Evidence for Automatic Accessing of Constructional Meaning: Jabberwocky sentences prime associated verbs

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Abstract

A central question within psycholinguistics is where sentences get their meaning. While it has been shown that phrasal constructions are readily associated with specific meanings, it remains unclear whether this meaning is accessed automatically, without reflection or explicit instruction. In this study, participants performed a lexical decision task on individual target words which were preceded by abstract skeletal constructions devoid of any real open class items (e.g. He daxed her the norp). The target words either corresponded to the hypothesized meaning of the construction (i.e a match for the English ditransitive would be give or handed) or did not (e.g., put). We found significant priming effects for congruent over incongruent target words, both for associated primes (which occur regularly within the construction), and to a lesser extent, for primes that are semantically related to the construction but which rarely occur in the construction (e.g transfer for the ditransitive).

Keywords: construction grammar, sentence meaning, associative priming, semantic priming
Introduction

“Somehow it seems to fill my head with ideas”- Alice in Wonderland on reading Jabberwocky (Through the Looking-Glass, Lewis Carroll)

Where does the meaning of a sentence come from? Chomsky (1957) made famous the sentence, *Colorless green ideas sleep furiously*, arguing that although it is syntactically well-formed, it has no meaning. While many poetically minded people objected that the sentence can be interpreted metaphorically in a number of ways (e.g., Chao, 1997), the overall idea that open class words of a sentence must be combined in ways that make sense in order for a sentence to be interpretable still enjoys widespread currency. In this way, it has regularly been assumed that sentences that contain no meaningful open-class items, such as those in (1), are meaningless.

1. She jorped it miggy.

For example, this type of “nonsense sentence” has regularly been used in experiments designed to distinguish the contribution of pure form from that of meaning, so as to determine the neural representations of syntax (Friederici, Opitz, & von Cramon, 2000; Mazoyer et al., 1993; Moro et al., 2001; Roeder, Stock, Neville, Bien, & Roesler, 2002; Yamada and Neville 2007).

Within this perspective, the main verb of the sentence is generally taken to play a pivotal role in interpretation, by specifying the way that overt arguments are related to one another. Almost any traditional grammar book, or beginning logic or linguistic class
will likely begin a discussion of sentence types with a classification of verbs according to how many arguments they “take.” It is generally assumed, for example that *sneeze* is intransitive, *kick* is transitive, and *give* requires an agent, a theme, and recipient arguments. In this way, basic sentence patterns of a language are believed to be determined by syntactic and semantic information specified by the main verb. For example, the sentence pattern in (2) appears to be due to the specifications of *put*:

2. Pat put the ball on the table.

That is, *put* is a verb that requires an agent, a theme and a location, and it appears overtly with the corresponding three complements.

But the idea that all meaning comes from lexical items has its critics. If argument structure were projected exclusively from a verb's semantics, we would need special verb senses for each of the verbs in the expressions in (3) (e.g., Goldberg 1995; 2006; Jackendoff 2002):

3.a. If time is money then save yourself rich at Snyder's! (Mark Turner, personal communication)  
b. The people of this small town...have been unable to pray Mrs. Smith's two little boys home again. (Mark Turner, personal communication)  
c. “his thousands of travelling fans… had roared him into the Thomas and Mack Center ring” www.topix.net/wire/world-soccer/manchester-united  
d. She tried to avoid blinking the tears onto her cheeks (Anne Tyler, 1992, Dinner at the Homesick Restaurant, NY: Knopf)  
e. "Demi Moore thinks this will Halle Berry her back to the B List.” <from Mr. Brooks movie> (fR. Grush, personal communication 2007)  
g. “I actually had a moth go up my nose once. I…coughed him out of my mouth”  (bikeforums.net/archive/index.php/t-292132)

That is, we would need a sense of *save* that meant roughly “to cause to become by saving”; a special sense of *pray* “to cause to move by praying,” a special sense of *roar*
that entails motion and so on. These senses are implausible in that one doesn’t find languages that devote unique stems to these meanings. For example, it is unlikely that one would find a word *kamo*, meaning “to cause to move by coughing” because this is not a situation that is likely to occur regularly enough to warrant a lexical meaning (Goldberg, 2010).

