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Repetition Brings Success: Revealing Knowledge of the Passive Voice

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1. Introduction

Children struggle with the passive voice, of that there is no question. We have known this for decades, since the earliest days of the modern field of language acquisition (e.g., Fraser, Bellugi & Brown, 1963; Slobin, 1966, amongst others). The precise source of that difficulty is something that has remained elusive. Over the years, numerous explanations have been proffered for this difficulty, including that children are unable to form argument chains (the A-Chain Deficit Hypothesis, Borer & Wexler, 1992), that children have difficulty transmitting theta roles to the oblique argument (Fox & Grodzinsky, 1998), and that children fail to treat passive phases as deficient (the Universal Phase Requirement, Wexler, 2004). In this study, we revisit the concerns about the acquisition of passives by focusing on two theories: the Universal Freezing Hypothesis (Snyder & Hyams, 2015, see also Orfitelli's (2012) Argument Intervention Hypothesis), and an incremental processing account by Huang, Zheng, Meng & Snedeker (2013). We also discuss a discrepancy in the field with regard to a failure to replicate an important finding, and present three experiments that tie these issues together, allowing us to adjudicate between the grammatical and processing theories of the passives, as well as addressing the discrepancy in the field.

2. Theoretical Background

There are numerous theoretical approaches to the delay in the acquisition of the passive voice. Here we focus on a prominent contemporary approach referred to as the Universal Freezing Hypothesis (UFH, Snyder & Hyams, 2015). The basic intuition of this approach is that a procedure (involving 'smuggling,' Collins, 2005, and the loosening of the Freezing Principle, Wexler & Culicover, 1980) is unavailable to children. Without this option, passive structures do not

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converge. This procedure becomes available sometime in the fifth year of life, at which point the passive becomes available as well. Let's see how this works with an example.

For a sentence like (1), the structure of which is shown in (2), the external argument *John* (or PRO in a short passive) occupies the specifier of *v*P while the internal argument *the book* (the theme) is a complement to the verb. Movement of the internal argument to the [Spec, IP] position violates Relativized Minimality (RM, Rizzi, 1990), since it involves movement over the external argument—a nominal that is featurally indistinct (in the relevant sense) from the internal argument.

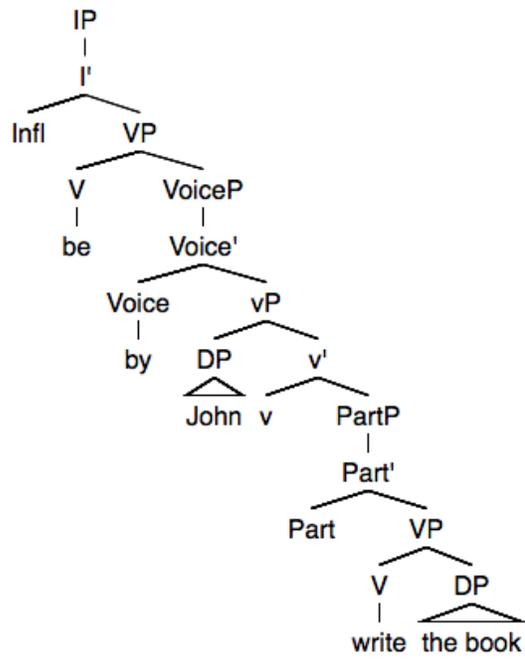
(1) The book was written by John.

To get around this, a larger phrase (in which the internal argument occurs) such as PartP moves to a position above the external argument. This procedure is referred to as 'smuggling' because it surreptitiously moves the internal argument past the external argument without violating RM. From this position, the external argument moves into the [Spec, IP] position without any violation of RM, as shown in (3).

