

Lessons Learned While Examining the Stroop Task

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Outline

- General Advice
- Specific Examples
- After the Big 3
- Stroop Research

General Advice

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Application Timeline

“The bottom line, prepare early, and be well organized. The earlier you complete your application the better your chances of admission.”

Jr. Year and into the Summer

- March/April
 - Define goals and objectives
 - Browse graduate programs
 - Eventually want 2 long shots, 2-3 borderlines, 3-5 good matches, and 1-2 sure bets
- May
 - Draft statement of purpose
- June
 - Prepare for the GRE (can take 1-6 months to prepare)

Additional Resources

- List of accredited programs
- Occupational Outlook Handbook
- The Complete Guide to Graduate School Admissions: Psychology and Related Fields
- Graduate Study in Psychology and Allied Fields

Senior Year

- September
 - Meet with faculty to discuss statement and possible programs
 - Sign up for standardized tests
- October
 - Take standardized tests
- November
 - Order transcripts
- December
 - Complete application
 - Reference forms to professors
 - Completed
 - Addressed
 - Copies of statement of purpose
- December/January
 - Mail applications

Details, Details, Details

- Carefully read the application material to determine what is required
 - Determine the deadlines
 - Find out what material needs to be sent to what office
- Complete everything on the application and submit all required supporting materials
- Follow up with the admissions office to verify that they have everything they need for your application

The Big 3

- Undergraduate GPA
- GRE scores
- Letters of Recommendation

Minimum Scores

- GPA
 - Average minimum GPA for admission is a 3.2
 - *Psi Chi Membership*
- GRE General and Subject Test
 - Low scores around 900 combined V+Q
 - More competitive schools require higher total (>1100 combined V+Q)

The Graduate Record Exam

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GRE Content

- Verbal

- analyze and evaluate written material and synthesize information obtained from it
- analyze relationships among component parts of sentences
- recognize relationships between words and concepts

- Quantitative

- understand basic concepts of arithmetic, algebra, geometry, and data analysis
- reason quantitatively
- solve problems in a quantitative setting



- Analytical Writing

- articulate complex ideas clearly and effectively
- examine claims and accompanying evidence
- support ideas with relevant reasons and examples
- sustain a well-focused and coherent discussion

More on Analytical Writing

- Two tasks
 - present your perspective on an issue
 - your perspective but should include relevant reasons and examples to support views
 - 45 minutes
 - “Present you perspective on the issue below, using relevant reasons and/or examples to support your views.”
 - “Both the development of technological tools and the uses to which humanity has put them have created modern civilization in which loneliness is ever increasing.”



– analyze an argument

- critique an argument by discussing how well reasoned (logically sound) it is
- 30 minutes
- “Discuss how well reasoned you find this argument.”

Six months ago the region of Forestville increased the speed limit for vehicles traveling on the region's highways by ten miles per hour. Since that change took effect, the number of automobile accidents in that region increased by 15 percent. But the speed limit in Elmsford, a region neighboring Forestville, remained unchanged, and automobile accidents declined slightly during the same six-month period. Therefore, if the citizens of Forestville want to reduce the number of automobile accidents on the region's highways, they should campaign to reduce Forestville's speed limit to what it was before the increase.

Interpreting the Results

- Rated on a six-point scale
 - 1 or 2 - could have great difficulty meeting writing requirements
 - 3 - could have some difficulty meeting writing requirements
 - 4 - likely to have little or no difficulty meeting writing requirements
 - 5 or 6 - highly likely to meet writing requirements

- Validity studies suggest that what administrators look for in essays is very similar to how the GRE-AW is scored
- Approximately 53% score 4.5 or higher with a mean rating of 4.23

Preparation

- Practice tests
- Barron's *How to Prepare for the GRE*
- Strategies
 - Verbal and Quantitative
 - scores are based on the number of items correctly answered minus .25 of the items incorrectly answered
 - a non-answer is not an incorrect answer
 - if you can eliminate one or more of the answers or if one answer seems better than the others than guessing may improve your score