In order to avoid such implausible verb senses, it has been proposed that argument structure patterns are associated with abstract meanings independently of the verbs that appear in them. On this view, verbs can combine with argument structure constructions on the fly to create novel sentences like those in (3). Examples of such *argument structure constructions* are given in Table 1.

<table>
<thead>
<tr>
<th>Table 1: English Argument Structure Constructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ditransitive: (Subj) V Obj1 Obj2</td>
</tr>
<tr>
<td>Transitive: (Subj) V Obj</td>
</tr>
<tr>
<td>Caused-Motion: (Subj) V Obj Oblique&lt;sub&gt;path&lt;/sub&gt;</td>
</tr>
<tr>
<td>Resultative: (Subj) V Obj Pred</td>
</tr>
<tr>
<td>Removal: (Subj) V Obj Oblique&lt;sub&gt;source&lt;/sub&gt;</td>
</tr>
<tr>
<td>Way construction: (Subj) V [poss&lt;sub&gt;i&lt;/sub&gt;way] Oblique&lt;sub&gt;path&lt;/sub&gt;</td>
</tr>
<tr>
<td>X CAUSES Y to RECEIVE Z</td>
</tr>
<tr>
<td>X CAUSES Y to MOVE Z</td>
</tr>
<tr>
<td>X CAUSES Y to MOVE from Z</td>
</tr>
<tr>
<td>X ACTS on Y; X EXPERIENCES Y</td>
</tr>
<tr>
<td>X CAUSES Y to BECOME Z</td>
</tr>
<tr>
<td>X CREATES PATH &amp; MOVES Z&lt;sub&gt;path&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

Previous work has provided some theoretical and experimental evidence in support of argument structure constructions. Theoretical arguments have typically emphasized the ad hoc and implausible nature of the verb senses that would otherwise be required, as just mentioned (see Goldberg 1995, 2006 for further arguments).

Other work has noted that learners use the semantics associated with syntactic patterns in order to figure out what new verbs mean (Fisher, 1996; Gillette, Gleitman, Gleitman, & Lederer, 1998; Landau & Gleitman, 1985); this idea presupposes the idea that the syntactic patterns are associated with meanings independently of the main verb.
Bencini & Goldberg (2000) conducted a sorting experiment with the aim of directly comparing the semantic contribution of the construction with that of the verb. The stimuli were sixteen sentences created by crossing four verbs with four different constructions: A sample set of sentences for the verb *throw* is given in Table 2:

| a. Pat threw the hammer | Transitive |
| b. Chris threw Linda the pencil | Ditransitive |
| c. Pat threw the key onto the roof | Caused Motion |
| d. Lyn threw the box apart | Resultative |

Participants were asked to sort the sixteen sentences, provided in random order, into four piles based on “overall sentence meaning.” Participants could sort equally well by verb: e.g., all instances of *throw* (a-d) being grouped together, regardless of construction; or they could sort by construction: all instances of e.g., the ditransitive construction being grouped together. The stimuli were designed to minimize contentful overlap contributed by anything other than the lexical verb. No other lexical items in the stimuli were identical or near synonyms.

Results demonstrated that participants were just as likely to sort by construction as they were to sort by verb, providing evidence that the constructions were as strong a cue to sentence meaning as verbs.

On the multiple sense view, the reason that instances of *throw*, for example, were put into separate piles was because each instance represented a distinct sense which was more similar in meaning to one of the senses of another verb than to the other senses of *throw*. However, the only way for participants to discern which verb sense was involved was to recognize the argument structure pattern and its associated meaning. That is, the
proposed different verb senses all look the same; the only way to determine that a particular

sense is involved is to note the particular argument structure pattern that is expressed and

infer which verb sense must have produced such a pattern. Therefore, at least from an off-

dline comprehension point of view, the pairing of argument structure pattern with meaning

must be primary.

