Using word association norms as a tool for testing theories and assessing memory in schizotypy

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Using word association norms as a tool for testing theories and assessing memory in schizotypy
William James (1890, p. 680)
“If we remembered everything, we should on most occasions be as ill off as if we remembered nothing”
Directed Forgetting Paradigm

List 1

Forget

List 2

Remember

List 1

Remember

List 2

Remember

Memory Test
Directed Forgetting Paradigm

List 1
↓
Forget
List 2
↓
Remember

List 1
↓
Remember
List 2
↓
Remember

Memory Test
Leading Accounts of DF

- **Inhibitory account** (Geiselman, Bjork, & Fishman, 1983; Bjork, 1989)
  
  “Inhibition merely limits retrieval by reducing activation of unwanted items” (Anderson, 2009, p. 224)

- Inhibition can be released with appropriate cues

- **Context-change account** (Sahakyan & Kelley, 2002)
A Contextual Change Account of the Directed Forgetting Effect

Lili Sahakyan and Colleen M. Kelley
Florida State University

The authors propose that the costs and benefits of directed forgetting in the list method result from an internal context change that occurs between the presentations of 2 lists in response to a “forget” instruction. In Experiment 1 of this study, costs and benefits akin to those found in directed forgetting were obtained in the absence of a forget instruction by a direct manipulation of cognitive context change. Experiment 2 of this study replicated those findings using a different cognitive context manipulation and investigated the effects of context reinstatement at the time of recall. Context reinstatement reduced the memorial costs and benefits of context change in the condition where context had been manipulated and in the standard forget condition. The results are consistent with a context change account of directed forgetting.
Extra-List Probe Task

Studied Words
- PLANET
- WIN
- POLITE
- CORK

Test Cues
- CONTEST – ?
- STOPPER – ?
- MANNERS – ?
- SPACE – ?
Extra-List Probe Task

Studied Words

PLANET
WIN
POLITE
CORK

Test Cues

CONTEST
STOPPER
MANNERS
SPACE
Key Processes Involved in Extra-list Probe task

1. Activation process
What Affects Target Activation Strength?
2. **Cue-Target intersection process**
2. **Cue-Target intersection process**
2. **Cue-Target intersection process**
Key Processes Involved in Extra-list Probe task

2. **Cue-Target intersection process**
What Affects the Success of Intersection?
The Strength of the test cue affects success of intersection process
Effects of implicit associates are reduced by manipulations of context

target connectivity effects

cue strength effects
Key Processes Involved in Extra-list Probe task

1. Target activation process

2. Cue-Target intersection process

3. Test cue and Context cue combine together to retrieve the target
Theoretical Implications of Extralist Probes for Directed Forgetting

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In 5 experiments, the authors examined the influence of associative information in list-method directed forgetting, using the extralist cuing procedure (Nelson & McEvoy, 2005). Targets were studied in the absence of cues, but during retrieval, related cues were used to test their memory. Experiment 1 manipulated the degree of resonant connections from associates of the target back to the target. Experiment 2 varied the degree of connectivity of associates of the target. Experiment 3 varied the size of the associative neighborhood of the target. Experiment 4 varied the direct target-to-cue strength, and Experiment 5 varied the indirect strength between the cue and the target. Reliable directed forgetting impairment emerged in all experiments. Furthermore, directed forgetting reduced the effects of the associates contributing to the target activation strength (Experiments 1-2), and it also reduced the effects of the associates contributing to the cue-target intersection strength (Experiments 3-5). Together, these results support the context account and challenge the inhibitory interpretation of directed forgetting.
Predictions for DF studies based on the Context-change Account

observe *reduced* effects of implicit associates in the Forget group regardless of whether the study manipulates a property of the target or a property of the test cue

Exp 1: *Connectivity* (e.g., target property)
Exp 2: *Target-to-cue strength* (e.g., cue property)
Predictions based on Context-change

Remember

Forget Context
Predictions for DF studies based on the Inhibitory Account

observe *enhanced* effects of implicit variables in the Forget group when the study manipulates a property of the test cue because strong cues can release the inhibition

Exp 1: *Connectivity* (e.g., *target* property)  
Exp 2: *Target-to-cue strength* (e.g., *cue* property)
Predictions based on Inhibition account

Remember

Forget Inhibition
General Method of Two Experiments

8 items with implicit advantage
8 items with implicit disadvantage

Forget

Remember

8 items with implicit advantage
8 items with implicit disadvantage

Test: Extra-list Cued Recall

N = 72 Ss
Presentation rate: 4 s/item

Controlled Variables
Set size (both Target and Cue)
Connectivity
Resonance
Forward strength
Backward strength
Number and strength of direct and indirect connections
K-F frequency
Concreteness
Exp. 1: Target Connectivity

Instruction $\times$ Connectivity: $F(1, 46) = 10.61, p < .01$
Exp. 2: Cue strength

Instruction $\times$ Test cue strength: $F(1, 70) = 4.46, p < .05$
Summary thus far

Using word association norms allowed testing two leading theoretical accounts of the directed forgetting phenomenon.

