Introduction

In previous studies, Kiran and colleagues (Kiran, under review; Kiran & Johnson, under review; Kiran & Thompson, 2003) have suggested that for patients with naming deficits, training atypical examples within a semantic category may be a more efficient treatment approach to facilitating generalization within the category than training typical examples of the category. A theoretical framework for this selective generalization (Kiran, 2007) suggests that atypical examples are more complex than typical examples because within a category atypical examples consist of a greater variation of semantic features than typical examples. The nature of this generalization also depends upon the degree of graded structure across categories. Graded structure refers to the continuum of category representativeness, beginning with most typical members of a category and continuing through its atypical members to those nonmembers least similar to category members. For instance, categories such as birds and clothing are relatively graded (i.e., atypical members are considered least representative but are still members of the category). In contrast, Shapes is an example of a well defined category that has a clear definition and category boundary and has items that meet membership requirements to the same degree.

Evidence for patterns of selective generalization comes from three related studies. In one study with four patients with fluent aphasia (Kiran & Thompson, 2003) training atypical examples (e.g., ostrich, pumpkin) belonging to two animate categories (e.g., birds, vegetables) resulted in generalization to untrained typical examples (e.g., robin, cucumber). In contrast, training typical examples improved naming of those items whereas naming of untrained atypical examples remained unchanged. Similar findings were observed in a follow up study (Kiran, under review), where five patients with fluent and nonfluent aphasia were trained on either typical (e.g., recliner, suit) or atypical (e.g., hammock, apron) from two inanimate categories (e.g., clothing, furniture). In a third study, three patients with anomic aphasia were trained on either typical or atypical examples within the category shapes (Kiran & Johnson, under review). Whereas training atypical examples generalized to untrained typical examples, training typical examples did not generalize to untrained atypical examples. The acquisition and generalization patterns however were not as robust as the effects observed in previous typicality treatment studies.

The present study extended the examination of the typicality effect to ad hoc categories such as ‘things to sell at a garage sale’ that do not have rigidly defining features that constitute category membership. Instead, category members follow a loose combination of common features. Even though ad hoc categories are not as established in memory as common categories because people have had less experience of them as categorical concepts, ad hoc categories are instrumental to achieving goals, particularly goals of daily living. Importantly, goal-derived ad hoc categories also possess graded structures in which typicality can be determined for members of a particular category (Barsalou, 1983, 1985).

The aim of the present study was to investigate if manipulation of typicality in ad hoc categories would reveal selective generalization patterns from atypical to typical examples but not from typical to atypical examples. Five aphasic individuals received a semantic feature treatment to improve lexical retrieval of either typical or atypical examples of the category ‘things to have in a garage sale’ and/or ‘things to take camping’, while generalization was tested to the untrained examples of the category.

Methods.

Five individuals with fluent aphasia (range = 39-84 years) were involved. Participants presented with varying degrees of naming deficits and semantic impairments (see Table 1). Thirty items
(15 typical: lamp, 15 atypical: candle) for things to have in a garage sale and 30 items (15 typical: tent, 15 atypical: slippers) for category things to take camping were selected after an extensive stimulus norming task. Stimuli were matched for frequency, familiarity and number of syllables. Additionally, for each category, 25 target features that described physical and functional attributes of each example and 10 distracter features were developed for use in treatment.

**Baseline and Treatment probes.**

A single subject experimental design with multiple baselines across behaviors and participants was employed. Generative naming for the two categories was tested during baseline and treatment. Participants were instructed to name as many words associated with each category as they could. A generative naming task instead of a picture naming task was chosen as the dependent variable in the present study because it was hypothesized that the number and nature of responses produced in each category would vary greatly across the participants. Consequently, in addition to calculating the number of target typical and atypical responses, all words generated for each category was tabulated for each participant. Effect sizes (ES) for each treatment type was calculated (Busk & Serlin, 1992).

**Treatment.**

After sorting the word cards by category, the participants performed the following steps for each of the target words in the category in training: (1) identifying semantic attributes applicable to the target example from a set of category features, (2) answering yes/no questions pertaining to the semantic features of the target item, and (3) naming the target item and other items studied during that particular treatment session.