Kaschak and Glenberg (2000) provided important evidence of constructional

meaning through a series of comprehension studies involving novel denominal verbs (Clark

and Clark 1979). In particular, they asked participants to read passages that set up potential

transfer contexts such as that in (4):

4. Tom and Lyn competed on different baseball teams. After the game, Tom, who

had been pitching, was kidding her about striking out three times. Lyn said, “It was

an aberration! I was distracted by your ugly face. I can hit anything to any field

using anything!” To prove it, she took her apple over to manager who was

recovering from a twisted ankle, and she grabbed his crutch.

Participants were asked to paraphrase sentences such as (5a) or (5b). Another group

was asked to define the denominal verbs involved.

5.a. Lyn crutched Tom her apple to prove her point. (double object)

b. Lyn crutched her apple to prove her point to Tom (transitive)

Results demonstrated that participants were more likely to decide that transfer had

occurred in 5a than in 5b, and were more likely to decide that the novel verb (e.g., crutch)

was a verb of transfer. In addition, Kaschak and Glenberg demonstrated that different

aspects of the affordances of the denominal verb played a role in the sentences’

interpretations. For example, participants were faster to judge “the crutch is sturdy” as true

after a passage like that in (4) than they were to judge “The crutch can help with injuries,”
despite the fact that helping with injuries is more associated with crutches in general, as determined by various Latent Semantic Analysis measures (Landauer & Dumais, 1997). They conclude that “the syntax specifies a general scene, and the affordances of objects are used to specify the scene in detail sufficient” (pg 508).

Goldwater and Markman (2009) have likewise shown that instances of the middle construction involving novel denominal verbs are more likely to be judged as being nonsensical when followed by purpose clauses than passive constructions involving the same novel verbs.

Middle:
6.??The ripe tomatoes had sauced well to complement the pasta at the gala dinner.
Passive:
7. The ripe tomatoes were sauced well to complement the pasta at the gala dinner.

They attribute the difference to the fact that only the passive construction requires a (possibly unspecified) agent argument. As in Kaschak and Glenberg (2000), Goldwater and Markman (2009) used novel denominal verbs in order to determine what role the construction played in assigning meaning. The meaning could not be ascribed to a preexisting denominal verb because the verbs were normally only used as nouns. Kako (2006) makes a similar point by asking for semantic judgments about nonsense words in Jabberwocky-type sentences such as “The rom gorped the blickit to the dax.”

These studies collectively argue that argument structure constructions play a role in speaker’s ultimate interpretations of sentences. But a critic might argue that all of these tasks lent themselves to strategic responding, since they are all either off-line tasks (Bencini and Goldberg 2000; Kaschak and Glenberg 2000; Kako 2006), or tasks that require sensicality judgments (Goldwater and Markman 2009). Work demonstrating a
role of constructional meaning in the acquisition of verbs (“syntactic bootstrapping”) in younger children is compelling, but the aspects of meaning that have been demonstrated to date have focused primarily on the number of arguments involved (cf. also Goldwater and Markman 2009).

In fact, there have been virtually no experiments designed to determine whether contentful constructional meaning is accessed automatically and without reflection. The present study was motivated by this lacuna, as it investigates the possibility of automatically accessed constructional meaning in Jabberwocky-type sentences, using in a speeded lexical decision task.

Materials

Four abstract constructions were used as primes. These are shown in Table 3. The experimental target words chosen for each construction are provided in Table 4. Each verb was presented in its past tense form.

Table 3: The four abstract phrasal constructions used as primes

<table>
<thead>
<tr>
<th>Abstract Construction</th>
<th>Constructional frame used to create stimuli</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ditransitive:</td>
<td>S/he nonseV-ed him/her the nonseN.</td>
<td>He daxed her the norp</td>
</tr>
<tr>
<td>Resultative:</td>
<td>S/he nonseV-ed it nonseAdj.</td>
<td>She jorped it miggy</td>
</tr>
<tr>
<td>Caused-motion:</td>
<td>S/he nonseV-ed it on the nonseN.</td>
<td>He lorpied it on the molp</td>
</tr>
<tr>
<td>Removal:</td>
<td>S/he nonseV-ed it from him/her.</td>
<td>She vakoed it from her.</td>
</tr>
</tbody>
</table>