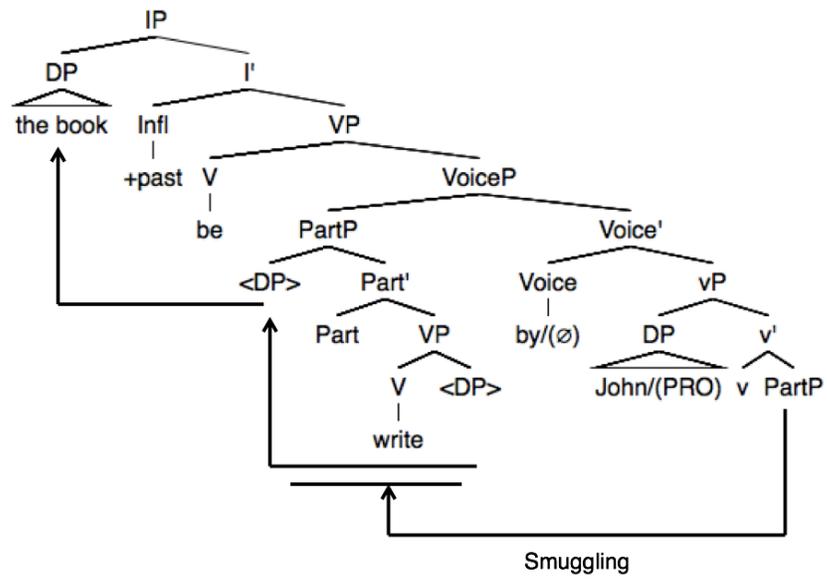
This does, however, violate the Freezing Principle (Wexler & Culicover, 1980), which states that movement from an already-moved constituent is prohibited. While exceptions of some sort are often invoked on most treatments of the passive, the loosening of the Freezing Principle here has the very desirable result of providing an escape hatch for the RM problem outlined above. The UFH proposes that children are universally faithful to the Freezing Principle, and so smuggling cannot act as an escape hatch for the passive in young children. In children's fifth year of life, the loosening of the Freezing Principle occurs (either through maturation or the development of processing abilities), and the passive comes online.

The well-noted distinction between actional and nonactional verbs in the acquisition of the passive is captured by reference to the notion of semantic coercion (the ability to construe a nonactional verb as a consequence of an event, Grillo, 2008). Nonactional verbs are thought to require semantic coercion (because of the lack of internal event structure), a process that is unavailable for children until after age six. So nonactional passives are even further delayed because of this second process. It is not until age six or seven that children are capable of semantic coercion, thereby allowing an understanding of nonactional passives.

(2)



(3)



However, there are several notable exceptions to the generalization that passives are acquired late by children. Crain, Thornton & Murasugi (2009) show that young children are in fact able to produce passive questions, as in (4).

(4) Which car gets crashen by the bus?

The solution that Snyder & Hyams (2015) provide is that the context used to elicit such utterances topicalizes the internal argument, and as such, the internal argument is marked as [+topic], making it featurally different from the external argument. This means movement of the internal argument into the [Spec, IP] position (without smuggling) does not violate RM, and so smuggling is not even required in this case. A similar analysis is provided by Snyder & Hyams for data from Pinker, Lebeaux & Frost (1987).

A different explanation for the difficulty in the passive is provided by Huang et al. (2013), who propose the Incremental Processing Hypothesis (IPH, see also Hyams, Ntelitheos & Manorohanta, 2006, for a proposal in a similar vein). The key idea behind their approach is that children acquire canonical word order very early, and therefore they map the agent theta role onto the subject/first nominal and the theme theta role onto the object/second nominal. This canonical mapping interferes with the online processing of passives, since when children hear the first nominal of a passive, they incorrectly map the agent role to that nominal. As they get evidence that the sentence they are hearing is a passive sentence (verbal morphology, the *by*-phrase), they are unable to reanalyze their incorrect mapping. As such, they either prevaricate and maintain their incorrect mapping (the so-called Kindergarten Path Effect, Trueswell, Sekerina, Hill & Logrip, 1999) or they lose track of their mapping altogether, resulting in confusion. In either case, children are likely to accept a mismatch test item under these conditions. Huang et al. test Chinese speaking children on passive sentences (and other sentence types), and find evidence for this incorrect initial mapping, as well as evidence for prevarication.

In the experiments presented below, we address these two approaches to the delay in the acquisition of passives, with one experiment testing the idea that topic-marked passive sentences are easier to comprehend than non-topic-marked passives, and another testing whether a novel manipulation might ease the processing difficulty of passive sentences presented by the canonical mapping effect. In the next section, we review a wrinkle in the empirical evidence in the field which our experiments ultimately also address.

3. Replication of the Three-Character Effect

As outlined above, research on children's acquisition of passives has generally reported a failure of comprehension by children. O'Brien, Grolla and Lillo-Martin (2006) questioned this finding, suggesting that previous experiments tested children on passive sentences with contexts in which there were only two characters (one agent and one theme). This made the use of the *by*-phrase

infelicitous since a *by*-phrase is used in the passive to disambiguate between two potential agents. If there is only one potential agent in the scene, a short passive is perfectly appropriate, and a *by*-phrase in that context is actually infelicitous. Such infelicity is enough to confuse children, thereby resulting in the acceptance of mismatch test items (by the Yes-Bias, also known as the Principle of Charity, Crain & Thornton, 1998).

