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The Effect of Thematic Roles During Grammatical Encoding in Sentence Production

Sanghee Kim · Jeong-Ah Shin*
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Kim, Sanghee and Shin, Jeong-Ah. 2016. The Effect of Thematic Roles During Grammatical Encoding in Sentence Production. Korean Journal of English Language and Linguistics 16-1, 77-97. Language production is realized in three stages: conceptualization, formulation, and articulation (Levelt, 1989). Within the formulation phase, grammatical encoding has gained considerable attention as it reveals much about the underlying mechanism of sentence production. While various components have been identified as crucial factors that comprise the formulation stage, the influence of thematic roles during grammatical encoding is still controversial. This study examined the effect of thematic roles in the process of grammatical encoding. Eighteen native speakers of English participated in a sentence recall experiment with an RSVP paradigm. The experiment used hit verbs and spray-load verbs and involved three conditions, in which the order and type of syntactic structures and thematic roles varied: NP-theme-PP-LOCATION, NP-LOCATION-PP-theme and PP-LOCATION-PP-theme. The results of a conditional logistic regression model showed that in grammatical encoding, (i) thematic roles as well as syntactic structures are crucial factors, and (ii) thematic role information outweighs syntactic structure information.

Key Words: sentence production, grammatical encoding, syntactic structure, thematic role

*Sanghee Kim is the first author, and Jeong-Ah Shin is the corresponding author.
1. Introduction

Psycholinguistic researchers have proposed several distinct models to account for speech production (e.g., Dell, Schwartz, Martin, Saffran, & Gagnon, 1997; Garrett, 1980; Levelt, 1989), but they have all agreed on the number of stages involved in speech production (Levelt, 1999; Dell, Chang, & Griffin, 1999). The following three stages comprise language production: conceptualization, formulation, and articulation (Levelt, 1989). In the first stage, a conceptualization phase, speakers connect their intended message to a certain representation. The second stage is commonly referred to as formulation, where verbal components are accessed in the mind. The formulation phase consists of a number of stages through a lexical access which involves grammatical encoding, and phonological encoding. The formulation phase is then followed by the articulation stage whereby a speaker’s initial concept is physically represented as the speaker articulates (or intends to articulate) the entities that are formulated over the previous stages.

The focus of our research is on the components involved during grammatical encoding, which is a bridging stage between the retrieved results from the lexical access and syntactic realizations. When a conceptual representation is grammatically encoded, information depicting the intended message comes into play during this process, and a speaker is highly attentive to a number of pieces of information. Frequently discussed are different types of information about constituent structures (Bock, 1986), semantic features such as animacy (Bock, Loebell, & Morey, 1992), event types (Konopka, van de Velde, & Meyer, 2012), emphasis (Vernice, Pickering, & Hartsuiker, 2012), and thematic roles (Chang, Bock, & Goldberg, 2003). As a tool for examining dedication of the elements to grammatical encoding and competition among the components, a structural priming
The paradigm has been extensively used as it depicts much about grammatical encoding during speech production (Pickering & Ferreira, 2008). Bock’s (1986) seminal study demonstrated a tendency to repeat or reuse syntactic structures that people recently processed rather than an alternative structure, which is now referred to as structural priming.

Employing the structural priming paradigm (e.g., Kim & Choe, 2013; Shin, 2010), researchers started to ask what kind of information influences the processes of grammatical encoding, and two discrete approaches have been suggested. One position has argued that syntactic structure information is a critically dominant feature in sentence production, and the supporters have termed such powerful information as “autonomous syntax” (Pickering & Ferreira, 2008, p.4). Several studies demonstrated that syntactic structure information engenders a structural priming effect even by itself (Bock, 1986; Bock, 1989; Bock et al., 1992; Loebell & Bock, 2003). This argument was supported by a finding that prosodic characteristics, considered to be distinctive from syntactic features, had no impact on priming effects (Bock & Loebell, 1990), and by the results of experiments where closed-class morphemes did not influence priming (Pickering & Branigan, 1998). The findings from these structural priming experiments indicated that information for different domains beyond syntactic structure is largely insignificant during grammatical encoding.

