Cognition Lab

Reverse Stroop

Serial or parallel processing?

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Outline

Reverse Stroop

Discussion section

Final project

- General Timeline
- Final project: designing your own study
- Tips
- Proposal
- Resources
- APA style
- Data collection timeline
- Project teams

Reverse Stroop

What causes the Stroop effect?

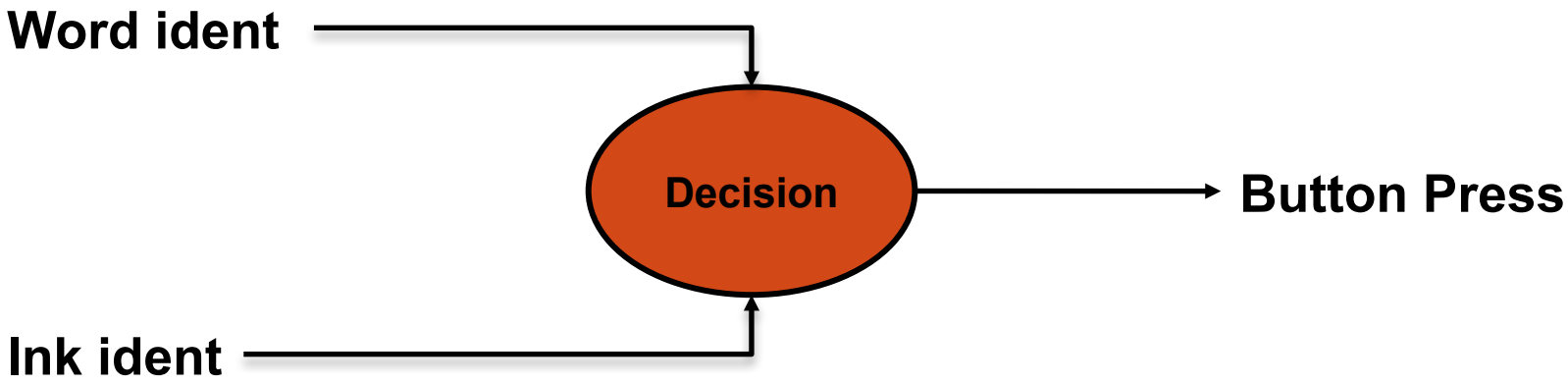
You had to make a decision about color, but there were two different color cues

Presumably you were trying not to be distracted by the color written in the word, but it still had an effect

It seems that you can't help but read it (reading is *automatic* and *mandatory*)

Having read the word, it seems to affect your decision about the letter colors

Theory 1: parallel processing



Parallel processor with conflicting evidence

- maybe we process both word and ink at the same time
- if the word is different from the ink it contributes conflicting evidence, which makes the decision harder to make
- then we would expect to see the reverse effect too…

Reverse Stroop task

Do we see a *reverse* Stroop effect?

i.e. if we try to name the *word*, are we affected by incongruous *letter colors*?

According to Stroop's original paper the reverse effect doesn't occur

But was this because his method was not very precise in timing?

Theory 2 : serial processing

If John Stroop were correct and the effect only occurs in one direction we need to modify the model

Maybe the 'decision maker' can only process one type of information at a time (a *serial* system)

And maybe the reading of a word is quicker than assigning a verbal label to a perceived color

Theory 2 : serial processing



Then maybe the delay is because the decision about the ink has to wait until the word identity has been processed and removed from the decision maker

Then we wouldn't expect to see the reverse effect; when identifying the word the ink color wouldn't get in the way

Run the reverse Stroop

The reverse Stroop effect seems to be useful in separating these two theories

Let's see whether, with more modern technology we can reveal an effect of ink color on color word recognition

