



Further Support for Negative Priming in the Dimensional Change Card Sort

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Introduction

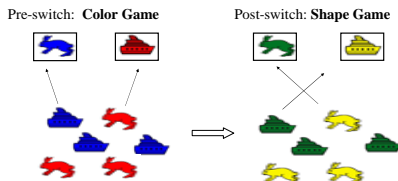
In the Dimensional Change Card Sort (DCCS), children sort cards by one rule (e.g., shape) in the preswitch phase, and sort the same cards by a conflicting rule (e.g., color) in the postswitch phase. Most 3-year-olds continue to sort by the preswitch rule in the postswitch phase (Zelazo, Frye, & Rapus, 1996). Some proposed explanations include inadequate inhibition, representational re-description, memory limitations, and reflective competence in using embedded rules.

Recently support has been established for a negative priming explanation, and this explanation forms a part of the Cognitive Complexity and Control Theory-Revised (CCC-R; Zelazo, Müller, Frye, & Marcovitch, 2003). Negative priming describes the disruption of the response to a stimulus that has previously been ignored. In the context of the DCCS, negative priming would occur if children suppress the irrelevant rule in the preswitch and thus become unable to use it when it becomes relevant in the postswitch. The present study adds further support to this explanation by examining the roles of frequency of conflicting stimuli and their placement relative to the rule switch.

Prior Research

Two manipulations of the standard DCCS have provided support for the negative priming hypothesis (Gela & Müller, 2003; Müller, Dick, Gela, Overton, & Zelazo, 2003). These are the Relational Negative Priming (RNP) and Absolute Negative Priming (ANP) manipulations (Figure 1). The finding that the majority of 3-year-olds failed the RNP version (Fig. 1a), but not the ANP version (Fig. 1b) suggests that they have problems dis-inhibiting the values of the dimension that were irrelevant during the pre-switch phase (i.e., the problem is *too much* inhibition of the irrelevant stimulus characteristic in the preswitch). Negative priming thus occurs because of the conflict between the target and the test cards (e.g., a blue boat can be sorted by both color and shape in the RNP version, and shape must be inhibited in the preswitch, but a blue car can only be sorted according to color, as in the ANP version).

a. **Relational Negative Priming (RNP)** (33% of 3-year-olds pass; 67% of 4-year-olds pass).



b. **Absolute Negative Priming (ANP)** (75% of 3-year-olds pass)

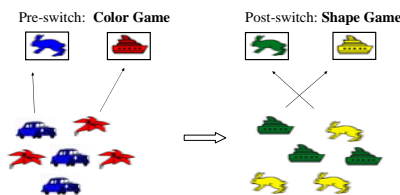


Figure 1. The Relational Negative Priming and Absolute Negative Priming versions of the DCCS.¹

¹ For all versions, to allow for comparison, the stimuli shown are for the "color-rule-first". In the actual experiment, the rule presentation (color-first or shape-first) was counterbalanced, and different stimuli were used accordingly.

The Present Study

The prior research has established an effect of the conflicting stimulus characteristics in the preswitch. In the present study, 3- and 4-year old children were randomly assigned to one of four manipulations of the DCCS to determine the role of frequency and recency of the conflicting test cards in negative priming.

Participants

A total of 60 children between the ages of 36 and 54 months participated, all matched on age across conditions. The final sample consisted of 15 children in each of 4 conditions (mean age Standard = 46.00 months; NP-Random = 46.07 months; NP-Recency = 46.40 months; Partial-Partial Change-Random = 46.20 months).

General Design

For each condition, children were asked to sort the test cards to match the target cards according to a preswitch rule (e.g., the color rule, "Blue ones go here, red ones go here"), and then switch and sort by a postswitch rule (e.g., the shape rule, "Rabbits go here, boats go here").

Target cards and postswitch test cards remained the same for all conditions. The conditions differed according to preswitch test cards, and the order of the presentation of the cards (see Figure 2).

- Standard Condition (Fig. 2a): The standard presentation of the DCCS (Zelazo et al., 1996).
- Negative Priming Random (NP-Random; Fig. 2b): In the preswitch phase, conflicting test cards and non-conflicting test cards were presented in a random order.
- Negative Priming Recency (NP-Recency; Fig. 2c): In the preswitch phase, non-conflicting test cards were presented as the first four test cards, and conflicting test cards were presented as the last four.
- Partial-Partial Change-Random (Fig. 2d): For half of the test cards, the irrelevant conflicting dimension in the preswitch was removed entirely, and the cards were presented randomly.

Results

Table 1. The proportion of children passing each condition, and the significance levels of the analysis of t-tests of proportion differences ($df = 28$).

	Proportion Passing (n=15)	Standard	NP-Random	NP-Recency	Partial-Partial Change
Standard	3 (20%)	--	$p = .07$	$p < .05$	<i>n.s.</i>
NP-Random	7 (47%)		--	$p < .01$	<i>n.s.</i>
NP-Recency	0 (0%)			--	$p < .05$
Partial-Partial Change	5 (33%)				--

Discussion

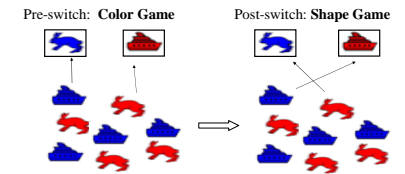
The results show that recently presented interfering test cards yield more negative priming during post-switch sorting performance than randomly distributed interfering test cards. Children performed better in the NP-Random version than in the NP-Recency version and Standard version. Negative priming thus appeared to be more influenced by recency than by frequency.

References:

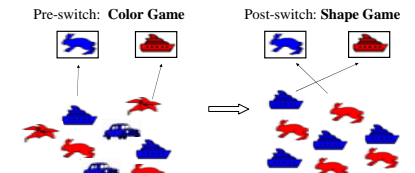
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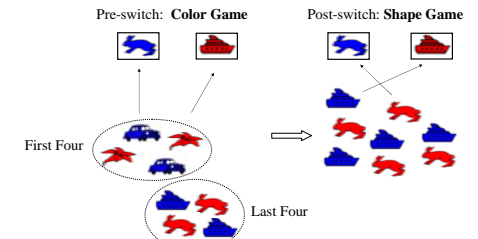
a. **Standard Version** (20% of 3-4-year-olds pass).



b. **Negative Priming-Random** (47% 3-4-year-olds pass).



c. **Negative Priming-Recency** (0% of 3-4-year-olds pass).



d. **Partial-Partial Change Random** (33% of 3-4-year-olds pass).

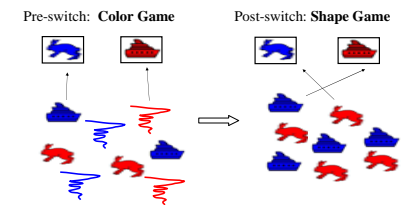


Figure 2. The Standard, Negative Priming-Random, Negative Priming-Recency, and Partial-Partial Change Random versions of the DCCS.¹