

Stony Brook University



OFFICIAL COPY

The official electronic file of this thesis or dissertation is maintained by the University Libraries on behalf of The Graduate School at Stony Brook University.

© All Rights Reserved by Author.

Soaring over Metropolis: How readers comprehend realistic and fantastic stories

A Dissertation Presented

by

Jeffrey Evan Foy

to

The Graduate School

in Partial Fulfillment of the

Requirements

for the Degree of

Doctor of Philosophy

in

Experimental Psychology

Stony Brook University

August 2012

Stony Brook University

The Graduate School

Jeffrey Evan Foy

We, the dissertation committee for the above candidate for the
Doctor of Philosophy degree, hereby recommend
acceptance of this dissertation.

Richard Gerrig
Professor of Cognitive Science

Nancy Franklin
Associate Professor of Cognitive Science

Hoi-Chung Leung
Associate Professor of Biopsychology

Susan Scheckel
Associate Professor of English

This dissertation is accepted by the Graduate School

Charles Taber
Interim Dean of the Graduate School

Abstract of the Dissertation

Soaring over Metropolis: Comprehending realistic and fantastic stories

by

Jeffrey Evan Foy

Doctor of Philosophy

in

Experimental Psychology

Stony Brook University

2012

Narrative worlds often include features that would be implausible in the real world: Characters remain eternally youthful; carpets can fly. For my dissertation, I conducted five experiments that demonstrated how the accessibility of knowledge specific to particular fictional worlds affects readers' comprehension of plausible and implausible events. In Experiment 1, participants were faster to read events that fit within narrative worlds (e.g., bullets bouncing off Superman's chest), even when those events were implausible in the real world. In Experiment 2, participants read about familiar characters experiencing events that were either highly plausible (e.g., Superman shooting lasers from his eyes), mildly implausible (e.g., Superman hypnotizing a criminal with his eyes), or very implausible (e.g., Superman turning a criminal to stone). Participants read the highly plausible events fastest. There were no significant differences in reading times between the mildly and very implausible events. The stories in Experiment 3 described ordinary characters (e.g., a bank teller) in realistic or fantastic worlds (e.g., Metropolis) experiencing realistic events (e.g., being killed by bullets) or implausible events (e.g., bullets bouncing off their chest). Participants were consistently slower to read about ordinary people experiencing implausible events, even within the context of fantasy worlds. In Experiment 4, participants read about ordinary characters, unfamiliar fantastic characters (e.g., a native of Krypton), or familiar fantastic characters (e.g., Superman) experiencing implausible events. Participants were slowest to read sentences containing an ordinary character, and there were no differences in reading times for sentences with the familiar and unfamiliar fantastic characters. In Experiment 5 participants read about the same characters from Experiment 4 experiencing realistic events. Participants were fastest for the unfamiliar ordinary characters, and equally slow for the familiar and unfamiliar fantastic characters. Taken together, these studies clarify how readers use their real-world knowledge, prior knowledge about a particular fictional world, and textual cues to assess the plausibility of events in narratives.

Dedication Page

To my parents, for all their love and support.

Table of Contents

Chapter 1: Introduction	1
Chapter 2: Experiment 1	6
Method	7
Results and discussion	8
Chapter 3: Introduction to Experiments 2 through 5	11
Chapter 4: Experiment 2	13
Method	13
Results and discussion	14
Chapter 5: Experiment 3	16
Method	16
Results and discussion	17
Chapter 6: Experiment 4	19
Method	19
Results and discussion	20
Chapter 7: Experiment 5	22
Method	22
Results and discussion	22
Chapter 8: General Discussion	25
Bibliography	28
Appendix	30

List of Tables

Table 1: Sample story from Experiment 1.	30
Table 2: Experiment 1 mean reading times (and standard errors) in milliseconds for the target and spillover sentences.	31
Table 3: Sample story for Experiment 2.	32
Table 4: Experiment 2 mean reading times (and standard errors) in milliseconds for the target and spillover sentences.	33
Table 5: Sample story for Experiment 3.	34
Table 6: Experiment 3 mean reading times (and standard errors) in milliseconds for the target and spillover sentences.	35
Table 7: Sample story for Experiments 4 and 5.	36
Table 8: Experiment 4 mean reading times (and standard errors) in milliseconds for the target and spillover sentences	37
Table 9: Experiment 5 mean reading times (and standard errors) in milliseconds for the target and spillover sentences.	38

Acknowledgments

I am grateful to Richard Gerrig, who helped me develop, carry out, and write up my dissertation, and who has provided invaluable mentorship throughout my time at Stony Brook. I would also like to thank Nancy Franklin, Hoi-Chung Leung, and Susan Scheckel for their helpful comments and insights on my research. Matthew Bezdek and William Wenzel provided helpful feedback on my project. I am also grateful to Megan Tudor for her love and support throughout my dissertation

Chapter 1: Introduction

When people become immersed in stories, they are often transported to new worlds (Gerrig, 1993; see also Green & Brock, 2000). Consider the following passage from Mary Shelley's novel *Frankenstein: or, the Modern Prometheus* (1823):

With an anxiety that almost amounted to agony, I collected the instruments of life around me, that I might infuse a spark of being into the lifeless thing that lay at my feet. It was already one in the morning; the rain pattered dismally against the panes, and my candle was nearly burnt out, when, by the glimmer of the half-extinguished light, I saw the dull yellow eye of the creature open; it breathed hard, and a convulsive motion agitated its limbs. (p. 97)

This passage transports readers to a fictional world in which Dr. Frankenstein breathes life into a monster made out of lifeless parts. To comprehend this passage, readers must imagine a world different from their own—one in which such fantastic events are possible.

This project considers how ordinary memory processes allow readers to comprehend fictional narratives that are set in fantastic worlds. I begin by discussing how readers comprehend narratives by creating mental models of narrative worlds. Using the memory-based processing approach as a framework, I discuss how ordinary memory processes make real-world knowledge readily available from memory during comprehension, allowing readers to construct mental models. Next I argue that the availability of real-world knowledge may pose a problem for comprehending fantastic stories, which are often inconsistent with the real world. I discuss research on whether real-world knowledge affects how easily readers comprehend fantastic narratives. I then present Experiment 1, which clarifies whether real-world knowledge always affects how easily people comprehend events in fantastic stories. I then propose three hypotheses about how readers comprehend information in fantastic narratives, which I test in Experiments 2 through 5.