In contrast to proponents of autonomous syntax stand researchers who argue that information for syntactic structure cannot be the predominant factor for structural priming and thus for grammatical encoding (Chang et al., 2003; Chang, Dell, & Bock, 2006; Griffin & Weinstein-Tull, 2003; Hare & Goldberg, 1999). By distinguishing ‘syntactic priming’ from ‘structural priming,’ these researchers claimed that parsers’ processing of thematic roles should be taken into consideration. A leading
account in support for this stance claims that information for the number and/or order of thematic roles is also an influential factor in grammatical encoding (Bock & Griffin, 2000; Chang et al., 2003; Chang et al., 2006; Griffin & Weinstein-Tull, 2003; Hare & Goldberg, 1999). Accordingly, it has been argued that information about thematic roles is as important as for syntactic structure during grammatical encoding in sentence production.

In light of this ongoing dispute over the significance of different types of information engaged during grammatical encoding, the current study has focused on examining the effect and its magnitude of the thematic role information. Of interest is evaluating how crucial either/both information on syntactic structure or/and thematic role would be during grammatical encoding, which still remains controversial.

2. Literature Review

As mentioned, some researchers argue that speakers are insensitive to information of thematic roles during grammatical encoding, while others suggest that the formulation process is clearly dependent on thematic role information. Two experiments in Bock and Loebell (1990) are well-known studies that advocate the first viewpoint. It was claimed that the formulation process is executed independent of the existence of thematic roles, yet is strongly controlled by the syntactic structural information. In Experiment 1, the prime sentences had the same constituent structure of NP V NP PP, but varied by having a different role assigned to the PP. For instance, the wealthy widow drove her Mercedes to the church and the wealthy widow gave her Mercedes to the church were presented as prime sentences. The results showed that both types equally primed a sentence with a prepositional dative phrase although the PP in each sentence did
not share the same thematic role. This demonstrated participants’ insensitivity to thematic roles in priming effects, which accordingly supported the idea that thematic roles are not essential in grammatical encoding. Experiment 2 also strengthened this argument by presenting intransitives with prepositional phrases that primed passive sentences with agentive prepositional objects. To illustrate, *the airplane is landing by the control tower* primed a sentence such as *a nurse is being hit by a truck*. Based on the condition that the constituent structure—prepositional phrase headed by the preposition *by*—was shared across the two sentences while the thematic role was not, the authors again demonstrated an independence of syntactic structure information from other types of information in sentence production.

On the other hand, Chang et al. (2003) used *spray-load* verbs, which allowed locative and thematic alternation constructions as in (1a) and (1b). The purpose of the experiments was to test the ongoing discussion of the significance of thematic roles during language production.

(1a) The maid rubbed **polish** onto the table.
   \[ \text{NP}_{\text{THEME}} - \text{PP}_{\text{LOCATION}} \]

(1b) The maid rubbed the **table** with **polish**.
   \[ \text{NP}_{\text{LOCATION}} - \text{PP}_{\text{THEME}} \]

As shown in (1a) and (1b), the constituent structure was fixed in the NP-PP order while the thematic role order varied as THEME-LOCATION (1a) or as LOCATION-THEME (1b). The results from a priming task demonstrated not only a general syntactic priming effect but also participants’ propensity for a construction that shared the same order and information of the thematic role. The study therefore proposed that thematic role information and syntactic structure are indeed significant factors
for structural priming, and accordingly, for grammatical encoding. Their conclusion stood in contrast to those studies favoring for an autonomous syntax in language production.

While the experiments in Chang et al. (2003) seems to validate a parallel activation of thematic role and syntactic structure information in sentence production, their suggestion cannot be fully appreciated unless the experimental design is more strictly controlled. We can infer from the sentences in (1), for example, that the design may have rendered participants be more sensitive to thematic roles because only one type of syntactic structure was available (i.e., syntactic structure in the response type was only restricted to NP-PP order). Although one recent study (Pappert & Pechmann, 2014) attempted to overcome this limitation, the study failed to do so as the design did not clearly distinguish thematic roles from word orders and functions.

Therefore, as a way to clearly test the influence of thematic role information on language production, the current study designed an experiment that allowed participants to have flexible options in both syntactic structures and thematic roles during their production. The design implemented in this experiment differed from the one used in Chang et al. (2003) in that a third type of constituent structure (PP-PP) was newly added. This new design enabled us to clearly examine the influence of thematic roles and syntactic structures in language production. We included hit verbs along with spray-load verbs to generate the new condition. The experiment design is described in the Method section more in detail.

Revising the experimental design used in Chang et al. (2003), the current study examined how influential thematic roles and syntactic structures are during grammatical encoding in sentence production. Two research questions are addressed as follows:
1) Is syntactic structure information a dominant factor during grammatical encoding in contrast with the influence of thematic role information? Or is thematic role information as essential as syntactic structure information?