We consider whether Jabberwocky type sentences such as those in Table 3 prime words related to their hypothesized meanings. Positive evidence of priming would be evidence that the constructions are associated with meaningful verbs. In particular, we consider whether argument structure constructions prime the following types of words:
high frequency associates and lower-frequency associates. High frequency associates were chosen to be the verbs that (most) frequently occur in a particular construction. For example, *give* is the most frequent verb that occurs in the ditransitive, accounting for close to half of all tokens of the construction (Goldberg, Casenhiser, & Sethuraman, 2004; Stefanowisch and Greis 2003). Low frequency associates are verbs that appear in the construction, but markedly less frequently than the high frequency associates. For example, *hand* occurs in the ditransitive (e.g., *She handed him something*), but less frequently than *give* does. Statistics were gathered from the 400 million word Corpus of Contemporary American English (COCA), and are provided in the Methods section (Table 6).

We also sought to investigate whether the constructions primed semantically related non-associates as a way to more directly determine whether semantic priming as well as associative priming would be evident. To this end, we also included semantically related non-associate target verbs. These were verbs that do not generally occur in the corresponding construction, but are semantically related to the meaning that has been hypothesized for the construction. For example, the meaning of *transfer* captures the hypothesized meaning associated with the ditransitive construction, and yet the verb itself rarely occurs in that frame (e.g., *She transferred him something*). (quantitative data is given in Table 6). The particular verbs chosen for each of four verbs are provided in Table 4.

Table 4: Experimental target words for each construction

<table>
<thead>
<tr>
<th>Constructions</th>
<th>High frequency associate</th>
<th>Low frequency associate</th>
<th>Semantically related-non associate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ditransitive</td>
<td><em>Gave</em></td>
<td><em>Handed</em></td>
<td><em>Transferred</em></td>
</tr>
</tbody>
</table>
If results indicate evidence of priming, it would provide evidence that the 
“nonsense sentence” primes were not, after all, completely non-sensical. If the 
ditransitive, for example, devoid of a contentful verb or any open class lexical items, 
primes gave, it would provide evidence that the abstract pattern is associated directly with 
this verb. It is possible that constructions with nonse-words prime only the highest 
frequency verbs that can occur in them (such as gave in the ditransitive), because by 
hypothesis, the constructions are closely associated with these verbs. Or it may be that 
only high or low frequency verbs that can appear in the construction are primed, but 
semantically related non-associates are not primed, because it may be that priming 
requires compatibility of the verb in the construction. The strongest finding would be that 
all three types of verbs are primed by their respective abstract constructions. The 
overarching goal of the study is to determine whether there exists evidence in favor of 
abstract semantics being automatically associated with syntactic frames that contain no 
open-class lexical items, without recourse to possible reflective strategies.

Methods

Participants

Forty Princeton undergraduate students, aged 18-23, participated in exchange for 
course credit. All participants were native English speakers.
Procedure

Participants performed lexical decisions following sentential primes. In particular, they were instructed that they would be presented with a phrase written in black, directly followed by a ‘word’ written in green. They were to read the sentence aloud, and then respond as quickly as possible, pressing ‘1’ if the green ‘word’ was a real word and ‘2’ if it was a non-word.

Construction primes:

Stimuli included four different abstract constructions that included nonsense open-class items (See Table 1). The four constructions were completely abstract since all of the open class items involved nonsense words. These nonsense words were drawn randomly from pre-determined lists of twenty-five items that did not overlap with the probe non-words. Prime sentences were created using all nonsense open class words. Nonse words were chosen randomly from a set of 75 forms that had the typical morphophonological form of verbs (25), nouns (25), or adjectives (25). Each nonse-word appeared randomly (with replacement) in the constructions. Example sentences for each construction type were given in Table 3.

Lexical targets

The target words of interest were high or low associates of one of the constructions, or words that were semantically related to one of the constructions, but which did not regularly occur in the construction. In order to classify verbs, we searched
the 400 million word on-line Corpus of Contemporary American English. The
frequencies of each of the target word in the relevant construction type are provided in
Table 6.

Table 6: Raw frequencies of target words in their congruent construction. Based on 400
million word COCA corpus.