– Analytical Writing

- reflect on the statement you need to evaluate
- prepare a brief outline
 - logical progression of ideas
 - explain reasoning
 - provide examples

Validity of the GRE

- Sternberg & Williams (1997)
 - examined the GRE as a predictive measure of graduate school grades and other outcome measures such as dissertation quality
 - GRE scores *may* be predictive of first year grades but are not associated with dissertation ratings
- Criticisms
 - restricted range of scores
 - only including accepted students

Primary Limitations

- The GRE does not and cannot measure all the qualities that are important in predicting success in graduate study or in confirming undergraduate achievement
- It is an inexact measure
 - only score differences that exceed the standard error of measurement of a given score can serve as reliable indications of real differences in academic knowledge and developed abilities

Guidelines for Using the GRE

- Use multiple criteria
 - GPA, letters of recommendation, personal statement, samples of academic work, and professional experience related to proposed graduate study
 - Especially important when English is a second language or when a student is returning to school after an extended absence
- Accept only official GRE score reports
- Conduct validity studies

- Maintain confidentiality of GRE scores
- Consider Verbal, Quantitative, and Analytical scores as three separate and independent measures

- Consider carefully any use of a composite
- Conduct reviews of subject content
- Avoid decisions based on small score differences
- Do not compare scores from different tests
- Recognize limitations of scores earned on tests taken under special conditions

Appropriate Uses

- Selection of applicants for admission to graduate school
- Selection of graduate fellowship applications for awards
- Selection of graduate teaching or research assistants
- Guidance and counseling for graduate study

General GRE Tips

- Take the GRE as if you are only going to take it once
- You should take the GRE in your junior year so that you can take it once again in the fall of your senior year if necessary
- Take the GRE at least one month before your application is due

- Request that your scores be sent to the appropriate department at the institutions you are applying to
- Different programs review the GRE in different ways. Most do not use the GRE as the only criterion for admittance
- Ask for the GRE score range of students accepted into your desired program

The Subject Test

- Same scoring format as the General Test
 - number correct
 - minus .25 of incorrect responses
- Earning a score of 500
 - answer 43% correctly
 - 25% incorrectly
 - 32% unanswered
- Not used as an admissions requirement for all programs
 - may not impact admission if it is required (unless it is very low)
- Can impact funding through fellowships or assistantships

GRE as a Predictor

- Correlations with first year grades:

UGPA	0.37
GREP	0.37
GREV	0.29
GREQ	0.29
GREA	0.28
GRE	0.33
UGPA+GREP	0.46
UGPA+GRE	0.44
All Combined	0.50

Subject Test Preparation

- Study introductory tests
 - will provide general knowledge
 - will also be limited in specific areas of psychology
- Use text in particular content areas to supplement study
 - modified PQ4R
 - read the chapter summaries
 - read sections of the chapters for areas problems areas
 - define the key words

Letters of Recommendation

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Steps in Obtaining a Good Letter

- Develop good relationships with your professors
 - letters will be better from faculty who know you and have a vested interest in you
 - they should know your interests, extracurricular activities, personal goals, etc.
 - how
 - work on research
 - student organizations (e.g., Psi Chi)
 - scheduled/regular meetings

- Get the most prestigious faculty to write your letters
- Ask professors in person
- It is a favor - thank you notes are a nice touch

- Give your recommenders your resume/vita and any other information you have that you think might be helpful
- Most of your recommendations should come from psychology faculty
 - Job supervisor for a clinical position if applying to a clinical or counseling program
- Some people think that a mix of male and female recommenders is advantageous

- Provide brief and clear instructions
 - include stamped and addressed envelopes
- Six weeks prior to the due date
 - follow up as the deadline approaches
 - faculty often have to write letters in a short period of time

Other Considerations

- If a faculty member hesitates or in any way indicates that he or she does not feel comfortable writing you a letter, choose someone else
- The waiver
- The letter should be personalized for the program you are applying to
 - you do not want a form letter of recommendation