2) Which of the two, syntactic structure information or thematic role information, has greater significance during grammatical encoding?

3. Method

3.1 Participants

Eighteen native speakers of English currently living in Korea participated in the experiment. They were either undergraduate or graduate students studying in Korea, or U.S. soldiers at the Yongsan U.S. Army Garrison (mean age: 28.71, range: 19-50; 10 males and 8 females). All participants received formal education until secondary school in the U.S. before they moved to Korea. A majority of the participants spoke two or more languages, but English was their first/dominant language. Participants had no identified language disorder. Participants were paid 5,000 won for compensation.

3.2 Design and Materials

In order to test the roles of syntactic or/and thematic information in language production, three conditions were used and counterbalanced in the experiment (Table 1). Condition 1 and condition 2 shared the same syntactic structure, but they differed in thematic role order. Meanwhile, condition 2 and condition 3 overlapped in thematic role order but had a different syntactic structure.
Table 1. Experiment design and examples by condition

<table>
<thead>
<tr>
<th>Condition</th>
<th>Syntactic structure and thematic role</th>
<th>Example Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NP(T)-PP(L)</td>
<td>The merchant hit a briefcase hard against the car.</td>
</tr>
<tr>
<td>2</td>
<td>NP(L)-PP(T)</td>
<td>The merchant hit the car hard with a briefcase.</td>
</tr>
<tr>
<td>3</td>
<td>PP(L)-PP(T)</td>
<td>The merchant hit at the car hard with a briefcase.</td>
</tr>
</tbody>
</table>

Note. NP = nominal phrase; PP = prepositional phrase; T = THEME; L = LOCATION

The verbs used in the experiment were modeled on Levin’s (1993) framework that allows for locative alternation, including hit verbs and spray-load verbs (12 hit verbs and 6 spray-load verbs). The target sentences had an NP functioning as the subject, followed by a verb—either a spray-load verb or a hit verb—that required two internal arguments. These arguments were assigned a theme role and a location role respectively, whose sequence changed depending on the condition.

Condition 2 and condition 3 had the same thematic role order assigned to the two internal arguments: LOCATION-THEME order. Sentences in condition 1, in contrast, had a THEME-LOCATION order. Note that we refer to the two types of thematic roles as THEME and LOCATION for the sake of reference, following Dowty’s (1991) criteria for thematic roles in general.

Syntactic structures of two internal arguments were also varied by condition. While these arguments were in an NP-PP order in condition 1 and condition 2, condition 3 had a PP-PP order. In condition 1, the second internal argument with a LOCATION role was headed by the preposition against, on, over, or onto, according to the context. The second internal argument with a THEME role in condition 2 and condition 3 was always headed by with, while at headed the prepositional phrase for the first
internal argument in condition 3. Additionally, an adverb was inserted between the two internal arguments in all target sentences so as not to create any prepositional phrase attachment ambiguity.

Altogether, 54 sentences were created with 18 verbs under three different conditions (see the Appendix for target sentences). Thirty-six sentences served as fillers, and none of the fillers shared the same verbs or similar constructions with the target sentences. Three sets of materials were constructed following a Latin Square Design. A single set consisted of 18 target sentences and 36 filler sentences, for a total of 54 sentences. The number of words for both target and filler sentences was held constant at nine to ten words.

To norm the sentences before the main experiment, an acceptability judgment task was conducted on the sentences to be used as experimental materials. The task verified that conditions did not influence participants’ sentence processability. Sixteen native speakers of English, who were not enrolled in the main experiment, participated in the four-scale judgment task. A Kruskal-Wallis rank sum test, implemented with the `kruskal.test` function of the R `stats` package, showed no significant difference across the score of items by condition ($M_{\text{condition}1} = 3.24$; $M_{\text{condition}2} = 3.11$; $M_{\text{condition}3} = 3.03$), $\chi^2(2) = 5.4764$, $p > .05$. The result indicated that all the sentences were acceptable and were plausible enough to be used for the main task.

### 3.3 Procedure

A rapid serial visual presentation (RSVP) sentence repetition paradigm (Potter & Lombardi, 1998) was used to observe the posited crucial components that comprised grammatical encoding in language production. We chose a sentence recall task, as it allows control for syntactic structures (Meijer & Fox Tree, 2003).

Participants were tested separately in a quiet room, seated in
front of a laptop. Trials were automatically presented by software called *the paradigm experiment* (www.paradigmexperiment.com) in Calibri bold 32-point font. All of the tasks were run on two PC laptops of the same model.