<table>
<thead>
<tr>
<th>Construction (search string)</th>
<th>High frequency associate</th>
<th>Low frequency associate</th>
<th>Semantically related, non-associate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ditransitive (V pronoun the N)</td>
<td>Gave 2365</td>
<td>Handed 362</td>
<td>Transferred 0</td>
</tr>
<tr>
<td>Resultative (V it Adj)</td>
<td>Made 19,833</td>
<td>Turned 184</td>
<td>Transformed 1</td>
</tr>
<tr>
<td>Caused motion (V it on the N)</td>
<td>Put 591</td>
<td>Placed 224</td>
<td>Decorated 0</td>
</tr>
<tr>
<td>Removal (V proN from pronoun)</td>
<td>Took 394</td>
<td>Removed 17</td>
<td>Ousted 0</td>
</tr>
</tbody>
</table>

The general procedure was the same throughout the experiment (see Diagram 1). Participants were first presented with a fixation cross (3 seconds), then an abstract phrasal construction which they read aloud (1000 ms), then another brief fixation (300 ms). Lastly, they were presented with the target word to which they decided whether it was a word or non-word. Participants were instructed to read the prime sentence aloud (1000ms), then respond as quickly as possible to the target which directly followed (Mean RT = 609), indicating via button press whether it was a real word or non-word. Half of the target words were words, half non-words.

Participants received feedback on each trial on whether their response was correct or not, or whether they took too long (> 1000 ms.) to respond. Feedback screens were presented for 500ms each, after which a new trial would begin.
Within each different block type, half of the targets were real words and half were non-words. As explained below, different types of non-words and real words were presented during different blocks.

The dependent measure was reaction time, and the independent variable was prime type. In order to control carefully for length, frequency, and other factors, we compared reaction times to the same set of words, systematically varying whether the prime construction was either congruent or incongruent with the target word, across participants. For example, when gave was preceded by the ditransitive construction (e.g., *He jorped him the brap*), it is “congruent;” when gave is preceded by the removal construction it is incongruent.

**Practice**

After the task was explained to participants, they proceeded to a practice phase in which they were given 12 training trials, again half of which were real words and half of which were non-words (see stimuli). These training stimuli were only used during the practice phase. New items were used during the experimental trials. The purpose of the practice phase was to get participants properly adjusted to the speed of the experiment. Although many participants found it difficult at first, by the end of the practice trials, all participants felt confident continuing.
Experimental Structure

Experimental trials were divided into 3 blocks based on the 3 priming categories: High Frequency (HF) Associative, and Low Frequency (LF) Associative and Semantic Non-associative (S). Four experimental words were seen for each experimental block. Participants were randomly divided into two groups such that one group saw two experimental words in a congruent context and the other two in an incongruent context; the other group saw the first two experimental words in an incongruent context, and the other two in a congruent context. In this way, each participant witnessed two words in each block in a priming context and two words without a relevant prime (see table 7).

All participants in both groups saw each experimental word exactly once. 20 participants (Group 1) saw and responded to gave and took after congruent constructions—i.e., after the ditransitive and the removal constructions, respectively, and responded to made and put after incongruent constructions—i.e., after the caused-motion and the resultative constructions, respectively. A second group of 20 participants (Group 2) saw the reverse, as shown in Table 7. Responses to each particular target word after congruent and incongruent primes were then compared between subjects.

Table 7: Target words and the prime construction given to each of two groups of participants

<table>
<thead>
<tr>
<th>Prime Words</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gave, Handed, Transferred</td>
<td>Congruent (ditransitive)</td>
<td>Incongruent (removal)</td>
</tr>
<tr>
<td>Made, Turned, Transformed</td>
<td>Incongruent (caused-motion)</td>
<td>Congruent (resultative)</td>
</tr>
<tr>
<td>Put, Placed, Decorated</td>
<td>Incongruent (resultative)</td>
<td>Congruent (caused motion)</td>
</tr>
<tr>
<td>Took, Removed, Ousted</td>
<td>Congruent (removal)</td>
<td>Incongruent (ditransitive)</td>
</tr>
</tbody>
</table>
Again, the *same* target words were used following incongruent constructions to determine baseline RTs for each word (between subjects).