Seven Sins of Applying

- Give your professors only three weeks notice about writing letters of recommendation for you
- Don't do any background research to find out what the program you are applying to really focuses on
- Don't find out what the average GPA and GRE scores are for the programs you are applying to

- Ask your friends and family members about the quality of a program instead of consulting APA, the APS profiles, or the National Research Council
- Do not look up the publications of your potential mentor(s)
- Don't look at the cost of the program
- Don't let anyone smarter than you read your statement of purpose/application essay before you send it

Kisses of Death in a Letter of Recommendation

- Inappropriate authors
 - No professors
 - Family members
 - Therapists
 - Self
 - From faculty who don't know you
 - No letter from research supervisor
- Negative letters

Letters coming from outside the University

- All letters do not have to come from professors
 - Job
 - Volunteer work
- Educate them on what is expected

Specific Examples

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The Application Process

- Selecting Schools
 - Select a range of schools
- Letters of Recommendation
 - A neutral letter is a bad letter
 - Get writers who know you and will be positive about you
- Contacts
 - Contacts at schools are valuable in the admission process
 - Develop them whenever possible

After the Big 3

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Secondary Criteria

Keith-Spiegel & Wiederman (2000)

- Items rated “Very Important”
 - Research publication in journal
 - Applicant’s match to program
 - Research presentation at professional meeting
 - Interest of someone on the committee in working with applicant
 - Clarity and focus of personal statement

Secondary Criteria

Keith-Spiegel & Wiederman (2000)

- Items rated “Generally Important”
 - Research assistant experience
 - Writing skills in statement of purpose
 - Status of letter writers
 - Strong mentor advocating for applicant
 - Knowledge and interest in specific program
 - Underrepresented ethnic minority membership
 - # of stats, research, and hard science courses
 - Status of faculty in major and undergrad institution
 - Honors or merit scholarships

Secondary Criteria

Keith-Spiegel & Wiederman (2000)

- Items rated “Somewhat Important”
 - Area of major
 - Relevant volunteer experience
 - Personality style (in interview)
 - Relevant paid work experience
 - Neatness and professional look of application
 - Teaching assistant experience
 - Level of departmental activity

Rank the following criteria...

- Undergraduate GPA
- Total GRE
- Verbal GRE
- Quantitative GRE
- Written/analytical GRE
- Letters of recommendation
- Field experience
- Psi Chi membership
- Research experience (helped)
- Research publication
- Research presentation
- Research grant
- Research award
- Service
- Leadership
- Athletics (other extracurricular)

Personal Statement

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Keith-Spiegel & Wiederman (2000)

- General interest areas
- Career plans
- Research experience
- Academic objectives
- Clinical/field experience
- Academic background and achievements
- Why did you choose this specific program
- Motivation
- *Relevant* personal information
- Specific graduate faculty of interest
- Special skills

Other Personal Statement Tips

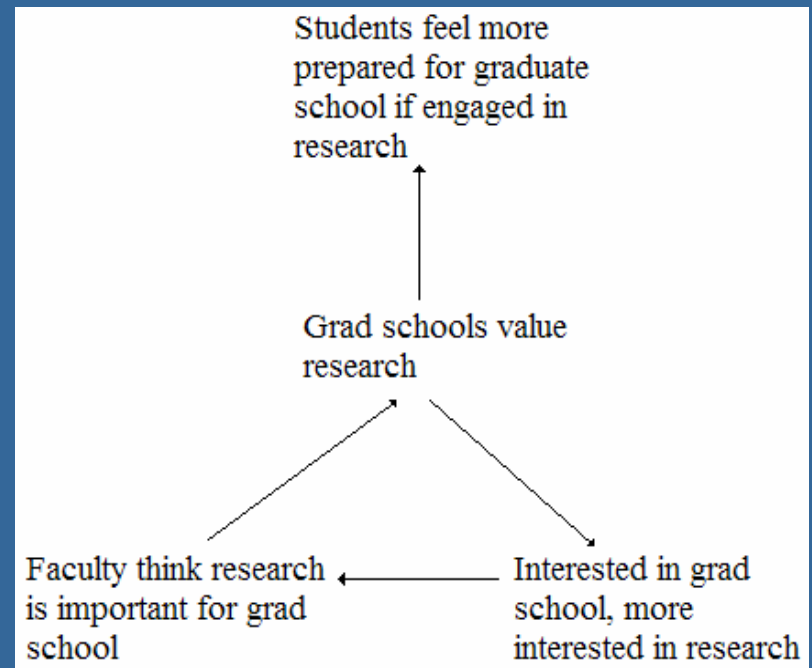
- Be concrete, avoid vagueness and clichés
- Fit the statement to the specific program
- Conform to the required specifications
- Have your faculty mentor read drafts
- ***Don't...***
 - Make spelling mistakes or grammatical errors
 - Use unusual fonts or colored paper
 - Sound arrogant
 - Discuss irrelevant personal info
 - Discuss personal problems
 - Word things in the negative