O'Brien et al. (2006) hypothesized that providing contexts that properly motivate the use of the *by*-phrase would lead to higher comprehension by children in long passives. They tested 12 children aged 3;5–3;11 and 7 children aged 4;0–4;10 using a Truth Value Judgment Task (TVJT, Crain & Thornton, 1998) in which a third character (a second potential agent) was present (Experiment 1), and a protocol in which only one agent was present (Experiment 2). Results showed children's improved comprehension on the three-character experiment compared to the two-character experiment. This indicates that young children *can* understand passives if the use of the *by*-phrase satisfies the felicity conditions for their use.

More recently, an attempt to replicate this important finding has failed. Nguyen & Snyder (2017) tested 4-year-old children using the same protocol as O'Brien et al. (2006) but were unable to replicate any effect of the third character. Nguyen & Snyder found that, whereas children performed better on actional than nonactional passives (a finding found in many studies over the years, e.g., Maratsos, Fox, Becker & Chalkley 1985), there was no statistical difference between story types (i.e., 2-character vs. 3-character stories). In other words, adding a third character as a potential agent did not improve the 4-year-olds' understanding of long passives. Failure to replicate is an important issue, and this discrepancy requires further investigation. We attempt to do just that in our experiments, which we turn to now.

4. Experiment 1

We hypothesized that the difference between the findings of O'Brien et al. (2006) and Nguyen & Snyder (2017) was due to unnoticed methodological differences such as prosodic or discourse emphasis on certain characters or other parts of the narration in the TVJT. In order to carefully control the delivery and presentation of the stories, we presented the items using a pre-recorded video format. This ensured control across all the child participants and the three experiments. This baseline experiment is a replication of O'Brien et al.'s study, but with careful control of presentational variables such as speed of presentation and prosodic differences between test items.

4.1. Participants

All participants attended a local preschool and were split into two groups: seven children aged 4;8–5;8 (mean age 5;1, the older age group) and nine children aged 3;10–4;6 (mean age 4;1, the younger age group). All children were living in

an English-speaking environment and had English as their only or dominant language.

4.2. Materials

The experiment began with three training items followed by eight test items (four passive items and four active items). We used two lists (randomly assigned to participants), each consisting of eight test items that were drawn from four passive actional verbs (*push, pull, cover, chase*) and four passive nonactional verbs (*surprise, anger, understand, remember*) borrowed from Maratsos et al. (1985). Half of the test items were in the mismatch condition (target answer = no) and half were in the match condition (target answer = Yes). Each script (Appendix A) for the TVJT, modeled after O'Brien et al. (2006), included three animal characters, and was narrated and recorded in child-friendly voices by native English speakers. Photographs were taken of each scene in each story and these were laid into a movie timeline with the audio (using Adobe Premiere), creating a child-friendly cartoon-like story (Figure 1).

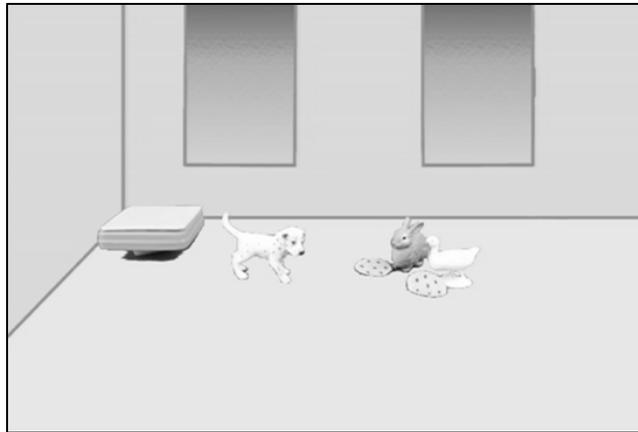


Figure 1. Screenshot from an item showing a story.

4.3. Procedure

The children were tested individually at their pre-school. The pre-recorded TVJT videos were presented to the child on a laptop computer with the audio played over headphones. Two experimenters were present: a primary experimenter, who interacted with the child, and a secondary experimenter, who recorded answers but did not interact with the child. The session was also audio recorded.