Within the field of cognitive psychology, researchers have theorized that people comprehend stories by constructing mental models of the events in the story (see Gerrig, 1993; Johnson-Laird, 1983; Zwaan & Radvansky, 1998). These sentences from a study by Bransford, Barclay, & Franks (1972) illustrate what it means for readers to construct a mental model of a story:

1. Three turtles rested on a floating log, and a fish swam beneath them.
2. Three turtles rested on a floating log, and a fish swam beneath it.

In their experiment, Bransford et al. tested how well people remembered the specific wording of sentences. For example, participants may have encountered sentence 1 during encoding, when they learned a set of sentences. Later, at test, participants were shown a series of sentences, including new sentences and ones from encoding, and had to pick the ones that they read earlier. Bransford et al. found that participants who had read sentence 1 later often mistakenly claimed to have seen sentence 2. Though both sentences describe the same situation, they do not explicitly describe the same details. Sentence 1 explicitly states that the fish swam underneath the turtles.

In contrast, sentence 2 explicitly states that the fish swam underneath the log. Because participants confused these sentences, Bransford et al. concluded that they did not simply represent the information stated explicitly within the sentence; instead, participants created a mental model of the situation using the information described within the sentence (for a similar discussion, see Zwaan & Radvansky, 1998). Subsequent research has demonstrated that readers create mental models as they read narratives. Readers often go beyond the information given in a text, creating rich mental models by adding information from memory. For example, participants may have inferred that the log is floating on a pond even though this information was not contained within the sentence.

Psychologists have constructed different theories about how readers access information in memory to construct mental models of narratives (for a review of these theories, see McNamara & Magliano, 2009). In this paper, I use the memory-based processing approach as a framework for how people create mental models using ordinary memory processes (Gerrig & McKoon, 1998; Gerrig & O'Brien, 2005; O'Brien, Rizzella, Albrecht, & Halleran, 1998). According to the memory-based processing approach, texts act as cues that activate information in memory through a process known as resonance. Resonance is an automatic, passive process in which textual cues activate semantically related information in memory (Myers, Cook, Kambe, Mason, & O'Brien, 2000; Rizzella & O'Brien, 2002). Textual cues activate information that is semantically related to the cue, regardless of whether it is relevant or irrelevant to a text (Gueraud, Harmon, & Peracchi, 2005; O'Brien et al., 1998; O'Brien, Cook, & Gueraud, 2010). When information within a text does not match information contained in long-term memory, readers may experience difficulty with comprehension (Albrecht & O'Brien, 1993; O'Brien et al., 1998). Readers select relevant knowledge from the set of information that is activated and integrate it into their mental representation of a text (for a discussion of the distinction between activation and integration, see Long & Chong, 2001; Long & Lea, 2005).

Several studies have shown that textual cues make real-world knowledge accessible during comprehension. For example, Albrecht and O'Brien (1993) found that readers experienced difficulty, as measured by reading times, when a character who was described as vegetarian ordered a cheeseburger, because this is inconsistent with readers' prior knowledge about vegetarians (Albrecht & O'Brien, 1993). In another study, readers experienced difficulty when a character who wanted to go on vacation to a place where he could sunbathe bought a ticket to go to Alaska (Huitema, Dopkins, Klin, & Myers, 1993). However, readers experienced no such difficulty when the character bought a ticket to Florida. Readers may also use their prior knowledge to draw inferences during comprehension. For example, when people read about a character carrying out an action (e.g., sewing), they often infer that the character is using particular tools (e.g., a needle) (Harmon-Vukic, Gueraud, Lassonde, and O'Brien, 2009; McKoon & Ratcliff, 1981). The accessibility of real-world knowledge during comprehension allows readers to construct rich mental models of narratives.

Research in psychology has largely focused on how readers construct mental models of texts set in realistic worlds. It remains unclear how readers construct mental models of fantastic worlds, which often contain information that is inconsistent with the real world. If textual cues activate information about the real world, in which such events are implausible, readers may experience difficulty because of the mismatch between the facts of the text and their real-world knowledge. Some studies have indeed found that readers have difficulty comprehending information about a fictional world that contradicts their real-world knowledge. In one study, Ferguson and Sanford (2008) gave participants sets of sentences that created either realistic or

fantastic worlds (see also Ferguson, Sanford, & Leuthold, 2008; Ferguson, Scheepers, & Sanford, 2010). For example, one set of sentences described a world in which cats were vegetarians (fantastic) or had their normal diet (realistic). Participants then read a sentence that described either a fantastic event (e.g., cats eating carrots) or a realistic event (e.g., cats eating fish). Ferguson and Sanford found that participants always took longer to read the fantastic events, even within the context of the fantastic stories. They concluded that participants always checked new information against their real-world knowledge and experienced difficulty when there was a mismatch.

Research on anomalous suspense, conducted by Gerrig (1989) and Rapp (2008), has also found that readers take longer to process information in narratives that is inconsistent with the real world. Participants read short narratives about famous historical events, such as George Washington becoming U.S. president. Half the narratives created a fictional world that made the real-world outcome seem unlikely, generating suspense. The suspenseful version of the story about George Washington made it seem unlikely that he would become president because he was tired and frail and wanted to retire. Participants also read non-suspenseful stories that made the real-world outcome seem likely. The non-suspenseful version of the Washington story described him as wanting to become president with strong support from his friends. After reading suspenseful and non-suspenseful stories, participants read outcomes that were either accurate (e.g., “George Washington was elected first president of the United States”) or inaccurate (e.g., George Washington was not elected first President of the United States). Gerrig (1989) had participants verify whether the outcomes were accurate and measured how long they took to respond. Participants always took longest to respond to historically inaccurate outcomes. However, participants took longest to reject inaccurate outcomes for the suspenseful stories, suggesting that they were affected by the context of the story. Rapp (2008) found similar results by measuring reading times for the accurate and inaccurate outcomes. Participants were always slower to read outcomes that were inconsistent with historical outcome, even for the suspenseful stories. However, participants were faster to read endings that were inconsistent with the historical outcome if they read the suspenseful version of the stories than if they read the non-suspenseful versions. These findings suggest that readers may experience some difficulty when they encounter information that is inconsistent with their real-world knowledge, but that readers find it easier to assimilate such inconsistencies when they fit within the context of a narrative.