Research



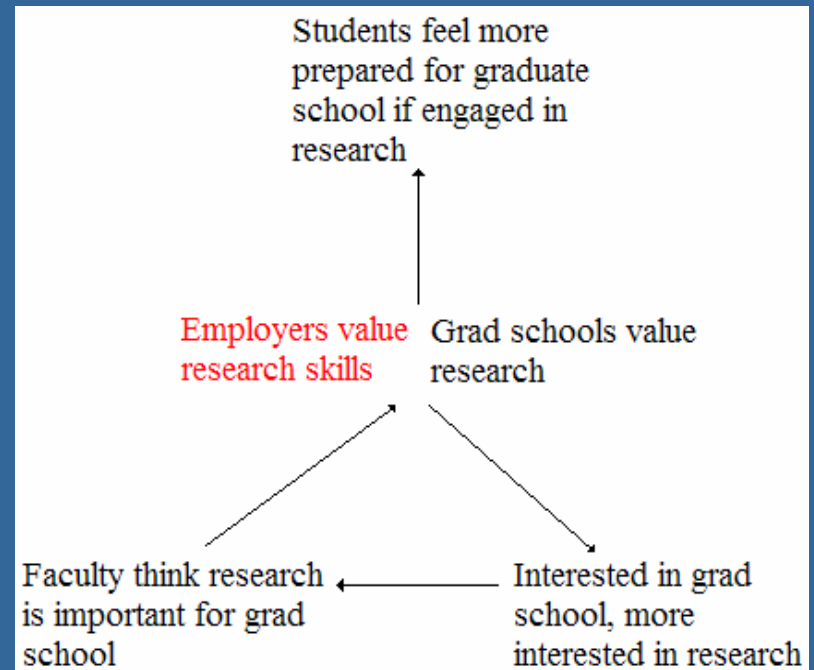
Research Experience

- Students interested in doctoral programs are more interested in research (Vittengl et al., 2004)
- Faculty think research experience is important preparation for graduate school (Landrum & Nelson, 2002)
- Graduate schools value undergraduate research (Vittengl et al., 2004)
- Research helps students feel prepared for graduate school (Huss et al., 2002)



Research Experience

- Employers also value research skills (Appleby, 2000; Gibson, Kahn, & Mathie, 1996; Landrum, 2001; Landrum & Harrold, 2003)



Skills Valued by Employers

- Social Skills
 - Deals effectively with a wide variety of people
 - Works productively as a member of a team
- Personal Skills
 - Holds high ethical standards
 - Remains open-minded during controversies
- Communication Skills
 - Listens carefully and accurately
 - Speaks articulately and persuasively

- Information Gathering and Processing Skills
 - Plans and carries out projects successfully
 - Gathers and organizes information from multiple sources
- Numerical/Computer/Psychometric Skills
 - Performs and interprets descriptive and inferential statistics

Meetings Skills Through Research: Social Skills

- Deals effectively with a wide variety of people
 - Running a large number of subjects and having them following instructions or believe a particular research scenario
 - Presenting research to different people having different view points of view and addressing their concerns
- Works productively as a member of a team
 - work on research teams
 - advisor
 - peers