Children were trained with three active items, followed by the critical items described above. For each item, children were first introduced to three animal characters followed by the actual TVJT story (Appendix A). After the story, a

puppet named Momo appeared on the screen along with all the characters and the pre-recorded narrator asked her to say what had happened in the story. The puppet then made a short statement about the story followed by the test sentence, as shown in (5).

(5) *Example of lead-in and test sentences in Experiment 1*

Narrator: Hey Momo, can you tell us what happened in that story?

Puppet: That was a fun story about Dog, Rabbit, and Frog. Let's see...

In that story, Dog was understood by Rabbit. (Match)

In that story, Rabbit was understood by Dog. (Mismatch)

After the test sentence, the live experimenter paused the video and asked the child if the puppet was wrong or right. The child indicated their answer using a system of stickers (a smiling face or a frowning face). When a frowning face was chosen, the experimenter asked the child to explain why the puppet had been wrong.

4.4. Results

Following standard practice, we report the nonactional mismatch items. Figure 2 shows the results from Experiment 1. The older children performed well with the nonactional mismatch items, correctly rejecting them more than 90% of the time, as expected. The younger children, however, showed relatively poor performance on the nonactional mismatch items, rejecting the items at just about chance rate (55%).

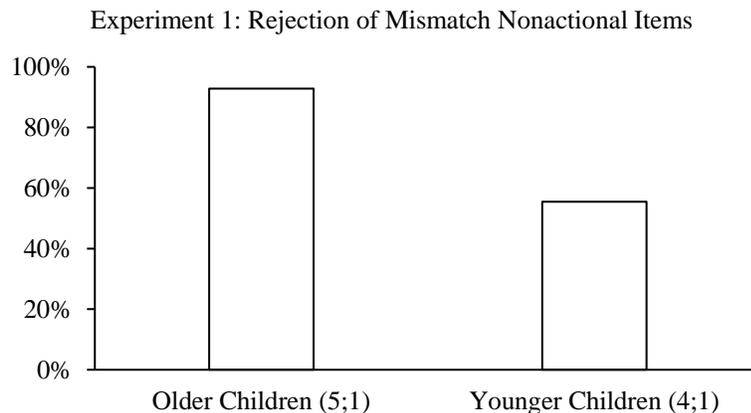


Figure 2. Rates at which older and younger children rejected mismatch test sentences in trials with nonactional verbs during Experiment 1.

4.5. Discussion – Experiment 1

The results from Experiment 1 show that the 3-character story did not appear to help young children comprehend passive sentences correctly. Despite tempo, prosody, and many other extra-syntactic factors being controlled, children in the younger age group comprehended long nonactional passives at chance level, suggesting that they are unable to understand passive sentences. Thus, we were unable to replicate O'Brien et al.'s (2006) findings. Instead, our results echoed those of Nguyen & Snyder (2017).

5. Experiment 2

We tested whether topicalizing the theme would improve comprehension of passive sentences, as hypothesized by Snyder & Hyams (2015). Recall that according to Relativized Minimality, if the theme is marked as [+topic], it should be able to move past the external argument without causing an RM violation. We manipulated the topicality of the theme by changing the wording of the narrator's lead-in to the test sentence so as to make the theme in the test sentence more topical.

5.1. Participants

Participants were children from the same preschool as in Experiment 1. Nine children aged 3;9–4;3 (mean age 3;11.17) were tested in this second experiment. Note that these participants were all regarded as “younger” children given their range of ages, which was similar to that of the younger group in Experiment 1.

5.2. Materials

All materials were identical to those used in Experiment 1 except for the lead-in. In Experiment 1, the narrator used a generic lead-in, saying “Hey Momo, can you tell us what happened in that story?”, which was immediately followed by the puppet's response, as shown in (5). In Experiment 2, however, the lead-in was changed to topicalize one of the characters (the one who would be the theme of the test sentence), following the template presented in (6). Note that the sentence ‘And something interesting happened with A’ was included to specifically draw attention to character A, thereby topicalizing it.

(6) *Example of the modified lead-in in Experiment 2*

Narrator: Hey Momo, that was a fun story about A, B and C.
They made such a mess with those crumbs, didn't they? (*or similar*).
And something interesting happened with A. Could you tell us what happened?

Puppet: That WAS a fun story. Let's see...In that story, A was verbed by B.

5.3. Procedure

The procedure was identical to Experiment 1, including the video TVJT and in-person experimenters.