The results supported the context account of directed forgetting and they pose a challenge for the inhibitory account.
Using word association norms as a tool for testing theories and assessing memory in schizotypy

Lili Sahakyan & Thomas Kwapisil
Schizophrenia

• A devastating disorder affecting up to 1% of adults, marked by extensive cognitive impairment
  – Disorganized or blunted thought
  – Deficits in attention, working memory, and executive functions
Schizotypy

- Some people are more prone to developing schizophrenia and spectrum disorders (Andreasen, 1999; Gottesman, 1991; Meehl, 1990)

- This vulnerability reflects an interaction of genetic, neurodevelopmental, and psychosocial factors (Goodin & Iacono, 1995)

- Schizotypy reflects a continuum of vulnerability to schizophrenia, expressed from relative health to clinical psychosis
Schizotypy

• Schizophrenia is the most severe expression of schizotypy

• Majority of schizotypes will never develop schizophrenia
Why Study Schizotypy?

• Identify individuals at risk for spectrum disorders

• Those who remain healthy are also worthy of study because..
  – similar neurodevelopmental processes occur in these people as in schizophrenic patients
  – their mental processes can be studied unconfounded by schizophrenia
    • Are deficits due to cognitive vs. motivational influences, and do they confer liability for schizophrenia or follow from having the disease
Wisconsin Schizotypy Scales

• Perceptual Aberration Scale (35 items)
  – Assesses schizophrenic-like bodily and perceptual distortions
    • *The boundaries of my body always seem clear.*

• Magical Ideation Scale (30 items)
  – Assesses belief in magical or implausible causation
    • *I have sometimes felt that strangers were reading my mind*

• Revised Social Anhedonia Scale (40 items)
  – Assesses social disinterest and a lack of pleasure from social interactions
    • *Having close friends is not as important as many people say*

• Physical Anhedonia Scale (61 items)
  – Assesses lack of pleasure from sensory and aesthetic experiences
    • *The beauty of sunsets is overrated*
Dimensions of Schizotypy

- Schizotypy = multidimensional construct comprising latent factors that mirror those of schizophrenia

- Traditional Dimensions
  - Positive (psychotic-like) schizotypy – odd beliefs, unusual perceptual experiences
  - Negative (deficit) schizotypy – affective flattening, cognitive deficits, social disinterest, anhedonia
Reliability & Validity of WSS

• Reliability:
  – Coefficient alphas from .84 to .88

• Cross-sectional Validity
  – Associated with mild and transient impairment seen in schizophrenia

• Longitudinal Validity
  – Predict development of psychotic symptoms and schizophrenia-spectrum disorders
Cognitive Deficits in Schizotypy

• The cognitive deficits in schizophrenia are also seen in schizotypy (e.g., Barch et al., 2004; Chen et al., 1997; Gooding, Kwapił, & Tallent, 1999)

• Deficits have been shown in sustained attention (e.g., Bergida & Lenzenweger, 2006), working memory (e.g., Kerns & Becker, 2008; Park & McTigue, 1997), and task switching (e.g., Cimino & Haywood, 2008; Wilson et al., 2008)

• However, studies have not examined long-term memory deficits in schizotypy
• N=195 college students completed the study

• Studied two lists of 24-items, at a rate of 3 s / word

• Within each list, 12 words had small set size (< 8 associates), and 12 words had large set size (> 17 associates)

• Memory was tested with extra-list cuing procedure
  • All variables known on earth to affect memory were controlled across set size manipulation and test cues.

• ½ of subjects did the test under fast testing conditions (10 s per cue), whereas the remaining ½ had slower testing condition (15 s per cue)

• After memory test, all Ss completed the battery of schizotypy tests
Set size Effect as a function of Response Deadline

- **Slow (15 s):** N = 97
  - Large set size
  - Small set size

- **Fast (10 s):** N = 98
  - Large set size
  - Small set size

Proportion Recall
• Fast response deadline led to:

  • overall lower memory

  • large sets suffered more than small sets (i.e., enhanced the set size effect) presumably because of greater interference from competitors during retrieval in the large sets

  • more time may be needed during retrieval to find the right target amidst many distractors (i.e., resolving competition)
Set size effect in Negative & Positive Schizotypy as a function of response deadline

Fast: \( R^2 = .001 \)
Slow: \( R^2 = .000 \)

Fast: \( R^2 = .003 \)
Slow: \( R^2 = .01 \)
Set size effect in Negative & Positive Schizotypy as a function of response deadline

Fast: $R^2 = .001$

Slow: $R^2 = .000$

Fast: $R^2 = .003$

Slow: $R^2 = .01$

Take-home message:
Set size effect is invariant across both dimensions of schizotypy
overall memory as a function of response deadline in Positive schizotypy

Fast: $R^2 = .01$ ($r = .10, p=.34$)

Slow: $R^2 = .001$
overall memory as a function of response deadline in Negative schizotypy

Fast: $R^2 = .15 \ (r = -.39, \ p<.001)$
Slow: $R^2 = .01$
• Fast response deadline differentiates positive and negative schizotypy in memory performance

• Positive schizotypy shows better recall under slow than fast conditions, irrespective of severity of schizotypy

• Negative schizotypy shows an interaction: the more extreme scorers suffer a lot more under fast response conditions
THANK YOU
APPENDIX
Negative Schizotypy: Memory as a function of response deadline

Fast: $R^2 = .14$
Slow: $R^2 = .01$

Fast: $R^2 = .10$
Slow: $R^2 = .01$
Positive Schizotypy: Memory as a function of response deadline

Fast: $R^2 = .01$
Slow: $R^2 = .001$

Fast: $R^2 = .004$
Slow: $R^2 = .01$
Associates $A_2$, $A_4$, $A_7$, and $A_8$ are competitors because they are unique to the target and are not linked to the cue.

Competitors lower recall because they lead away from the target.

The number of competitors increases as the set size increases.