A study conducted by Warren, McConnell, and Rayner (2008) provided further evidence that readers experience difficulty when they encounter violations of their real-world knowledge, but that readers can adjust when the violation occurs within a fantastic narrative world. Warren et al. measured participants’ eye movements as they read stories set in realistic (e.g., a woman going to her friend’s wedding) or familiar fantastic (Cat Woman going to Spiderman’s wedding) narrative worlds. The events in the narrative were either plausible (e.g., “She used a shortcut to avoid the annoying traffic and just made it to the wedding.”) or implausible (e.g., “She used an adhesive to glue the annoying traffic and just made it to the wedding.”). To analyze how easily participants comprehended the plausible and implausible event, Warren et al. broke down the sentence describing the event into regions and looked at eye movements for each region. One region contained a noun that was either plausible or implausible within the sentence (i.e., traffic). Participants always experienced more difficulty when they first encountered the implausible events, as indicated by longer time initially looking at the implausible noun, regardless of whether it occurred in a fantastic or realistic story. However, despite this initial difficulty, participants continued past the implausible noun faster when it was in the fantastic stories than

when it was in the realistic stories, suggesting that they quickly adjusted to the narrative world. This study suggests that readers may experience difficulty when they first encounter information that is inconsistent with the real world, but that they are able to adjust quickly when the information is situated within a fantastic narrative.

In contrast to the studies discussed so far, research by Filik and colleagues suggests that readers may not experience difficulty comprehending unrealistic events when they are plausible within a familiar fantastic world (Filik, 2008; Filik & Leuthold, 2008). In one study, Filik (2008) measured participants' eye movements as they read sentence pairs about events that took place either in a familiar fantastic or a realistic narrative world. The first sentence established either a fantastic or realistic context (e.g., The Incredible Hulk vs. Terry). The second sentence described the main character either completing a realistic action (e.g., picking up the car) or a fantastic action (e.g., glaring at the car). Filik found that participants experienced no difficulty comprehending either the realistic or fantastic sentences within the context of the familiar fantastic world. In contrast, people took longer to read the fantastic action when it occurred within a realistic story context.

The studies conducted by Filik and colleagues suggest that readers may find it easy to comprehend fantastic actions (i.e., those that contrast with the real world) that are plausible in familiar fantastic worlds. This result suggests that the texts cued readers' prior knowledge about the particular narrative world, making it easy to comprehend the fantastic action. Though the study conducted by Warren et al. (2008) also used familiar fantastic worlds (e.g., Bat Girl), their stories contained actions that were implausible even within the fantastic world. Thus, implausible actions did not fit with readers' prior knowledge, potentially leading them to experience some difficulty comprehending the fantastic action. Warren et al.'s findings are consistent with those of Gerrig (1989) and Rapp (2008), who found that readers always took longer to process outcomes that did not fit with their prior knowledge.

The studies by Ferguson and colleagues suggest that readers always experience difficulty comprehending unrealistic information, even when it fits within a particular fantastic world. However, participants may not have had enough information to fully construct a mental model of the unfamiliar fictional worlds; they only read one sentence before they encountered the unrealistic information. A study conducted by Nieuwland and Van Berkum (2006) suggests that readers may need more information about an unfamiliar fantastic narrative world before they find it easy to comprehend fantastic events. Nieuwland and Van Berkum gave participants five-sentence fictional narratives that described inanimate objects acting like animate objects (e.g., a peanut falling in love). To examine how participants dealt with such information, Nieuwland and Van Berkum measured electrical activity on the scalp, known as event-related potentials (ERPs), that corresponds to neural activity. Specifically, they looked at a spike in electrical activity known as the N400, which registers that people detect information that is anomalous with respect to prior context. They found that participants showed a large N400 for the first sentence that described a fantastic event, such as a dancing peanut, suggesting that readers thought that this event was anomalous. In the third sentence participants showed a weaker N400, suggesting that they considered the event to be less anomalous. By the fifth sentence, participants did not exhibit an N400 when they read about a fantastic event that was consistent with the narrative (e.g., the peanut was in love). When the fifth sentence described a realistic event that was inconsistent with the narrative (e.g., the peanut was salted), participants showed a large N400. By the end of the story, participants found it easier to assimilate information that was consistent with the narrative world, even when it was inconsistent with the real world. This

study suggests that readers can adjust to unfamiliar fantastic narratives when they have built up enough prior knowledge about the narrative world.

Given the inconsistent findings in previous research, it is unclear how readers adjust their mental models for narrative worlds. I begin my research by testing whether readers find it easy to comprehend information that is consistent with their prior knowledge of a narrative world, even when it contradicts real-world knowledge. I then discuss four experiments that explore how readers use prior knowledge and textual cues to comprehend realistic and fantastic events in narratives. In all of the experiments, I use stories that take place in familiar narrative worlds (e.g., the world of Superman). This allows me to draw on readers' prior knowledge rather than have to establish new narrative worlds. Additionally, using stories set in familiar narrative worlds allows me to test how readers' prior knowledge affects how easily they assimilate new information within a story, such as information about novel characters. In Experiment 1, I test whether readers find it easier to comprehend fantastic actions (e.g., flying) when they are carried out by characters from familiar fantastic worlds (e.g., Peter Pan) relative to characters in realistic worlds. Following Experiment 1, I put forward three hypotheses about how readers comprehend realistic and fantastic events, such as driving a car and flying, in narratives using their prior knowledge and textual cues. I then propose Experiments 2 through 5 to test these hypotheses.

Chapter 2: Experiment 1

In Experiment 1, participants read short fictional stories set in realistic or familiar fantastic worlds. Here is a sample of a realistic story from Experiment 1:

Bobby was preparing to visit his girlfriend, Judy. Bobby hadn't seen Judy in a while and planned to surprise her with a visit. He imagined how happy she would be when she opened the door and saw him. He looked around for something to bring her and saw some flowers in a nearby garden. He picked a couple of flowers and then decided that it was time to set out for Judy's house.

This realistic text should activate readers' real-world knowledge, which they should use to construct a situation model of the text. Each story continued with a realistic or fantastic event in the sixth sentence, which I will refer to as the *target sentence*. Here are the continuations for the sample story:

Realistic event: He got into his car and drove to her house.

Fantastic event: He leapt into the air and flew to her house.

She welcomed him with a warm embrace.

Readers should find it relatively easy to comprehend the realistic event because it fits with their real-world knowledge. In contrast, readers should experience difficulty comprehending the fantastic event because it is implausible in the realistic world of the story. Now consider the fantastic version of the same story:

Peter Pan was preparing to leave Neverland to visit Wendy. Peter hadn't seen Wendy in a while and planned to surprise her with a visit. He imagined how happy she would be when she opened the door and saw him. He looked around for something to bring her and saw some flowers in a nearby garden. He picked a couple of flowers and then decided that it was time to set out for Wendy's house.

Realistic event: He got into his car and drove to her house.

Fantastic event: He leapt into the air and flew to her house.

She welcomed him with a warm embrace.