5.4. Results

Children in Experiment 2 rejected mismatch nonactional passives 89% of the time (compared to chance level in Experiment 1), showing that topicalizing the object significantly improves comprehension of passives.

5.5. Discussion – Experiment 2

Given that the only change between Experiments 1 and 2 was the change in the lead-in sentence to make the theme topicalized, the results are consistent with the UFH: Adding the [+topic] feature to the theme resulted in higher comprehension rates, exactly as predicted by the UFH. These results are, however, also consistent with the IPH: Because topics track subjecthood, when the theme has been topicalized, the child might predict that this topicalized nominal will be the subject of the following (test) sentence. Thus, the expectation that the first argument will be an agent may have been reduced by the topicalizing of the theme. In the next experiment, we attempt to tease these two theories apart using a novel but simple manipulation: repeating the test sentence.

6. Experiment 3

Experiment 3 was identical to Experiment 1 except that the test sentence was delivered twice. Any parent will tell you that repeating things to children helps with comprehension, but it was unclear if this technique would also help with passives, a construction children typically have difficulty comprehending.

If the UFH is on the right track, then a repeated test sentence should have no impact on whether they violate the Freezing Principle or not. There should be no effect of repeating the test sentence, since the Freezing Principle should hold until maturation at around age 4 years, and before that age children should not be able to smuggle DP objects above subjects.

However, following the IPH, repeating the test sentence may have a beneficial effect. We hypothesized that if the difficulty with passives is one of *expectations* regarding thematic roles, then a repeated test sentence should allow children to overcome these expectations. On the first presentation of the test sentence, children assign the first nominal the agent role, which is the preferred pattern in English. They then encounter passive morphology and a *by*-phrase but are unable to reanalyze online (as outlined above). However, when they hear the repetition of the test sentence—their second bite at the apple, so to speak—they know that assigning the agent role to the first nominal is a losing proposition, and so they either delay thematic role assignment, or they assign a different thematic

role to that first nominal. Thus, on this view a repeated test sentence *may* influence children's comprehension of passives.

6.1. Participants

Participants included children from the same preschool as in Experiments 1 and 2, as well as additional children recruited from the wider community. Nine children were included in Experiment 3, aged 3;8–4;6 (mean age 4;0). As with Experiment 2, these children were deemed to be equivalent to the younger aged children in Experiments 1 and 2.

6.2. Materials

All materials were identical to Experiment 1 except that the test sentence was repeated (with a 1000 ms pause between the two iterations). The second iteration of the test sentence was identical to the first. Note that the baseline lead-in from Experiment 1 was used in Experiment 3, not the topicalized version from Experiment 2.

6.3. Procedure

The procedure was identical to Experiment 1 aside from the modified presentation of the test sentences.

6.4. Results

In Experiment 3, when the test sentence is repeated, young children correctly rejected mismatch nonactional passive sentences at a rate of 83.3%, compared to 55% in the baseline condition. This suggests that a repetition of the test sentence improves comprehension of passives.

6.5. Discussion – Experiment 3

Figure 3 summarizes the results of the three experiments. In the baseline condition, children rejected the mismatch nonactional passives at about chance. However, when the theme was topicalized, we see an increase in correct rejection rates to 88%. Likewise, in a non-topicalized setting, when the test sentence is repeated, the rejection rate is 83%. We interpret the improved accuracy with a repeated test sentence to show that children's difficulty with passives is not a deficit in competence. A grammatical account of failure on the passive does not predict any improvement in comprehension of the passive. If smuggling is not permitted, it just is not permitted, no matter how many times a test sentence is repeated. On the other hand, the IPH accounts for this nicely. We hypothesized that if the difficulty with passives is one of *expectations*, then a repeated test

sentence should allow children to overcome these expectations. This hypothesis was borne out by our experiments.