Meetings Skills Through Research: Personal Skills

- Holds high ethical standards
 - ethical treatment of participants
 - consent
 - debrief
- Remains open-minded during controversies
 - need to examine issues from alternative perspectives
 - being your own devil's advocate

Meetings Skills Through Research: Communication

- Listens carefully and accurately
 - comments from others
- Speaks articulately and persuasively
 - paper and poster presentations

Meetings Skills Through Research: Information Skills

- Plans and carries out projects successfully
 - conducting background (literature) research
 - designing a study and collecting data
 - analyzing the data
 - communicating the results

- Gathers and organizes information from multiple sources
 - database searches
 - journals
 - books
 - presentations

Meetings Skills Through Research: Numerical Skills

- Performs and interprets descriptive and inferential statistics
 - data analysis
 - writing a results section

Stroop Task



Variations

- Stroop's Original Task
- Variations in Visual Presentation
- Cross-Modal Presentation I
- Auditory Presentation
- Cross-Modal Presentation II

Stroop's Original Task



RED	BROWN
BROWN	BLUE
BLUE	PURPLE
PURPLE	ORANGE
ORANGE	RED
BLUE	PURPLE
ORANGE	BLUE
PURPLE	ORANGE
RED	BROWN
BROWN	RED

Variations in Visual Presentation

BLUE

BLUE

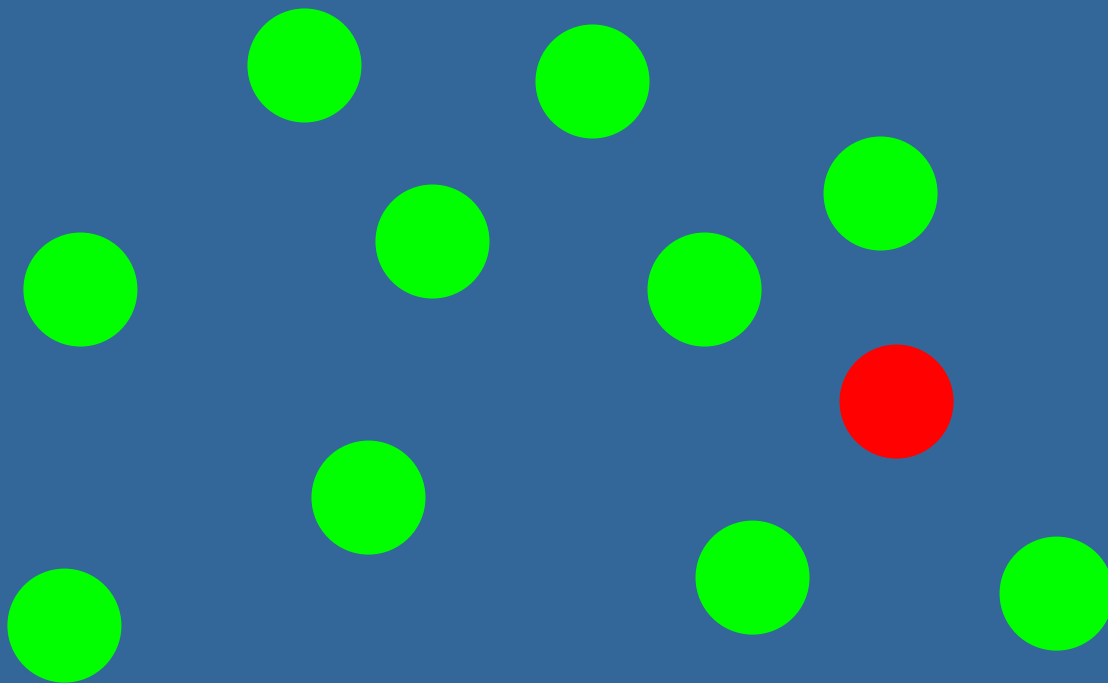
BLUE



Explanations

- Words are processed faster than colors
- Word reading interferes with color naming
- Automaticity
- Relative-Speed of Processing
- PDP

Triesman



Kahneman & Chajczyk (1983)