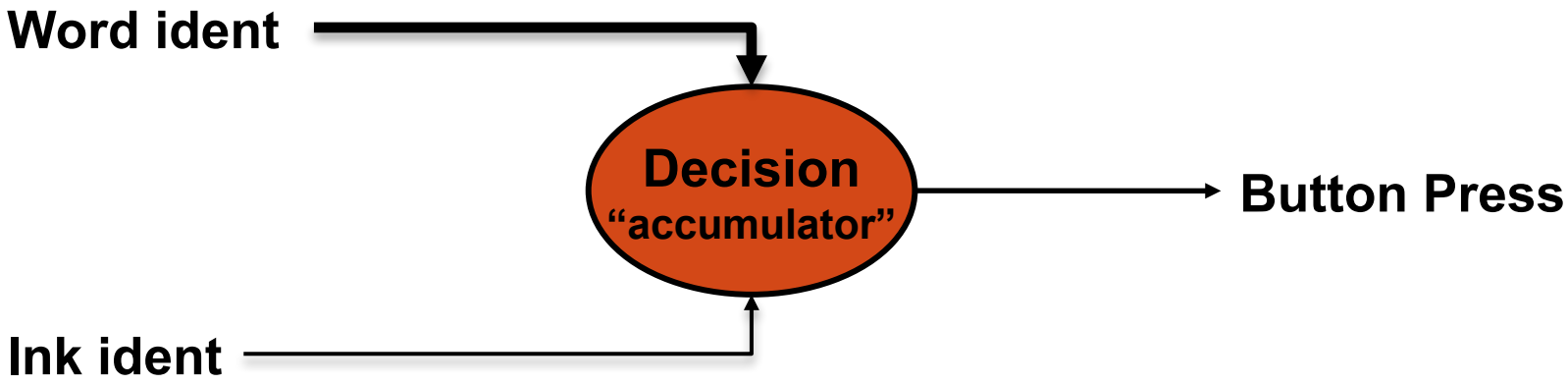
Load the 'ReverseStroop' experiment in PsychoPy and run it. Remember, this time you're pressing buttons according to the word you read, ignoring the color it was written in

When you're done, fetch your new data file and calculate the two means as before. Is there a difference again?

Theory 3

Usually we find that we can measure a significant effect in the reverse Stroop, although it is weaker

An intermediate theory might account for that; with parallel processing, but with faster accumulation of evidence for word recognition



Data Analysis

Data analysis: use csv file

For this data analysis we will use the csv file from the original Stroop experiment that we ran a few weeks ago and the csv file from the current experiment.

When we ran the Stroop experiment the first time, we were only interested in the mean. That's why we used the .xlsx file (summary file.)

The csv files contain the trial by trial data. This time we want to run a t-test, and for that we need trial-by-trial data, not summary data. We need he csv file to run a t-test.

Data analysis

For each csv data file (Stroop and reverse Stroop):

- Make a copy of the file
- Delete trial rows (#2-#13) but keep headers (#1)
- Filter out incorrect trials
- Sort by congruency
- Calculate mean RT for congruent and incongruent cases
- Run a t-test comparing the mean RTs for the two conditions

2 – filter out incorrect trials

2 - filter out incorrect trials

→ Use the IF formula

→ Example: =IF(J2=1, K2, "")

(You will need to adapt the cell range to your own dataset)

Data analysis

Once you have the t-tests, compare your results:

- Through the p-value, the t-test will give you a measure of the strength of the effect

Data analysis

Once you have the t-tests, compare your results:

- Through the p-value, the t-test will give you a measure of the strength of the effect
- The smaller the p-value, the stronger the effect
- Which experiment had the strongest effect? Stroop or reverse Stroop?
- Which theory is supported?

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Further reading

HALF A CENTURY OF RESEARCH ON THE STROOP EFFECT - AN INTEGRATIVE REVIEW

Macleod, C.M.