As shown in Figure 1, a preparation screen appeared for 500 ms. Participants were then required to silently read a series of words rapidly presented in a computer screen. Each word was presented for 200 ms. The presentation was followed by a yes-no distractor task to prevent the experiment from simply testing participants’ working memory. The participants were instructed to answer either *yes* ( “F” key) or *no* ( “J” key) to a word probe question by pressing a button.

![Figure 1. A visual summary of an RSVP sentence recall task](image)

After the distractor task, participants were instructed to recall the target sentence and say it out loud. Their responses were automatically recorded through a built-in microphone in the laptop. Two practice trials were conducted before the main task.
3.4 Scoring and Coding

Participants' responses were transcribed and categorized according to two criteria. First, the responses were scored on a binary scale according to whether they were successfully recalled. The responses were scored *recalled* and coded 1 if they contained two constituents (either NP-PP or PP-PP) and two thematic roles (LOCATION and THEME role), but were coded 0 if participants failed to successfully recall them. Since our focus was on the influence of thematic roles versus syntactic structures during sentence production, we adopted a "standard coding" (Chang et al., 2003, p. 38) for scoring. This type of coding accepts alternation of content words and minor changes such as articles and adverbs as long as the meaning of the response was comparable to the given sentence. Responses that failed to include a noun in a prepositional phrase were also coded as *recalled*.

Secondly, successfully recalled responses were then coded into two key categories: *syntactic structure* and *thematic role*. If a response contained the same syntactic structure order as the stimulus, the response was coded 1 for *syntactic structure* category, but as 0 if it had a different order. This criterion was applied the same to the *thematic role* category as well. For instance, a response of NP\textsubscript{THEME}-PP\textsubscript{LOCATION} after an NP\textsubscript{LOCATION}-PP\textsubscript{THEME} stimulus was coded 1 for *syntactic structure* because the NP-PP overlapped, but 0 for thematic role as the *thematic role* order changed.

3.5 Data Analysis

The data were analyzed using a conditional logit model as it is well suited to analyzing binary categorical dependent variables (e.g., Dixon, 2008; Hoffman & Duncan, 1988). The model differs from the logistic linear mixed-effects model typically used in psycholinguistic research (Baayen, Davidson, & Bates, 2008;
Cunnings, 2012; Jaeger, 2008), in that the conditional logit model enables examination for influences of features embedded in response variables. Hence, considering the characteristic of the experiment, where the responses were categorized by their properties, we analyzed the data with a conditional logit model using the \textit{mclogit} function of the R \textit{mclogit} package.

4. Results

While data were initially collected from 18 participants, we excluded data from two participants who were 49 and 50 years old in order to prevent a possible working memory effect. Additionally, data from one subject were not included in the analysis due to performance failure. This left us with 270 responses in total (15 subjects x 18 responses). We then applied the recall criteria to the responses. Out of 270 responses, 237 tokens were successfully recalled. Table 2 presents the frequency of the responses by the stimulus conditions.

<table>
<thead>
<tr>
<th>Stimulus</th>
<th>Response</th>
<th>Proportions of the response type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NP(T)-</td>
<td>NP(L)-</td>
</tr>
<tr>
<td>Condition 1</td>
<td>PP(L)</td>
<td>PP(T)</td>
</tr>
<tr>
<td></td>
<td>73 (.924)</td>
<td>4 (.050)</td>
</tr>
<tr>
<td></td>
<td>2 (.025)</td>
<td></td>
</tr>
<tr>
<td>Condition 2</td>
<td>NP(L)-</td>
<td>NP(L)-</td>
</tr>
<tr>
<td></td>
<td>PP(T)</td>
<td>PP(T)</td>
</tr>
<tr>
<td></td>
<td>5 (.062)</td>
<td>67 (.827)</td>
</tr>
<tr>
<td></td>
<td>9 (.111)</td>
<td></td>
</tr>
<tr>
<td>Condition 3</td>
<td>PP(L)-</td>
<td>PP(L)-</td>
</tr>
<tr>
<td></td>
<td>PP(T)</td>
<td>PP(T)</td>
</tr>
<tr>
<td></td>
<td>2 (.026)</td>
<td>16 (.208)</td>
</tr>
<tr>
<td></td>
<td>59 (.766)</td>
<td></td>
</tr>
</tbody>
</table>

Note. NP = nominal phrase; PP = prepositional phrase; T = THEME; L = LOCATION

Table 2 showed that participants were highly attentive to the stimuli during the experiment and succeeded in understanding the meaning of the given sentences. A high proportion of the
responses with the same information for both syntactic structure and thematic role as for the stimuli may imply that both types of information contributed to the formulation process in language production.