**Results.** P1 received treatment for atypical examples of ‘garage sale’, which improved moderately from 7% to 87% accuracy (ES = 12.2). Generalization was observed to the untrained typical examples which improved from 26% to 87% (ES = 7.0) (Figure 1). P2 received treatment for atypical examples of ‘camping’ which improved from 20% to 100% (ES = 4.6). Generalization was also observed on the untrained typical examples which improved from 40% to 100% (ES = 1.9). This patient was subsequently trained on typical examples of ‘garage sale’ which improved from 47% to 86% (ES = 2.5) and the untrained atypical examples improved from 27% to 66% (ES = 4.1) (Figure 2). P3 was trained on atypical examples of ‘garage sale’ which improved from 0% to 87% (ES = 9.4). Some improvement to untrained typical examples also occurred from 7% to 47% (ES = 7.5) (Figure 3). P4 was trained on typical examples of ‘camping’ which improved from 6% to 47% (ES = 7.4). No change was observed on untrained atypical examples (ES = 0.01). This patient was subsequently trained on atypical examples of ‘garage sale’. Although performance on trained items improved only from 13% to 33% in 10 sessions (ES = 3.2), performance on the untrained typical examples also changed from 0% to 27% (ES = 2.41) (Figure 4). Finally, P5 was trained on typical examples of ‘camping’ which improved from 6% to 47% only in 10 sessions (ES = 6.03). Performance on the untrained atypical examples did not show much change from 0% to 13% (ES = 1.1) (Figure 5).

**Discussion.** As predicted, training atypical examples in the category resulted in generalization to untrained typical examples with strong changes in patients P1 and P3 and smaller changes in P2 and P4. Training typical examples did not result in generalization to untrained atypical examples in P4 or P5 although changes were observed in P2. Not all patients (e.g., P4, P5) responded positively to treatment for generative naming although all patients showed improvements in the total number of items generated for each category subsequent to treatment. Analysis of errors reveals some explanations for the varying patterns across patients.
Selected References


Table 1: Demographic details for the five patients involved in treatment. Also provided in this table are details regarding the order of category and typicality trained for each participant. (Note CVA: cerebrovascular accident, WAB AQ = Western Aphasia Battery Aphasia Quotient, BNT = Boston Naming Test, PAPT = Pyramids and Palm Trees).

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Gender</th>
<th>Time post onset CVA (months)</th>
<th>Pre-Tx WAB AQ</th>
<th>Pre-tx performance on BNT</th>
<th>Pre-tx performance on PAPT</th>
<th>Category Trained</th>
<th>Typicality Trained</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>77</td>
<td>F</td>
<td>11</td>
<td>79</td>
<td>43%</td>
<td>96%</td>
<td>1. Things at garage sale</td>
<td>Atypical</td>
</tr>
<tr>
<td>P2</td>
<td>39</td>
<td>F</td>
<td>9</td>
<td>82</td>
<td>22%</td>
<td>92%</td>
<td>1. Things to take camping</td>
<td>Atypical</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. Things at garage sale</td>
<td>Typical</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1. Things at garage sale</td>
<td>Atypical</td>
</tr>
<tr>
<td>P3</td>
<td>74</td>
<td>M</td>
<td>72</td>
<td>84.3</td>
<td>68%</td>
<td>96%</td>
<td>1. Things at garage sale</td>
<td>Atypical</td>
</tr>
<tr>
<td>P4</td>
<td>68</td>
<td>M</td>
<td>9</td>
<td>72.1</td>
<td>18%</td>
<td>92%</td>
<td>1. Things to take camping</td>
<td>Typical</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. Things at garage sale</td>
<td>Atypical</td>
</tr>
<tr>
<td>P5</td>
<td>84</td>
<td>F</td>
<td>9</td>
<td>70.9</td>
<td>27%</td>
<td>86%</td>
<td>1. Things to take camping</td>
<td>Typical</td>
</tr>
</tbody>
</table>
Figure 1

P1
THINGS TO HAVE IN A GARAGE SALE

Probes

Percent target responses

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%

1 2 3 4 5 6 7 8 9 10 11 12

Baseline
Treatment

Typical- untrained
Atypical- trained
Figure 2

P2
THINGS TO TAKE CAMPING

Typical-Untrained
Atypical-Trained

Baseline
Treatment
Maintenance

Probes
Percent target responses

P2
THINGS TO HAVE IN GARAGE SALE

Typical-trained
Atypical-untrained

Baseline
Treatment
Maintenance

Probes
Percent target responses
Figure 3

**P3**

**THINGS TO HAVE IN A GARAGE SALE**

- **Baseline**
- **Treatment**

- **Probes**

- **Percent target responses**
  - 0% to 100%

- **Typical untrained**
  - Dotted line

- **Atypical trained**
  - Solid line
Figure 5

P5
THINGS TO TAKE CAMPING

Baseline
Treatment
F/up

Percent correct responses

Probes

Typical-trained
Atypical-untrained