Psychological Bulletin 109: (2) 163-203 MAR 1991

Abstract:

The literature on interference in the **Stroop** Color-Word Task, covering over 50 years and some 400 studies, is organized and reviewed. In so doing, a set of 18 reliable empirical findings is isolated that must be captured by any successful theory of the **Stroop** effect. Existing theoretical positions are summarized and evaluated in view of this critical evidence and the 2 major candidate theories-relative speed of processing and automaticity of reading-are found to be wanting. It is concluded that recent theories placing the explanatory weight on parallel processing of the irrelevant and the relevant dimensions are likely to be more successful than are earlier theories attempting to locate a single bottleneck in attention.

Further reading

You may want to get more information about the Stroop effect from this **review**:

- Macleod, C.M. (1991) Half a century of research on the Stroop effect - an integrative review. *Psychological Bulletin* 109: (2) 163-203

But also try to read at least one recent journal article about it

- Text books and review articles (like Macleod, 1991) give you concise info about theories
- But reading journal articles really helps you to understand;
  - how to write your own reports
  - the experiments that lead to the theories
  - the fact that these are still under debate (even for effects discovered in 1935!)

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Finding journal articles

There are many places you can search for journal articles:

- from the references given in the text book or review article
- Google scholar (like google but gives for academic papers):

  https://scholar.google.com/
- pubmed (more biological, good for neuroscience): https://www.ncbi.nlm.nih.gov/pubmed/
- PsycINFO (but requires several steps to authenticate when off campus)
  https://www.apa.org/pubs/databases/psycinfo/index

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Finding journal articles

You can also check these two journals for papers related to your topic:

Current Opinion in Psychology

https://www.journals.elsevier.com/current-opinion-in-psychology

Current Opinion in Behavioral Sciences

https://www.journals.elsevier.com/current-opinion-in-behavioral-sciences

Why?

They have annotated bibliographies.

Discussion Section

Discussion

This section is where you can (A) interpret your findings and (B) relate them to previous research/predictions.

Often you will (B) make reference to material you raised in your introduction.

General structure:

- **State** what the results are by providing a summary (in *words* – no numbers) of the results.
- **Account** for the findings.
- **Explore** the implications of the findings.

Discussion – State main results

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What were the key findings?

Were there any **significant** differences between conditions?

- If so, then what direction were those differences in?

Do they support the hypothesis/hypotheses?

If the differences were **not significant** in all cases or in some of the case, you should also report that.

If the differences were not significant in *some* of the cases, you should report those cases first, followed by the significant result, because the significant result will lead you to the rest of the discussion.

Discussion – Account for the results

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Discuss what these results mean

- You will either have
  1. Rejected the null hypothesis (in favour of the experimental hypothesis) , or
  2. Failed to reject the null hypothesis

Discussion – Account for the results

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  1. Rejected the null hypothesis (in favour of the experimental hypothesis) , or
  2. Failed to reject the null hypothesis

- If 1. then are you sure that the effect was due to your manipulation of the IV or could confounding variables explain the result?
- If 2. then try to convince the reader that there is no relationship between the IV and DV.
- Either way, try your best to explain the findings!

Discussion - Implications

Are there any implications based on your results?

Are there any weaknesses of your study that may suggest factors to be improved?

- Don't tear apart your study! Constructive criticism is OK

This may pave the way to discuss any future research

Finally, conclude with a short paragraph summarising the main findings / implications

Discussion - Summary

- Comes after the results
- Summary of results *in words*
- Connect results with hypothesis: supported?
- Compare/contrast with other studies in the literature
- Limitations of present study
- Future directions
- Check:
  - Basics of Scientific Writing
  - Communication in Psychology

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References

Follow the APA style of referencing

- See Referencing/APA one-off lecture & the online '**Guidelines on how to write a report'** web-page
- References cited in the report (in text citations) must also appear in your end reference list (and vice-versa)
- Don't directly cite articles/books that you haven't actually read:
  - Learn to use Secondary source citations
    - E.g. 'Jones (1999) suggested that cats were more neurotic than dogs (as cited in Eysenck & Keane, 2006)', then just list the source (E & K) in the end reference list.