BLUE

BLUE



SOA Research

- Dyer (1971)
- Dyer & Severance (1973)
- Dyer (1974)
- Thomas (1977)
- Glaser & Glaser (1982)

MacLeod (1991)

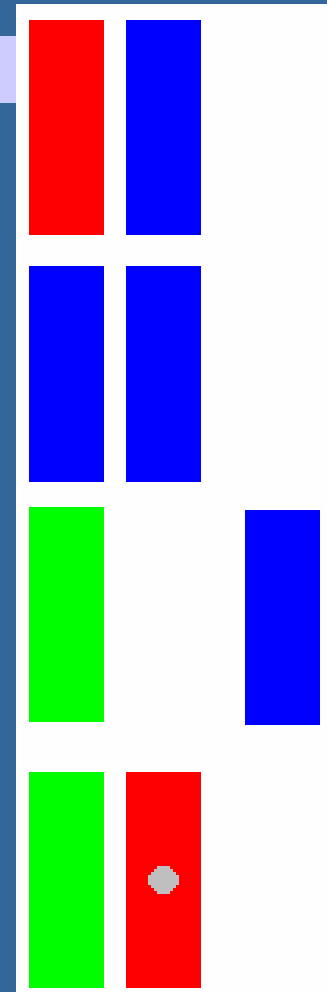
When the color (or picture) is to be named, maximal impact of a congruent or incongruent word will be observed when the two dimensions begin within 100 ms of each other. Facilitation may be observed for longer SOAs than interference when the word comes first. Manipulating SOA has virtually no impact on word reading unless a very high proportion of congruent trials biases use of the color to initiate response production. Concerted empirical efforts have failed to find any evidence of such a point."

Integrated Stroop

- Color Congruent, Color Incongruent, Neutral
- 40, 60, 80, 100, 120, 160, 200, 300, 500, 1000 msec
- Interference occurred across durations
 - Greatest amount of interference occurred at the shortest durations (40 and 60msec)
 - Interference relatively constant until 200msec when RT declined

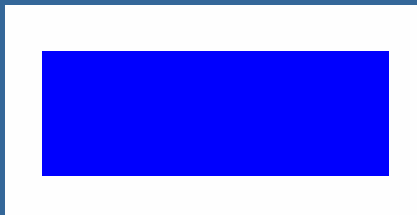
Color-Color Stroop Task

- Stroop stimuli have two components
 - color
 - word
- Can Stroop-like interference be obtained with two conflicting pieces of information from within the same domain?





Cross-Modal Presentation I

- Several tasks have been used to show cross-modal Stroop interference
 - color-word
 - HIGH and LOW in high and low tones
- Driver & Baylis (1993) has suggested that the presence of cross-modal Stroop interference suggests a common underlying attentional mechanism



Auditory Presentation

- Jerger, Martin, &, Pirozzolo (1988) used only auditory stimuli
 - male and female voices
 - “mommy” and “daddy”
 - ignore the name and identify the voice
- Congruent pair 
- Incongruent pair 
- It took preschoolers longer to identify the male voice saying mommy than the female voice - suggesting interference


Two Important Questions

- 1 Can auditory Stroop interference be obtained without using word information?
- 2 Can cross-modal Stroop interference be obtained with vision and other senses?

Auditory Stroop without Words?

- Both the visual-auditory cross-modal and the auditory Stroop tasks used word information
- Can auditory Stroop-like interference be obtained without using word information?
 - Auditory analog to the color-color visual version

Musical Stroop Task

- Two musical tones
 - violin 
 - clarinet
- Tones presented dichotomously
 - violin-violin or clarinet-clarinet
 - violin-clarinet or clarinet-violin
 - violin-noise or clarinet-noise
- Significantly faster identifying tones in congruent than incongruent trials

Cross-Modal Presentation II

- If visual and auditory information can create cross-modal Stroop-like interference, can cross-modal interference be obtained using vision and other senses?
- Examined word and weight discrimination
 - LIGHT, STANDARD, HEAVY
 - light (125 g), standard (175 g), heavy (225)