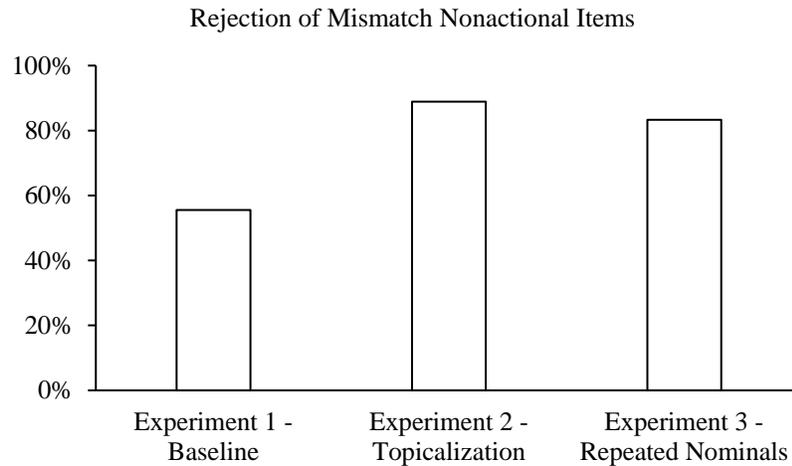


Figure 3. Rates at which young children rejected mismatch test sentences in trials with nonactional verbs in Experiments 1, 2, and 3.

7. Overall Discussion and Conclusion

Theories for the delay in the acquisition of the passive abound in the literature. Here we tested two such theories: one a grammatical theory for the delay in the passive (the Universal Freezing Hypothesis, Snyder & Hyams, 2015) and the second the Incremental Processing Hypothesis (Huang et al., 2013). Moreover, we also attempted to replicate O'Brien et al.'s (2006) TVJT finding in which adding a third (potential agent) character to the context increases comprehension accuracy of passives by young children. In the end, we believe our contributions to the understanding of the acquisition of the passive are three-fold.

First, we hypothesized that the failure of Nguyen & Snyder (2017) to replicate O'Brien et al. (2006) was due to micro-variations in the presentation materials between the two research groups. For example, it may have been the case that in some items the theme was more prosodically emphasized (unintentionally). It is also possible that the speed at which the test sentences were delivered varied from item to item (also unintentionally). We controlled these factors by using pre-recorded stimuli, both audio and visual. We carefully manipulated stress, prosody, tempo, etc. and presented the exact same stimuli to all children. Nonetheless, we failed to replicate O'Brien et al.'s findings.

Our second contribution comes from the effect of topicality on the comprehension of passive sentences. Experiment 2 purposefully manipulated the topicality of the theme by drawing attention to it in the lead-in while keeping

everything else identical to the previous experiment. We found that topicalizing the theme did in fact significantly increase the comprehension rates of passive sentences by young children.

Finally, and perhaps most interestingly, we found that a simple repetition of the test sentence resulted in increased comprehension rates of passive sentences by young children. This result suggests that the underlying difficulty that children face with the passive is not grammatical in nature, but more likely a result of processing challenges that children face with passive sentences. We endorse an incremental processing approach to the delay in passives (Huang et al., 2013, although see Bever, 1970, amongst many others), though other interpretations are quite possible.

Regardless, we find the results from our last experiment incompatible with grammatical theories of the delay in the passive, and instead conclude that children have full knowledge of the passive structure and are able to perform all the operations associated with it (e.g., Demuth et. al., 2010; Messenger et al., 2011; Bencini & Valian, 2008, amongst others). There is no deficit in competence, and we conclude that children's grammars are maximally continuous with adult grammars, though the parsing and processing mechanisms that deploy that knowledge may be immature and still developing.

Appendix A: Example of a Story with a Nonactional Verb (*surprise*) in the Mismatch Condition

Monkey doesn't like surprises, but his friends find it really fun to surprise him anyway. One day, Pig decides to play a prank on Monkey. He decides to hide behind Monkey so he can surprise him. But he was seen by Monkey and failed. After a little while, Elephant decides to try to surprise Monkey. Elephant slowly creeps up behind Monkey and grabs him on the shoulder. Elephant succeeded in surprising Monkey. In revenge, Monkey tried to surprise Elephant, but he failed.

Experiment 1

Narrator: Hey Momo, can you tell us something about the story?
Puppet: Hmm, that was a fun story about Elephant, Monkey and Pig.
Let's see...in that story...Elephant was surprised by Monkey.

Experiment 2

Narrator: Hey Momo, that was a fun story about Elephant, Monkey, and Pig. They took turns trying to surprise each other, and something interesting happened with Elephant. Could you tell us what happened?
Puppet: Hmm, that WAS a fun story. Let's see...in that story...Elephant was surprised by Monkey.

Experiment 3

Narrator: Hey Momo, can you tell us something about the story?

Puppet: Hmm, that was a fun story about Elephant, Monkey and Pig.
Let's see...in that story...Elephant was surprised by Monkey
(1000ms pause) Elephant was surprised by Monkey.

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