The opening line of this version sets the story in the familiar fantastic world of Peter Pan. If real-world knowledge continues to become active while reading this story, readers may find it easier to comprehend the realistic event even though it is less consistent with the world of the story than the fantastic event. In this case, readers should always find it easier to comprehend realistic events, regardless of the narrative world. I will refer to this possibility as the *real-world first hypothesis*.

Alternatively, the familiar fantastic story version may activate readers' prior knowledge about Peter Pan, making it easy to comprehend the fantastic events that are consistent with their prior knowledge. If the readers' prior knowledge about Peter Pan becomes activated, readers may find it difficult to comprehend the realistic event because it is inconsistent with what readers know about the familiar narrative world. In this case, readers will always find it easier to comprehend information that is consistent with the familiar narrative world. I will refer to this as the *narrative-world first hypothesis*. I predicted that the data would support the narrative-world

first hypothesis, because I believe that narratives transport readers to narrative worlds, rendering prior knowledge about familiar narrative worlds more accessible than real-world knowledge.

I collected reading times for the target sentences as a measure of ease of comprehension. Each story also included another sentence after the target sentence that concluded the event in the story (the *spillover sentence*). Some past research has found that disruptions occurring in one sentence may affect the next sentence (Albrecht & O'Brien, 1993). If people are strongly disrupted by information in the fantastic or realistic event, they may take longer to read the *spillover sentence*.

Method

Participants

I recruited 36 Stony Brook University undergraduates from the Psychology department subject pool. All participants were native English speakers and received course credit for participating.

Materials

Norming. To ensure that the narrative-worlds in Experiment 1 were familiar to readers, I recruited 20 Stony Brook undergraduates to rate the familiarity of information about well-known fictional characters (e.g., “Shrek takes mud baths”). These participants only took part in norming and not in the main experiment. Each participant received course credit for their participation. The sentences described fantastic actions that were plausible (e.g., “Peter Pan would fly to visit Wendy”) or implausible (e.g., “Peter Pan would drive a car to visit Wendy”) for a particular character. Each participant rated 113 sentences on a computer using a seven-point Likert scale (1 = unfamiliar, 4 = somewhat familiar, 7 = very familiar). I instructed participants to make their ratings based on their familiarity with the character and the information described in the sentence. For example, consider the sentence “Spongebob Squarepants lives in a trailer”, which is an inaccurate statement about Spongebob. If people were familiar with Spongebob but not with the idea that he lives in a trailer, they were instructed to rate the sentence as low in familiarity. However, if they were familiar with Spongebob and believed that he lived in a trailer, they were instructed to rate the sentence as being high in familiarity. I instructed participants to press 0 if they had never heard of a particular character. Participants saw each sentence one at a time on a computer screen and pressed a number to make their response. The sentences were presented in random order by DirectRT software.

Stimuli. Based on the norming, I chose 20 sentences that were rated as containing familiar information about a particular fantasy world ($M = 6.23$) to serve as the basis for the fantastic events. I also chose 20 sentences that were rated as being unfamiliar for a particular fantasy character ($M = 1.58$) to serve as the basis for the realistic events. I used these sentences to create 20 stories (see Table 1 for a sample story). Each story was set in either a realistic or a familiar fantastic world. The sixth sentence of each story, which was the target sentence, contained either a realistic or a fantastic event that was based on sentences from norming. Thus there were four versions of each story. Because we were comparing reading times for the target sentences, both versions of the target sentence were matched on number of words and syllables

to equate for length. The final sentence, which served as the spillover sentence, concluded the event and was the same across all story versions. All 20 stories contained different characters.

Additionally, participants read 20 filler stories and 4 practice stories of equal length to the experimental stories. The filler and practice stories were set in realistic fictional worlds. They were included so that participants did not guess that we were comparing events in particular types of stories. Additionally, the inclusion of randomly distributed filler stories decreased the likelihood that participants would predict the content of a given story and adapt reading strategies based on these patterns. All of the stories ended with a yes/no comprehension question. The answer to half of the comprehension questions was yes.

Design

I used a Latin-square design to create four conditions to counterbalance the stories. All participants read an equal number of fantastic and realistic stories. Half of each story type contained realistic-event sentences and the other half contained fantastic-event sentences. Thus every participant read five of each story type. Each condition contained one version of every experimental story, with all four versions of each story presented across all four conditions. All participants read the same filler and practice stories.

Apparatus

Participants read the stories on two Dell Optiplex desktop computers. I used Direct RT software to display the stories and collect reading times. The computer displayed all stories in yellow Times New Roman font, size 16, against a black background.

Procedure

Participants read each story one sentence at a time at their own pace. Before each story, the screen displayed the sentence “Press spacebar to begin the next story.” After pressing the spacebar, participants read the first sentence of the story. They pressed spacebar to advance to the next sentence, until they read the entire story. After the final sentence, participants saw a yes/no comprehension question about the story. The comprehension question was accompanied by a beep to indicate that the participant needed to make a response. After the comprehension question, participants advanced to the next story until they read all the stories.

At the beginning of the experiment, participants read four practice stories to familiarize them with the task. Next they read the experimental and filler stories. DirectRT presented the experimental and filler stories in a different random order for each participant.

When participants finished reading all of the stories, they rated their familiarity with each of the fantastic characters from the experiment on a 1 to 7 scale (1 = unfamiliar, 4 = somewhat familiar, 7 = very familiar).

Results and discussion

I eliminated two participants who scored below 80% on the comprehension questions. Additionally, I removed the data from two participants who rated themselves as unfamiliar with more than 80% of the characters (i.e., who rated their familiarity as 1 or 2 for each character). I also eliminated reading times for stories in which participants rated themselves as unfamiliar

with the main character, resulting in a loss of 3.3% of the data. Next I pruned reading times that were less than 300 ms or more than three standard deviations above the cell mean, resulting in a loss of 0.8% of the data. Mean reading times for Experiment 1 are displayed in Table 2. I conducted separate repeated-measures ANOVA on the event and spillover sentences, using subjects (F_1) and items (F_2) as random variables.