Procedure and Results

- Participants practiced weight discrimination
- Completed experimental trials
 - catch trials
- Congruent word-weight pairs ($M = 1264.57$, $SD = 235.37$) were responded to significantly faster ($t(7) = 2.77$, $p < .04$; $r = .75$) than incongruent pairs ($M = 1493.21$, $SD = 281.61$)

Other Cross-Modal Tasks

- Auditory and weight – interference
- Vision and touch – no interference
- Vision and temperature – no interference

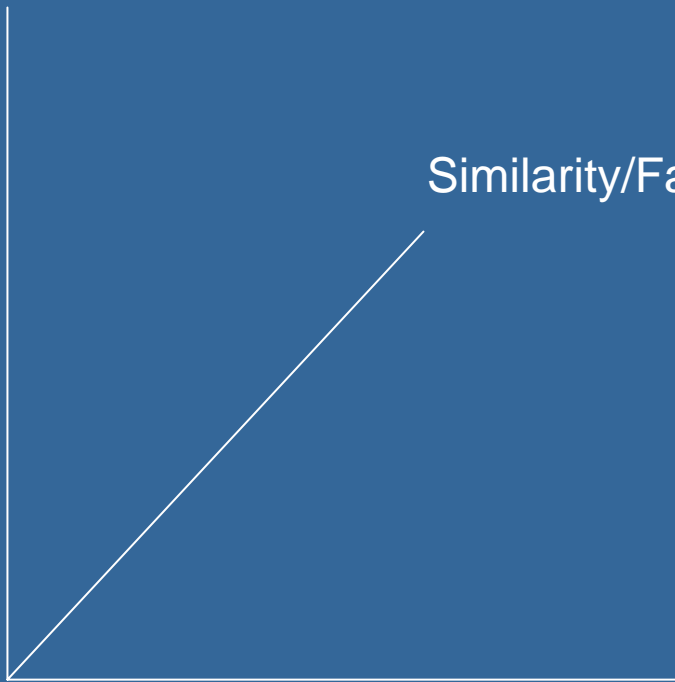
Theoretical Implications

- The proposed pattern of results would imply that Stroop interference may occur in two stages
 - Stage 1: encoding stage of processing in the sensory cortexes
 - Stage 2: at the decision and response stages in different areas of the frontal lobe

Space

Similarity/Familiarity

Time



Applications to Marketing

- Color is assumed to be an important aspect of packaging
 - This assumption has not been empirically verified
- Klein (1964) showed that color related words produced Stroop interference
 - Can color related products produce Stroop interference?

Soda Can Stroop Task

- 55 students at the University of Oregon named the first product they thought of for each of ten colors
 - Soda was among the most mentioned products for all colors
- 29 students at George Fox University were given names and sodas and asked to identify the first color they thought of