In addition, the participants also produced variations (i.e. different construction in either syntactic structures or thematic roles compared to the stimuli). This is particularly observed well in the case where condition 2 \((\text{NP}_{\text{LOCATION}}-\text{PP}_{\text{THEME}})\) was given as the stimuli. When participants were presented with the sentence in condition 2 \((\text{NP}_{\text{LOCATION}}-\text{PP}_{\text{THEME}})\), they had three possible options: (i) variation in thematic role (i.e. \(\text{NP}_{\text{THEME}}-\text{PP}_{\text{LOCATION}}\)), (ii) no variation in both thematic role and syntactic structure (i.e. \(\text{NP}_{\text{LOCATION}}-\text{PP}_{\text{THEME}}\)), or (iii) variation in syntactic structure (i.e. \(\text{PP}_{\text{LOCATION}}-\text{PP}_{\text{THEME}}\)). If grammatical encoding was purely syntactic, responses would mostly be from the first or the second type, with no syntactic variation. However, if factors other than syntactic structure were involved, thematic role in this case, then response types of either the second or the third category would occur. Interestingly, in the experiment, responses of the third type \((\text{PP}_{\text{LOCATION}}-\text{PP}_{\text{THEME}})\) were also observed, which implies that grammatical encoding does not depend only on syntactic structure information.

In order to test the effect of syntactic structure and thematic role information in grammatical encoding, we carried out a conditional logistic regression analysis. The results indicated a significant effect of syntactic structure information \((z = 7.564, SE = .204, p < .001)\) and a significant influence of thematic role information \((z = 8.773, SE = .289, p < .001)\) on participants’ production. That is, thematic role information as well as syntactic structure information is involved during the formation stage in language production.

In addition, to examine whether syntactic structure or thematic role information is more influential in grammatical encoding,
each effect size was calculated with the coefficient of the same conditional logistic model. The results demonstrated a larger effect size for thematic role information \((\beta = 12.571)\) than for syntactic structure information \((\beta = 4.688)\). That is, thematic role information is a more influential component than syntactic structure information in language production.

5. Discussion

This study addressed two research questions: (i) whether thematic role information contributes as much as syntactic structure information during grammatical encoding, and (ii) which of the two is more influential in grammatical encoding. The results showed a significant effect of thematic role information as well as syntactic structure information in grammatical encoding. This result offers evidence against those arguments positing an autonomous syntax (Bock, 1986; Bock, 1989; Bock & Loebell, 1990; Bock et al. 1992; Loebell & Bock, 2003; Pickering & Branigan, 1998). Unlike their arguments that thematic role information is insignificant or more or less ignored, our results showed that both types of information should be considered in explaining grammatical encoding during language production.

For the second research question comparing the effects of two types of information in grammatical encoding, the effect sizes evidently showed that language production is more strongly influenced by thematic role information \((\beta = 12.571)\) than by syntactic information \((\beta = 4.688)\). Based upon this result, we can suggest that during grammatical encoding, speakers are more sensitive to thematic role information than to syntactic structure. This result is in line with Chang et al.’s (2003) results in that both studies demonstrated participants’ attentiveness to thematic
roles. However, compared to Chang et al.’s (2003) study, which fell short of measuring the comparative impact of either type of information, the current study showed the relevant effect sizes of thematic role information and syntactic information. Thus, in addition to validating thematic roles as well as syntactic structures as influential components, we suggest that the significance of thematic role information outweighs that of syntactic structure information during grammatical encoding.

Based upon our results, a language production mechanism can be understood as follows. Following the aforementioned model of language production (Levelt, 1989), our production model also posits a three-stage model to account for language production. A speaker first builds a nonlinguistic representation of an event or a set of meanings during conceptualization. The idea is then realized in a linguistic representation during the formulation stage. Several components can be involved during grammatical encoding, such as information for animacy, thematic role, syntactic structure, and so forth. We particularly observed the influence of thematic roles and syntactic structures and proposed that thematic role information has a stronger impact on grammatical encoding processes than syntactic structure information during grammatical encoding. The formulation stage is then followed by the last phase, where grammatically encoded sentence is finally articulated. What is noteworthy in the current model we suggest is that it demonstrates thematic roles are essentially involved in language production, and shows the magnitude of its effect during grammatical encoding.