The real-world first hypothesis predicted that readers would always be fastest to comprehend the realistic events, regardless of the narrative world. The narrative-world first hypothesis predicted an interaction between story world and event type. Specifically, it predicted that readers would be faster to read fantastic events within fantastic narrative worlds, and realistic events within realistic narrative worlds. To test these predictions, I first analyzed reading times for the target sentences. There was a significant effect of story type on reading time for the event sentences ($F_1(1, 31) = 12.46, p = .001$; $F_2(1, 19) = 5.93, p = .025$). Additionally, there was a significant main effect of event ($F_1(1, 31) = 11.57, p = .002$; $F_2(1, 19) = 5.46, p = .03$). As predicted by the familiar-world first hypothesis, these main effects were qualified by a significant interaction ($F_1(1, 31) = 54.63, p < .001$; $F_2(1, 19) = 12.73, p = .002$). Planned comparisons suggested that participants were significantly faster to read events that were consistent with the narrative world. For realistic stories, participants were significantly faster to read realistic events ($M = 2003$ ms) than fantastic events ($M = 2856$ ms) ($F_1(1, 31) = 45.00, p < .001$; $F_2(1, 19) = 14.62, p = .001$). For the fantastic stories, participants were faster to read the fantastic events ($M = 1983$ ms) than the realistic events ($M = 2302$ ms) by subjects ($F_1(1, 31) = 11.59, p = .002$) but not by items ($F_2(1, 19) = 2.59, p = .124$).

The means in Experiment 1 indicated that participants took longer to read events that were inconsistent with the narrative world in realistic stories (e.g., bullets bouncing off the chest of a police officer) (2856 ms) relative to fantastic stories (2302 ms) (e.g., bullets killing Superman). This difference suggests that reader may find it easier to comprehend an inconsistent event within the context of a fantasy story relative to a realistic story. To test this possibility, I subtracted reading times from the events that were consistent with the narrative world from the events that were inconsistent with the narrative world. A paired-samples t-test revealed a larger difference between consistent and inconsistent events in realistic stories (854 ms) than fantastic stories (319 ms), ($t_1(31) = 3.40, p = .002$; $t_2(19) = 2.34, p = .03$). This pattern supports the idea that readers recover faster from inconsistencies in fantastic stories relative to realistic stories. I will explore this further in the discussion.

I conducted a repeated-measure ANOVA on reading times for the spillover sentences to see if these were affected by whether the story contained a violation of the narrative world. The ANOVA revealed a main effect of story type such that participants were faster to read the spillover sentences for the fantastic stories ($M = 1879$ ms) relative to the realistic stories ($M = 1957$ ms), by subjects ($F_1(1, 31) = 5.28, p = .029$) but not by items ($F_2(1, 19) < 1$). This finding was not predicted by any of the hypotheses and is difficult to interpret. There were no other significant effects for the spillover sentences (All F 's $< 1, p > .05$). These results suggest that the slowdowns due to narrative-inconsistency are not appearing in the spillover sentences, indicating that participants recovered from the inconsistencies before continuing on to the next sentence.

The results in Experiment 1 support the narrative-world first hypothesis. Readers were quicker to read sentences that fit with their prior knowledge about familiar narrative worlds, even when those sentences described events that were implausible in the real world. These data suggest that, when people read a story set in a familiar narrative world, prior knowledge about familiar narrative worlds is more accessible in memory than real-world knowledge. This finding

is consistent with the idea that narratives transport readers to narrative worlds. One surprising result from Experiment 1 is that readers took less time to read narrative-inconsistent events in fantastic worlds relative to realistic worlds, suggesting that readers find it easier to recover from inconsistencies in fantasy stories. In Experiment 3, I attempted to replicate this difference between realistic and fantastic stories. Experiments 2 through 5 will focus on how readers use prior knowledge and textual cues to guide their comprehension of realistic and fantastic events in stories.

Chapter 3: Introduction to Experiments 2 through 5

In Experiment 1, I found that readers expect information in stories to be consistent with their prior knowledge of the narrative world. However, readers frequently encounter new situations and new characters that go beyond their prior knowledge. For example, how do readers react when an unfamiliar character gets shot? This unfamiliar character could potentially be an ordinary person or a fantastic character that is impervious to bullets. The reader may lack prior knowledge about whether the character is impervious to bullets, but may use cues in the text (e.g., that the character is a native of Krypton) to comprehend the event. In this section, I outline three hypotheses about how readers comprehend information in fantastic stories that goes beyond their prior knowledge, which I propose to test in Experiments 2-5.

The first hypothesis is based on the principle of minimal departure, which was formulated by philosopher Marie-Laure Ryan. According to the principle of minimal departure, people use the real world as a template for narrative worlds, and make minimal adjustments to the template when necessary. To illustrate the principle of minimal departure, consider a story about Superman. Based on their experiences with Superman, readers know that Superman has particular powers, such as the ability to fly and shoot lasers from his eyes. According to the principle of minimal departure, people make these adjustments for Superman, but expect the world of Superman to otherwise resemble the real world. The hypothesis that emerges from this, which I will call the minimal-departure hypothesis, states that readers will only find it easy to comprehend fantastic events that are consistent with their prior knowledge. This hypothesis predicts that readers would find it difficult whenever Superman acts in a way that goes beyond his specific powers, such as hypnotizing a character with his eyes. Presumably, prior encounters with Superman should not have led readers to believe that he has mind-control powers, rendering this event difficult to comprehend. On this hypothesis, when readers lack prior knowledge about a particular aspect of a narrative world they will fall back on their real-world knowledge. Thus if they don't know that Superman has mind control abilities, the minimal-departure hypothesis states that readers will assume that Superman, like an ordinary person, lacks these abilities. This hypothesis also predicts that, when readers encounter a new character in Metropolis, they should expect that character to behave like an ordinary person in the real world. It predicts that people will experience difficulty if an ordinary character carries out a fantastic action, such as shooting lasers from their eyes.

An alternative possibility is that readers allow for a range of possible events within a story based on their prior knowledge and textual cues. I will refer to this as the *graded-departure hypothesis*. As with the minimal-departure hypothesis, this hypothesis predicts that readers will find it easiest to comprehend fantastic events that are consistent with their prior knowledge about a specific fantastic world (e.g., Superman shooting lasers). Like the minimal-departure hypothesis, the graded-departure hypothesis predicts that readers will experience difficulty comprehending a story in which Superman is killed by bullets because this contradicts their prior knowledge. However, unlike the minimal-departure hypothesis, the graded-departure hypothesis predicts that readers will find it easy to comprehend a story about a native from

Krypton shooting lasers because the text provides a cue that the Kryptonian is different from ordinary people. This hypothesis also predicts that readers would experience difficulty if an ordinary bank teller in Metropolis shot lasers, because the text does not cue readers that the character is different from people in the real world. It is important to note that readers may vary in how they make these judgments, based on their beliefs about a particular narrative world. For example, somebody who is familiar with the world of Superman may know that all Kryptonians can shoot lasers. However, somebody who is less familiar with Krypton may believe that Superman possess special powers that other Kryptonians lack. On this approach, readers use both prior knowledge and textual cues to determine the plausibility of an event.

