PSY246 Cognitive Psychology

TUTORIAL 2: The Stroop Effect

Automaticity: Many behaviours can become automatized e.g. Reading, driving

- **Controlled, fast, low attentional capacity, unavailable to consciousness, unavoidable, inflexible (hard to modify)**
- **It is around 50% faster to read a word than to name an object or colour (retrieve a word – extract a meaning)**

T-TEST

- Used for ONE independent variable (2 levels) : within subject design, paired; between subject design, independent
- T-test to see if significant, T-test assesses whether the means of two groups are *statistically* different from each other. This analysis is appropriate whenever you want to *compare the means of two groups*

ANOVA

- "Analysis of variance" *mean* test to test for ***multiple variables*** with ***multiple levels***
- Within subject design with repeated measures, between subject design one way/two way

The Stroop interference effect

Study	**Stroop**, J. R. (1935). Studies of interference in serial verbal reactions. Journal of Experimental Psychology, 18, 643-622. [Experiment in-tutorial, not from paper]
Aim	to measure selective attention and cognitive flexibility
Procedure	Present 1. Black words or 2. Colour patches "XXXXX" or 3. Colour **congruent** (RED is coloured red) or **incongruent** (Red is not coloured red) words. Task to classify colour as quickly as possible regardless of word. Dependent variable – Response time (RT) Only correct responses scored, incorrect recycled and repeated later in experiment Independent variable – Whether the colour word and font colour were a match or not. 2 level condition, congruent "Red" coloured red vs incongruent "Blue" coloured red. *Within-subject* design because all participants were under all conditions. (in class experiment – also key use in response will delay responses)
Results	Semantic interference (naming the ink colour of neutral stimuli) is faster than in incongruent conditions. Reading is automatic, faster than colour naming (less practiced).Incongruent trials produced slower/less accurate responses than congruent trials. **Word reading interferes with colour naming.**
Discussion	Demonstrates automaticity of word reading: ***Reading words is unavoidable*** as you have years of experiencing reading English There are two theories that may explain the Stroop effect: **Speed of Processing Theory**: the interference occurs because words are read faster than colours are named. **Selective Attention Theory**: the interference occurs because naming colours requires more attention than reading words. Slower/less accurate responses to incongruent trials compared to *neutral* trials (XXXX) = the interference effect. Word reading interferes with the process of colour naming. *The interference effect of reading vs colour naming is not seen in children under age 7 as by this stage reading is often not yet automated.* It is ~50% faster to read a word than name and object or colour Stroop's task originally had subjects name the colour of the word aloud while we manually entered our responses using a keyboard. This matters because manual key press responses are slower than naming but the interference effect (thought reduced) still occurs.

Characteristics of interference paradigms

- Stimuli have 2 features – subjects respond to one and ignore the other
- Typically 3 conditions – congruent, incongruent, neutral,
- Research question – does the second feature interfere with processing first

Further support for interference effect

- Rosinski (1977), Lupber (1979, 1982) Picture word interference tasks
  - Related word over image, unrelated word over image, control xxxx over image.
  - Had lower response time to related word - Activates same area and interferes with processing
- "spatial interference" name position of the word (word placed above or below congruent or incongruent with space)
- "number Stroop" name the number of words (one one, one, one one one)

Lecture 7: Concepts and Categories

Concepts	Often interchangeable with term "Categories". *Internal representations*. We have **(conceptual) hubs** to generalize and predict. They make it easier for us to detect semantic similarities across concepts, and provide an efficient way to apply existing knowledge to new concepts.
Category	Class of stimuli that are treated in an equivalent manner. *External stimuli.* (Cuts down the diversity of objects so we can cognitively organise without being overwhelmed)

People divide the world into categories in every known culture on Earth.

Natural categories

- Are categories that occur in natural language (e.g. fruit, animal, tool, furniture clothing).
- **Have a correlational structure** (not combined arbitrarily) Eleanor Rosch's work suggests **natural categories**
  Feature dimensions are *not independent*. E.g. feature "had feathers" is likely to have the feature "has beak"
- A '**Prototype'** is a member of a category with the highest family resemblance scores. (A robin is a prototypical bird, a penguin is not – doesn't nest in trees, doesn't eat insects etc.)
- Have an **internal structure**
  - Typically a gradient with some members of the category a better (more typical) example than others
  - Graded on family resemblance – *better* exemplars share more attributes in common with other exemplars

Characteristics of natural categories

Fuzzy Sets Are ill-defined.

Study	1978 McCloskey & Glucksberg
Procedure	Subjects to decide the category membership for each exemplar-category pair, and repeat categorisation a month later. E.g. exemplar-category: chair-furniture, cucumber-furniture, bookend-furniture
Results	Both between-subject and within-subject there was low agreement for some exemplar-subject pairs – bookend-furniture, are bookends furniture? An unclear boundary

Family resemblance No single attribute is shared by all members of a category, but each member has a least one attribute in common with other members. (Wittgenstein 1953)

Study	1978 Rosch & Mervice
Procedure	Subjects listed attributes processed by each exemplar of a category Category: Bird. Exemplar: Robin. Subject response E.g.: flies, sings, lays eggs From this a "family resemblance score" was derived from weighted scores and attributes (more weight to attributes shared with other exemplars)
Results	Typicality rating and family resemblance scores have a high correlation Robin was rated higher than penguin by subjects on typicality. Penguin also had a lower shared-feature (family resemblance) score than robin. *Batman was not available for comment.*

Typicality Natural categories differ in typicality. Typicality and family resemblance correlate.

Study	1975 Rosch & Mervice
Procedure	Subjects rated how typical a member of the category matched the category with 1 highly typical and 7 not uniform
Results	"Fruit" matched well to apple, orange, banana but not to dates or avocados. *Even though a banana is herb and avocado is a super fruit…*

Artificial categories

- Artificial categories are not represented by a prototype, they are equally typical.
- Are different from a natural category because the features can be combined arbitrarily. Feature dimensions are independent. E.g. "black" in below experiment can be applied to the three shape types equally.

Study	1956 Bruner, Goodnow & Austin – **Category learning study**
Procedure	The researchers created a "concept universe" with 4 feature dimensions (81 cards) (3 shape values x 3 numerical values x 3 colour values x 3 border styles) The subject's task was to *work out the concept* the researcher has in mind. Much like a battleship game, the subjects chose a card and were told whether it did or didn't belong to the category.