Each block consisted of two phases: An ‘acclamation’ phase (12 trials), explained below, and an ‘experimental’ phase (8 trials). The overall structure of the experiment was as follows:

1. Practice (12)  
   -Break-  
2. High Frequency – acclamation (12 trials: 6 words and 6 non-words)  
3. High Frequency - experimental (8 trials: 4 experimental words and 4 non-words)  
   -Break-  
4. Low Frequency – acclamation (12)  
5. Low Frequency – experimental (8)  
   -Break-  
6. Semantics – acclamation (12)  
7. Semantics – experimental (8)

The reason for including the acclamation phase was to condition participants to attend carefully to target forms in order to avoid floor effects in response times. If words had been sufficiently distinct from non-words, the task would have been quite easy and might well have led to insufficient variability in response times. We therefore included target words and non-words that were minimally different from each other and from the experimental items in that block. For example, in the high frequency associates block, the experimental words were *gave, put, make,* and *took.* The words in the acclamation phase included verbs that are phonetically similar to those in the experimental phase (*e.g.* *have, met, stood, saw*), as well as non-words that are also phonetically similar (*stook, puv, goot, gade*). In the acclimation phase, participants saw 6 non-experimental real verbs and 6
non-words. While in the experimental phase, participants saw the 4 experimental words, as well as 4 non-words.

There was no transition from the acclimation phase to the experimental phase of each block. From the participant’s perspective, the practice phase was simply followed by 3 seamless blocks.

After each block, participants were shown a break screen, telling them that they had finished block 1 or 2 of three. They were asked to press a space bar to continue whenever they felt ready. Participants typically only paused long enough to read the break screen before continuing on to the next block.

Results

Only response times of the 12 experimental words that were accurately responded to as words within the 1000 ms. time window were analyzed. This provided a total of 425 data points, with a range of 13-20 data ($M=18$) for each cell (mean RT = 608 ms.).

By subtracting the reaction time for a given word after a congruent sentence from the reaction time for the same word after an incongruent sentence, we determine the extent of priming.

Table 9: Average difference in RT organized by construction and verb

<table>
<thead>
<tr>
<th>Construction</th>
<th>High frequency</th>
<th>Low frequency</th>
<th>Semantically related, non-associate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>associate</td>
<td>associate</td>
<td></td>
</tr>
<tr>
<td>Ditransitive</td>
<td><em>Gave</em> 137</td>
<td><em>Handed</em> 135</td>
<td><em>Transferred</em> 106</td>
</tr>
<tr>
<td>Resultative</td>
<td><em>Made</em> 86</td>
<td><em>Turned</em> -35</td>
<td><em>Transformed</em> -7</td>
</tr>
<tr>
<td>Caused-motion</td>
<td><em>Put</em> 104</td>
<td><em>Placed</em> 82</td>
<td><em>Decorated</em> 6</td>
</tr>
<tr>
<td>Removal</td>
<td><em>Took</em> 120</td>
<td><em>Removed</em> 128</td>
<td><em>Ousted</em> 132</td>
</tr>
<tr>
<td></td>
<td><strong>111</strong></td>
<td><strong>77</strong></td>
<td><strong>59</strong></td>
</tr>
</tbody>
</table>
We find an overall main effect of primed over unprimed by-subject, (F1(1,430) = 50.9; p < .001). Considering each of the three conditions in turn, we find significant priming for strong and weak associates, F1(1, 136) = 43.5, p < .001; F1(1, 153)= 21.7; p<.001, and for semantically related non-associates, F1(1, 140) = 6.9, p=.009.

Effects are expected to be weaker when considering performance by-item because we had relatively few items. Yet we still find an overall priming effect, F2(2,23) = 11.05, p<.01. Considering each category, we find significant priming for both strong associates (F2(2, 7) = 125.8, p<.001), and weak associates (F2(2, 7) = 7.2, p=.036). We
do not find a significant priming effect by-items for the semantically related non-associates (F2(2, 7) = 1.6, p=.25).