A third possibility is that readers always find it easy to comprehend fantastic events within a fantasy context. I will refer to this as the *anything-goes hypothesis*. For example, this hypothesis predicts that readers would find it equally easy to comprehend a sentence about bullets bouncing off the chest of Superman or an unfamiliar Kryptonian, because they are both fantastic characters. However, this hypothesis predicts that readers will experience difficulty if bullets bounce off the chest of an ordinary bank teller in Metropolis because there are not textual cues indicating that the bank teller is fantastic. Unlike the previous hypotheses, the anything-goes hypothesis predicts that readers will rely primarily on textual cues to determine the plausibility of fantastic events.

In the remainder of the experiments, I contrast these hypotheses by studying how easily readers comprehend realistic and fantastic events for familiar and unfamiliar characters. In Experiment 2, participants read stories about familiar fantastic characters experiencing fantastic events that do not fit with prior knowledge and varied in plausibility. Experiments 3 through 5 focused on how readers comprehend stories about unfamiliar characters experiencing realistic and fantastic events. In Experiment 3, participants read stories about familiar fantastic (e.g., Superman) and unfamiliar ordinary characters (e.g., a bank teller in Metropolis) in fantastic worlds experiencing realistic and fantastic events. In the last two experiments, participants read stories about familiar fantastic (e.g., Superman), unfamiliar fantastic (e.g., a native from Krypton), and unfamiliar ordinary characters (e.g., a bank teller) experiencing fantastic events (Experiment 4) or realistic events (Experiment 5).

Chapter 4: Experiment 2

In Experiment 2, participants read stories about familiar fantastic characters experiencing plausible, mildly implausible, or very implausible fantastic events. For example, the plausible version of the Peter Pan story described him flying to visit Wendy, the mildly implausible version described him riding a pirate ship, and the very implausible version described him riding a crocodile. (See Table 3 for a full example).

Each of the three hypotheses makes different predictions about how easily readers will comprehend the different types of events. The minimal departure hypothesis predicts that people will be fastest to read sentences containing the plausible events because these are consistent with prior knowledge. In addition, the minimal-departure hypothesis predicts that participants will be equally slow for the mildly and very implausible events, because neither are consistent with readers' prior knowledge and therefore will require readers to adjust in the moment. The graded-departure hypothesis also predicts that readers will be fastest for the plausible events because they are specified by prior knowledge. However, this hypothesis also predicts that readers will be faster to read the mildly implausible events relative to the very implausible events, because the latter more strongly violate readers' sense of what can happen within the story. I believed that there would be a gradient in the plausibility of events within a narrative, with some events being more plausible than others. I therefore predicted that the data would support the graded-departure hypothesis. Finally, the anything-goes hypothesis predicts that readers will be equally fast to read all fantastic events, regardless of their plausibility, because they are being experienced by fantastic characters.

Method

Participants

34 Stony Brook undergraduates participated for course credit. All participants were native English speakers.

Materials

Norming: I conducted norming to find plausible, mildly implausible, and very implausible events to serve as the basis for new stimuli. Thirty-three Stony Brook undergraduates read 104 sentences describing familiar fictional characters carrying out fantastic events on a computer as part of another experiment. Participants rated the plausibility of each event on a scale from 1-7 (1 = implausible, 4 = somewhat plausible, 7 = very plausible). Participants were instructed to press 0 if they were unfamiliar with the character in the sentence. DirectRT software randomized the order in which each participant saw the sentences.

Stimuli: Using the ratings from the norming, I chose characters who had an event that was rated as plausible ($M = 6.28$), mildly implausible ($M = 3.13$), or very implausible ($M = 1.40$).

All the stories described familiar fantasy characters carrying out fantastic events (see Table 3 for a sample). Thus, there were three versions of each story. Participants also read 18 filler stories set in familiar fantasy worlds. To prevent participants from consistently expecting implausible events in stories, I rewrote the filler stories to ensure that they all included plausible events.

Design, Apparatus, and Procedure.

I created three conditions using a Latin-square design to counterbalance the presentation of the different story versions. All stimuli were presented using the same computers and the same procedure as in Experiment 1.

Results and discussion

I eliminated the data from four participants who rated themselves as unfamiliar with more than 80% of the fantasy characters, leaving 30 participants for analysis. I followed the same pruning procedure as in Experiment 1, resulting in a loss of 8.14% of the data. Participants rated themselves as unfamiliar with more of the characters relative to Experiment 1, resulting in a loss of more data points.

I expected the pattern of reading times to be consistent with the graded-departure hypothesis, which predicted that readers would be fastest for the plausible sentences, slower for the mildly plausible sentence, and slowest for the very implausible sentences. The minimal-departure hypothesis predicted that readers would be fastest for the plausible sentences, and equally slow for the mildly and very implausible sentences. The anything-goes hypothesis predicted that there would be no significant differences in reading times between the different types of events.

To evaluate these hypotheses, I looked for differences in reading times for the target sentences to see if there was an effect of the event type (i.e., plausible, mildly implausible, or very implausible). The mean reading times are reported in Table 4. A Shapiro-Wilkes test revealed that the data did not meet assumptions of normality. Therefore, I log-transformed the data to meet assumptions of normality. A repeated-measures ANOVA revealed a significant effect of event type on reading times ($F_1(1, 29) = 8.09, p = .001$; $F_1(1, 17) = 3.48, p = .02$). Planned comparisons revealed that participants were faster to read target sentences with plausible events ($M = 2102$ ms) than mildly plausible events ($M = 2311$ ms) ($F_1(1, 29) = 4.88, p = .035$; $F_2(1, 17) = 2.80, p = .113$). Participants were also faster to read plausible events relative to very implausible events ($M = 2468$ ms) ($F_1(1, 29) = 24.27, p < .001$; $F_2(1, 17) = 4.53, p < .048$). However, there was no significant difference between reading times for the mildly and very implausible events ($F_1(1, 29) = 2.26, p = .144$; $F_2(1, 17) = .229, p > .05$). Though the data are numerically different, the effect size is small (Cohen's $d = .21$ by subjects and $.27$ by items). The small effect may have been due to the overall plausibility of mildly implausible sentences, which were rated somewhat low in plausibility ($M = 3.11$). The ratings for the mildly implausible sentences were closer to the very implausible sentences ($M = 1.40$) than the very plausible sentences (6.28), and so did not represent a middle level of plausibility. Perhaps if the mildly implausible sentences were considered a bit more plausible, around a 4.0 , a difference would have emerged. I used G*Power to conduct a power analysis of Experiment 2 with the current effect size. According to G*Power, I would require 297 participants to have a power of $.95$ to detect an effect of $d = .21$. Future experiments may find a significant difference between

mildly and very implausible events if they can increase the difference in plausibility between both types of stories, which may increase the effect size. The current pattern of results supports the minimal-departure hypothesis, which predicted that readers would be equally slow to read the mildly and very implausible events because they were not specified by prior knowledge.