Final Project

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Today

General Timeline

Final project: designing your own study

Tips

Proposal

Resources

APA style

Data collection timeline

Project teams

Final Project: Designing your own study

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What kinds of projects can you do?

A) Follow-up question about one of the exercises we've done

B) Investigate phenomenon from Cognition or Sensation & Perception classes

C) Another idea?

Anything you can think of, as long as the study is set up in PsychoPy (or it's very simple…)

- There are a number of "Demos" coming with PsychoPy
- Feel free to look for demos or studies online



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Designing your own study: tips

A) a variety of additional things can be tested for each of the exercises we've done so far.

- Modify the stimuli
- Introduce an additional, external factor (but remember, the study will be conducted in the lab!

B) & C) create a new study?

- Look at the studies we have built
- Check the PsychoPy manual on Sakai under Resources

Do something that interests you!

You can talk to your fellow students about this – you can even partner up – but the final project has to be your own writing. In addition, only a fellow lab students can be a subject for your experiment.

Project proposal

Your assignment for the Wednesday after the break, then, is to come up with a proposal for a project. The proposal needs to include the following:

- what research question are you asking?
- what is your hypothesis about the answer to this question?
- what will you use to test the hypothesis?
  - what experiment will you do?
  - what parameters will you use?
  - why will those parameters support or refute your hypothesis?
  - Is this one of the existing exercises? if so, how does it differ from what you've already done?
- why are you interested in this question?

As said earlier, feel free to team up! Just remember that the final project has to be your own work, and your own words.

Things to think about…

…whether the hypothesis is reasonable

…whether the experiment is set up to test the hypothesis or not

…what other hypotheses might explain the results

…what other hypotheses can be tested using the experiment (maybe using with different parameters)

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APA style

Final project must be formatted in APA* style

- (*American Psychological Association)

"*Communication In Psychology*"

- At the end of PDF, example of **research paper** (like the one we are writing) in APA style, with comments
- excellent guide, maybe a bit outdated regarding APA requirements

"*Purdue guide*"

- This is an example or a **review paper**
- (up to date regarding APA– but be mindful this is a **review paper** – general structure may differ a bit from the model we are using)

"*Useful Phrases*"

- Excellent phrasebook

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Data Collection Timeline

Think about an idea for the project (you can team up!)

Email me to get my feedback by Wednesday evening

Wednesday 3/4 : email project idea – if your idea entails building a new experiment, you should try building the stimulus

Wednesday 3/11 : submit formal proposal + have experiment ready

Wednesday 3/25 : submit instructions/debriefing

Friday 3/27: IN CLASS: run experiment

Wednesday 4/1 : submit raw data and data analysis

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Turnitin

The final project will be checked by Turnitin

Paper ID	Uploaded	Viewed	Grade	Similarity	Options
897465637	Dec 17th 2017, 11:52 PM EST			67%	•••
897455852	Dec 17th 2017, 11:33 PM EST			3%	•••
897445056	Dec 17th 2017, 11:12 PM EST			6%	•••
897438749	Dec 17th 2017, 11:00 PM EST			5%	•••
897347584	Dec 17th 2017, 10:46 PM EST			7%	•••
897400305	Dec 17th 2017, 9:45 PM EST			3%	•••
897345668	Dec 17th 2017, 9:09 PM EST			4%	•••
897334075	Dec 17th 2017, 9:08 PM EST			11%	•••
897367696	Dec 17th 2017, 8:31 PM EST			8%	•••
897296740	Dec 17th 2017, 7:03 PM EST			2%	•••
897334225	Dec 17th 2017, 7:00 PM EST			8%	•••
897324366	Dec 17th 2017, 6:31 PM EST			2%	•••
897268918	Dec 17th 2017, 3:25 PM EST			0%	•••
897119623	Dec 16th 2017, 10:11 PM EST			7%	•••
897054342	Dec 16th 2017, 3:00 PM EST			8%	•••

Questions?