If we consider each of the four constructions in turn by-subject, we find significant priming of the ditransitive (F1(1, 106) = 44.6, p<.001), the caused-motion (F1(1, 114) = 7.76, p=.006) and the removal constructions (F1(1, 98) = 18.02, p<.001). The only construction that does not show significant across the board priming is the resultative (F1(1, 106) = .79, p=.364). When considering the constructions by-item, the caused motion and the resultative do not reach significance (F2(2,2) = 4.5, p = .16 and F2(2,2) = .163, p = .725, respectively), but the ditransitive and the removal constructions do (F2(2,2) = 167.1, p = .006 and F2(2,2) = 361.2, p = .003, respectively).

Discussion

We compared the reaction times for target words following the construction that is expected to prime them (congruent) with reaction times for the same target words following one of the other three constructions (incongruent). Overall, the same words were recognized significantly faster after instances of semantically related constructions than after instances of unrelated constructions, when analyzed both by-items and by-subjects. The fact that the by-items analysis was significant overall is particularly striking since we used relatively few items (three for each of four constructions). More specifically, both strong and weak associates of constructions were primed by the Jabberwocky sentences, by-items and by-subjects.

The evidence for priming of semantically-related non-associates was mixed: priming was significant by-subjects only. We should also note that purely semantic
priming is well-known to be weaker than associative priming (Lucas, 2000), and so the fact that the effect was more fragile for non-associates is not unexpected.

When considering individual constructions, the weakest results were found for one particular construction: the resultative construction which did not exhibit priming either by-subject or by-item. In order to understand why this might have been the case, recall that priming was determined by comparing reaction times after the congruent construction to reaction times after an incongruent construction. The “incongruent” construction in this case was the caused motion construction (She made/turned/transformed it into the room). However, the target verbs can appear in the caused-motion construction with a metaphorical change of state interpretation as in 8:

8. She made/turned/transformed the clay into a vase.

Moreover, we used sentences such as He lorp ed it on the molp, using the preposition on which can readily be interpreted as a locational adjunct, and can in that capacity be used with transitive uses of the relevant verbs:

9. She made the model on the table.
10. She turned the car on the street.
11. She transformed the clay on the table.

Thus the null effect in the case of the resultative may have been due to the fact that the “incongruent” construction was not altogether incongruent.

It might be suggested that evidence of priming is not the same as demonstrating that the construction “has” meaning. This critique raises the thorny issue of the nature of meaning. At the least, we have demonstrated that constructions prime meaningful words...
that occur in them, both with high frequency and with markedly lower frequency. It has been argued that associative priming is a type of semantic priming (McRae & Boisvert, 1998). In fact, Thompson-Schill et al. (1998) found that associates only show priming if they are in fact semantically related. It is left for future work to determine conclusively whether semantically related non-associates are primed by constructions since the present evidence was mixed on this point: priming was significant by-subjects but not by-items.

In any case, it is sufficient to note that each construction primed associated meaningful words. If, for example, the ditransitive makes one activate give, then this provides a cue to interpretation. In fact it has been argued that words “have” meaning in much this way: they serve as cues that combine to direct a comprehender to an interpretation (Elman, 2009). The automatic nature of the task indicates that constructions provide cues to interpretation in real-time.

The present results do not speak to the question of whether argument structure constructions are necessarily phrasal or whether they may be conceived of as lexical templates (Hovav and Levin 1998; Mueller 2006). But the present work provides evidence that they are not exclusively tethered to particular verbs: meaningful argument structure constructions are evoked even by Jabberwocky sentences.

Conclusion

There is a growing trend toward distinguishing a verb’s inherent or “core” lexical semantics from the semantics associated with the grammatical structures in which the verb can occur (Goldberg, 1992, 1995; Jackendoff, 1997; Rappaport Hovav & Levin, 1998). At the same time, there is also much work that presupposes that all meaning comes
from the lexicon. The present findings indicate that phrasal abstract constructions are associated with semantics even when they contain no open class lexical items, and that the meaning is accessed automatically. Constructions prime not only main verbs with which they regularly occur, but they also prime main verbs that are low-frequency associates, and may even prime semantically related non-associates in some cases. This evidence of semantic priming indicates a tight link between syntax and semantics in the domain of argument structure. That is, argument structure constructions are associated with meanings. In this way, Alice was right when she noticed that the sentences of Jabberwocky “filled her head with ideas.”
References