Next I analyzed reading times for the spillover sentences to see if they were affected by the plausibility of the target sentence. As with the target sentences, a Shapiro-Wilkes test revealed that the data did not meet assumptions of normality. I therefore log-transformed the data to achieve normality. A repeated-measure ANOVA yielded no significant effects of story type (All F 's < 1 , $p > .05$), suggesting that participants assimilated the event in the target sentences before reading the spillover sentences.

The results from Experiment 2 provide support for the minimal-departure hypothesis, which states that people rely on their prior knowledge to comprehend events in stories. Whenever an event is not specified by prior knowledge, this hypothesis predicts that people will experience difficulty during comprehension. Consistent with this, participants in Experiment 2 were fastest to read about familiar characters experiencing plausible events that fit with prior knowledge, and reading times did not differ significantly for the mildly and very implausible events. This pattern is inconsistent with the anything-goes hypothesis, which predicted equal reading times across conditions, and the graded-departure hypothesis, which predicted that people would be faster to read mildly implausible events than very implausible events. These findings suggest that readers have specific expectations for familiar fantasy characters based on their prior knowledge. However, as Experiment 2 may not have had the power to detect a small difference in reading times between the mildly and very plausible sentences, further replication is necessary to reinforce these conclusions. In Experiments 3 – 5, I will extend these findings by exploring whether readers similarly rely on prior knowledge when reading about unfamiliar characters in fantasy worlds.

Chapter 5: Experiment 3

In Experiment 3, I tested how readers comprehend ordinary characters experiencing realistic and fantastic events (see Table 5 for a sample story). As in Experiment 1, participants read realistic and fantastic stories. In the fantastic version of the Superman story, the fantastic event described bullets bouncing off the chest of an ordinary bank teller in Metropolis, while the realistic event described the teller being killed by bullets. The realistic version of the story was set in Boston, and described bullets bouncing off the chest of or killing an ordinary police officer.

Both the minimal-departure and graded-departure hypotheses make the same predictions for this experiment. Specifically, they both predict that readers will take longer to comprehend fantastic events relative to realistic events because they expect ordinary characters to be subject to real-world principles. In contrast, the anything-goes hypothesis predicts that readers will be faster to read the fantastic events when they occur within a fantastic narrative world, because it specifies that readers find it easy to comprehend any fantastic event that is set within a fantastic story. The anything-goes hypothesis also predicts that reading times will be equal for the realistic events across both story versions, because the realistic events do not explicitly contradict readers' prior knowledge. I predicted that the data would support the minimal and graded-departure hypotheses because I believe that setting a story in a fantastic world does not render all fantastic events equally plausible. In addition to testing these hypotheses, I also sought to replicate the finding from Experiment 1 that participants were faster to read inconsistencies in fantastic narratives relative to realistic narratives.

Method

Participants

35 Stony Brook undergraduates participated for course credit. All participants were native English speakers.

Materials

I modified the stories from Experiment 1 so that the realistic and fantastic events always focused on an ordinary person (see Table 5 for a sample story). As in Experiment 1, the stories were set in either a realistic or familiar fantastic narrative world. In total, there were four versions of each story. For each story, both versions of the target sentence contained an equal number of syllables and words to control for length. Participants read the practice and filler stories from Experiment 1.

Design, Apparatus, and Procedure

I used a Latin-Square design to create four conditions to counterbalance the presentation of stories. The apparatus and procedure were the same as in the previous experiments.

Results and discussion

I eliminated the data from one participant who scored below 80% on the comprehension questions. Additionally, I removed the data for two participants who rated themselves as unfamiliar with more than 80% of the fantasy characters used in the stories, leaving 32 participants for analysis. I followed the same pruning procedure as in Experiment 1, resulting in a loss of 5.9% of the data.

Both the minimal-departure and graded-departure hypotheses predicted that readers would be slower to comprehend the fantastic events than the realistic events, regardless of the story world. The anything-goes hypothesis predicted that readers would always find it easy to comprehend the realistic event, but that readers would find it easier to comprehend the fantastic event within the context of a fantastic world. I conducted a repeated-measures ANOVA on reading times for target sentences to determine if the narrative world (i.e., realistic or fantastic) and event type affected reading times (mean reading times are displayed in Table 6). Because data for the items analysis violated assumptions of normality, I conducted a log-transformation. There were no significant main effects of narrative world (all F 's < 1 , $p > .05$). There was a significant main effect of event such that participants were faster to read realistic events than fantastic events, regardless of narrative context, ($F_1(1, 31) = 60.63$, $p < .001$; $F_2(1, 19) = 28.72$, $p < .001$). The interaction was not significant ($F_1(1, 31) = 1.08$, $p = .308$; $F_2(1, 19) < 2.66$, $p > .05$).

I also conducted a repeated-measures ANOVA on reading times for the spillover sentences to see if there were any effects of story or event type. There were no main effects of event or story type, all F 's < 1 , $p > .05$. For the interaction effect, there was a trend for participants ($F_1(1, 31) = 3.46$, $p = .073$) but not for items ($F_2(1, 19) < 1$, $p > .05$). Because the interaction was only a trend by participants and was not significant by items, I will refrain from interpreting this result. As in the previous experiments, reading times for the spillover sentences were unaffected by prior context.

I also tested whether participants were faster to read implausible events in fantastic stories relative to realistic stories, as I found in Experiment 1. Because the fantastic actions were considered implausible in this experiment, I subtracted reading times for the realistic actions from the fantastic actions as a measure of how long people took to adjust their mental model. A t-test revealed no significant differences in how long people took to adjust for fantastic stories (870 ms) relative to realistic stories (672 ms) ($t_1(32) = 1.04$, $p = .308$; $t_2(20) = 1.39$, $p = .18$). As the means indicate, this pattern of differences is opposite to Experiment 1. In Experiment 3, participants took longer to read inconsistencies in fantastic stories relative to realistic stories. This contradicts the idea that people find it easier to comprehend inconsistencies in fantastic stories. It is important to note that the type of inconsistency varied across experiments. In Experiment 3, the inconsistency always revolved around ordinary characters in fantastic worlds whereas in Experiment 1 some of the inconsistencies revolved around fantastic characters. It is possible that readers always find it easier to comprehend inconsistencies that involve fantastic characters.

