (perceptual span – moving window), how “far ahead” eyes were from hands (eye-hand span), key press + eye-tracking
  - Effect of perceptual span?
    - Significantly slower if had only 2 beat, but 4 beats, 6 beats or no window made no difference
  - Effect of skill?
    - The skilled readers had shorter playing times, larger eye-hand spans (average 2 beats), and shorter fixation durations than the less-skilled readers

Your turn

- Using a method or aspect of cognition described in this lecture, design a music psychology experiment within the cognitive psychology paradigm.



The cognitive approach

- An interaction between a stimulus and a perceiving mind

- Useful (if imperfect) tools for studying it
- Music psychology within the cognitive paradigm

- The “black box” is still very opaque

- Do we perceived all that is there?
- Do we construct things that aren’t there?

Any questions?

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- Next time: Music and emotions

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