Sodas and Colors



Red



Blue



Green

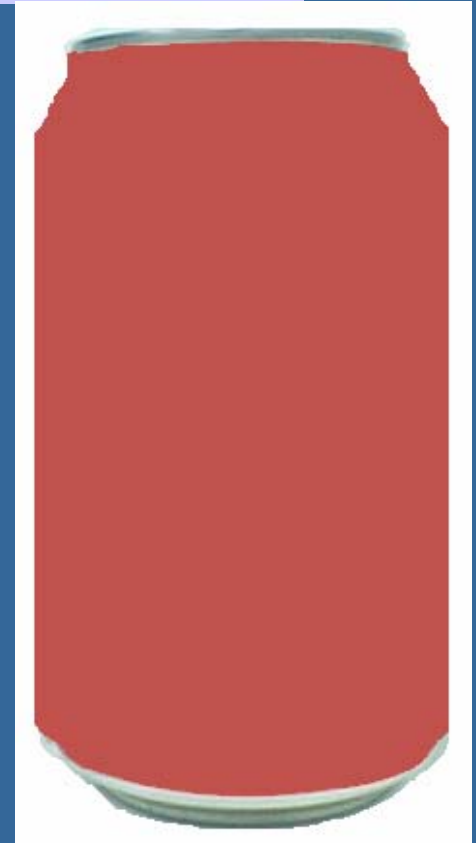
Conditions



Congruent Can



Incongruent Can



Neutral Can

Procedure

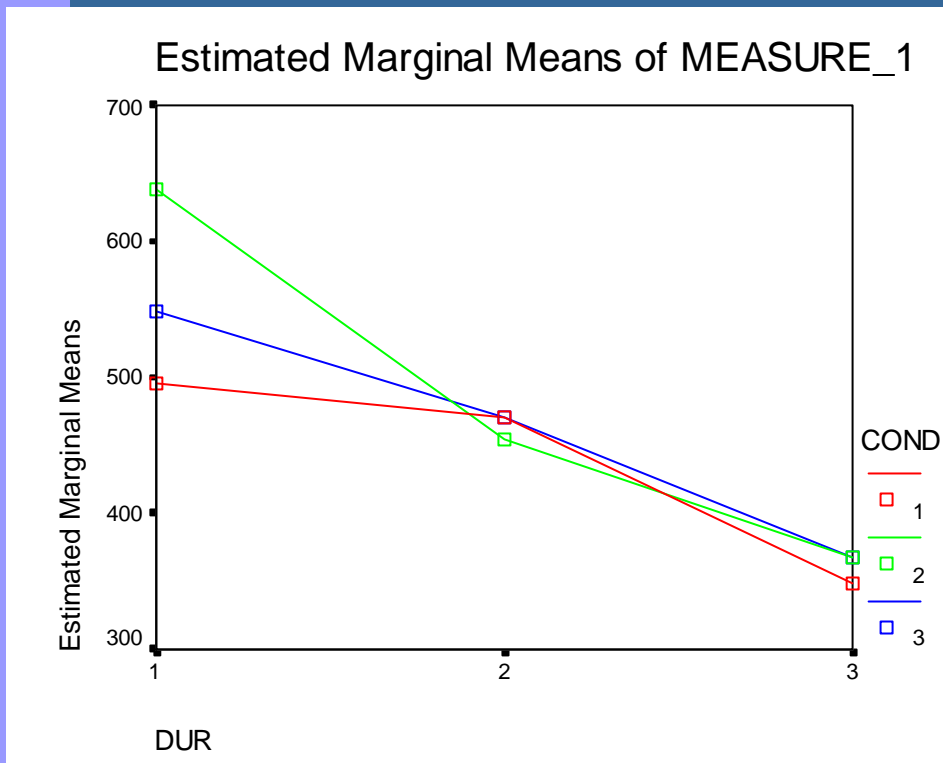
- 3 conditions
 - neutral
 - color congruent
 - color incongruent
- 10 trials per condition
 - 30 neutral
 - 30 color congruent
 - 180 incongruent
- Responded to color using a key press

Results

- There is an overall effect of condition ($F(2, 60) = 5.92, p < .005$)
- Pairwise comparisons reveal:
 - congruent cans ($M = 541.00$) are faster than neutral cans ($M = 578.13$) but not incongruent cans ($M = 536.79$)
 - incongruent cans also produced faster response times than neutral cans

Manipulating Presentation Time

- Presentation time varied
 - 50 msec, 100 msec, 200 msec
- Main Effect of Condition
 - $F(2, 16) = 4.70, p = .025$
 - congruent faster than neutral
- Main Effect of Duration
 - $F(2, 16) = 54.95, p < .001$
 - faster RTs as presentation time increases



- Significant interaction ($F(4, 32) = 8.14, p < .001$)
- Labeled cans yielded significantly faster RTs at 50 msec presentation time than non-labeled cans

Other Stroop-Related Research

- Developmental differences
- Personality differences
- Individual differences (e.g., social cognition factors, anxiety)
- Relation to models of working memory
- Interference and disorders

Why Get Involved in Research?

- Get involved with a mentor
- Apply information from content courses
- Learn skills important for graduate school and for jobs
- Can influence your career in ways you are not anticipating