6. Conclusion

This study examined the effect of thematic roles during grammatical encoding in sentence production. The first research
question asked whether syntactic structure information is an influential factor during grammatical encoding, apart from the influence of thematic roles. The results showed that it is not the case that thematic role information is ignored; instead, both thematic roles and syntactic structures are both crucial components in grammatical encoding. More importantly, with regard to the second research question, this study investigated which of the two, syntactic and thematic role information, showed greater influence. The results showed that thematic role information outweights syntactic structure information during grammatical encoding. A further study can include other types of information involved in the formulation stage and compare their significance weight during grammatical encoding by inviting more participants and using a structural priming paradigm. Such study will help us elaborate more on the types of information and their competitive relationship within the formulation stage, and better articulate the underlying mechanism in language production.

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Appendix

These are the target sentences presented in the Experiment. "C" denotes "condition" (e.g. "C1" indicates "condition 1").

1. Hit
   C1. The merchant hit a briefcase hard against the car.
   C2. The merchant hit the car hard with a briefcase.
   C3. The merchant hit at the car hard with a briefcase.

2. Tap
   C1. The teacher tapped a pencil skillfully on the notepad.
   C2. The teacher tapped the notepad skillfully with a pencil.
   C3. The teacher tapped at the notepad skillfully with a pencil.

3. Beat
   C1. The cook beat a whisk hastily against the bowl.
   C2. The cook beat the bowl hastily with a whisk.
   C3. The cook beat at the bowl hastily with a whisk.

4. Strike
   C1. The professor struck a suitcase hurriedly against the blackboard.
   C2. The professor struck the blackboard hurriedly with a suitcase.
   C3. The professor struck at the blackboard hurriedly with a suitcase.

5. Pound
   C1. The postman pounded a parcel wildly against the mailbox.
   C2. The postman pounded the mailbox wildly with a parcel.
   C3. The postman pounded at the mailbox wildly with a parcel.

6. Drum
   C1. The assistant drummed her fingers heatedly on the typewriter.
   C2. The assistant drummed the typewriter heatedly with her
fingers.
C3. The assistant drummed at the typewriter heatedly with her fingers.

7. Whack
C1. The clerk whacked a bag fiercely against the bed.
C2. The clerk whacked the bed fiercely with a bag.
C3. The clerk whacked at the bed fiercely with a bag.

8. Rap
C1. The guard rapped a broom frantically against the fence.
C2. The guard rapped the fence frantically with a broom.
C3. The guard rapped at the fence frantically with a broom.

9. Lash
C1. The detective lashed a whip angrily against the window.
C2. The detective lashed the window angrily with a whip.
C3. The detective lashed at the window angrily with a whip.

10. Thump
C1. The mechanic thumped a sack furiously against the post.
C2. The mechanic thumped the post furiously with a sack.
C3. The mechanic thumped at the post furiously with a sack.

11. Slap
C1. The banker slapped a folder carelessly on the desk.
C2. The banker slapped the desk carelessly with a folder.
C3. The banker slapped at the desk carelessly with a folder.

12. Bash
C1. The painter bashed his palette hysterically against the closet.
C2. The painter bashed the closet hysterically with his palette.
C3. The painter bashed at the closet hysterically with his palette.

13. Dab
C1. The pharmacist dabbed the ointment carefully on the rash.
C2. The pharmacist dabbed the rash carefully with the ointment.
C3. The pharmacist dabbed at the rash carefully with the ointment.

14. Rub
C1. The nurse rubbed a towel gently on the wheelchair.
C2. The nurse rubbed the wheelchair gently with a towel.
C3. The nurse rubbed at the wheelchair gently with a towel.

15. Spray
C1. The architect sprayed the paint evenly over the wall.
C2. The architect sprayed the wall evenly with the paint.
C3. The architect sprayed at the wall evenly with the paint.

16. Squirt
C1. The clown squirted some oil madly on the door.
C2. The clown squirted the door madly with some oil.
C3. The clown squirted at the door madly with some oil.

17. Splash
C1. The mechanic splashed some water crazily onto the floor.
C2. The mechanic splashed the floor crazily with some water.
C3. The mechanic splashed at the floor crazily with some water.

18. Swab
C1. The sailor swabbed a mop arduously on the deck.
C2. The sailor swabbed the deck arduously with a mop.
C3. The sailor swabbed at the deck arduously with a mop.