When reading about ordinary characters in realistic and fantastic worlds, participants were always faster to read realistic events than fantastic events. These results are consistent with both the minimal-departure and graded-departure hypotheses, which predicted that readers would expect ordinary people in both types of narrative worlds to be subject to real-world rules. The results are inconsistent with the anything-goes hypothesis, which predicted that participants would be faster to comprehend fantastic events within the fantastic narrative worlds. This suggests a potential refinement of the anything-goes hypothesis. Perhaps simply setting a story in a fantastic world is not sufficient to make fantastic events plausible, because even fantastic worlds contain ordinary people. Instead, when a story marks a character as fantastic, readers may find it easy to comprehend the character experiencing a fantastic event. This possibility will be tested directly in Experiment 4. Additionally, Experiment 4 will provide a context in which the minimal-departure and graded-departure hypotheses make competing predictions about how people respond to unfamiliar characters.

Chapter 6: Experiment 4

In Experiment 4, I explored how readers comprehend familiar fantastic characters, unfamiliar ordinary characters, and unfamiliar fantastic characters experiencing fantastic events (see Table 7 for a sample story). For example, the target sentence of the Superman story described bullets bouncing off the chest of Superman, a native from Krypton, or a bank teller.

The minimal-departure hypothesis predicts that readers will be fastest to read about familiar fantastic characters experiencing fantastic events because this will be consistent with prior knowledge. For the unfamiliar fantastic and ordinary characters, the minimal-departure hypothesis predicts that readers will slow down because they lack prior knowledge about the characters and will therefore expect them to act like ordinary people. The graded-departure hypothesis also predicts that readers will be fastest to read about familiar fantastic characters experiencing familiar fantastic events. Unlike the minimal-departure hypothesis, the graded-departure hypothesis predicts that readers will be faster to read about unfamiliar fantastic characters experiencing fantastic events than unfamiliar ordinary characters. I predicted that the pattern of reading times would be consistent with the graded-departure hypothesis because I expected that readers would use both prior knowledge and textual cues during comprehension. Finally, if simply marking a character as fantastic makes it easier to comprehend them experiencing fantastic events, as predicted by the anything-goes hypothesis, then readers should be equally fast to comprehend familiar and unfamiliar fantastic characters experiencing fantastic events. The anything-goes hypothesis also predicts that readers will slow down when an ordinary character experiences a fantastic event.

Method

Participants

Forty Stony Brook undergraduates participated for course credit. All participants were native English speakers.

Materials

Participants read 18 experimental stories with the same structure as Experiments 1 and 2 (see Table 7 for a sample story). All of the stories were set in fantasy world and described characters carrying out fantastic events. The event was carried out by a familiar fantastic character (e.g., Superman), an unfamiliar fantastic character (e.g., an alien from Krypton), or an unfamiliar ordinary character (e.g., an ordinary bank teller). Thus, there were three versions of each story. To prevent participants from expecting that all fantasy stories would contain fantasy events, I wrote 18 new filler stories describing familiar fantastic characters carrying out realistic events (e.g., The Mad Hatter boiling a pot of tea).

Design, Apparatus, and Procedure

As in Experiment 2, I created three conditions using a Latin Square design to counterbalance the presentation of stories. The procedure was the same as previous experiments, and the stories were presented on the same computers.

Results and discussion

I eliminated the data from one participant who scored below 80% on the comprehension questions. Additionally, I dropped the data from nine participants who rated themselves as unfamiliar with more than 80% of the fantasy characters used in the stories, leaving 30 participants for analysis. This high dropout rate may be due to the fact that I conducted this experiment at the end of the semester, when students who have waited until the last minute to fulfill their experiment participation requirement participate. Perhaps within this group of people, a disproportionate number of students happened to be unfamiliar with the characters used in this experiment. I followed the same pruning procedure as in Experiment 1, resulting in a loss of 6.5% of the data.

I analyzed reading times for the target sentences to see if comprehension was affected by the type of character. A Shapiro-Wilkes test revealed that the subject data did not meet assumptions of normality, so I log-transformed the data. A repeated-measures ANOVA found a significant effect of character type ($F_1(2, 58) = 7.31, p = .001$; $F_2(2, 34) = 5.60, p < .008$). Planned comparisons revealed that participants were slower to read fantastic events with unfamiliar ordinary characters ($M = 2480$ ms) relative to unfamiliar fantasy characters ($M = 2230$ ms) ($F_1(1, 29) = 7.68, p = .01$; $F_2(1, 17) = 2.85, p = .11$) and familiar fantasy characters ($M = 2035$ ms) ($F_1(1, 29) = 18.16, p = .001$; $F_2(1, 17) = 12.45, p = .001$). However, there were no significant differences in reading times between the unfamiliar and familiar fantasy characters ($F_1(1, 29) = 1.47, p = .235$; $F_2(1, 19) = 1.76, p > .20$). I conducted a post-hoc power analysis using G*Power, which estimated an effect size of .25 for the difference between unfamiliar and familiar fantasy characters. The power analysis revealed that both the subject and item analyses lacked power to detect this effect size. To attain a power level of .95, I would require 210 participants. As in Experiment 2, this experiment may have lacked the power to detect a difference between the unfamiliar and familiar fantasy characters, which has a small effect size. The pattern of reading times provides tentative support for the anything-goes hypothesis, which predicted that readers will find it equally easy to comprehend fantastic events when they are experienced by familiar and unfamiliar fantastic characters.

I also analyzed reading times for the spillover sentences to see if they were affected by the type of character. The spillover data for the subjects analysis did not meet assumptions of normality, so I log-transformed the data. A repeated-measures ANOVA did not yield any significant effects of character type on reading time ($F_1(2, 58) < 1, p > .05$; $F_2(2, 34) = 1.79, p > .05$). As in previous experiments, this finding suggests that readers finished processing the fantastic events before they read the spillover sentences.

The pattern of reading times for stories about familiar fantastic, unfamiliar fantastic, and unfamiliar ordinary characters supported the anything-goes hypothesis. Participants were slowest to read target sentences about unfamiliar ordinary characters, and were equally fast to read about familiar and unfamiliar fantastic characters. This was surprising in light of the results from Experiment 2, which supported the minimal-departure hypothesis, and Experiment 4, which

supported the minimal-departure and graded-departure hypotheses. These inconsistencies suggest that readers have specific expectations for how familiar characters will act based on their prior knowledge, and that they may expect more variation for unfamiliar characters. I will discuss this further in the general discussion. In Experiment 5, I tested how readers comprehend realistic events within fantastic stories.

Chapter 7: Experiment 5

The stories in Experiment 5 were identical to those in Experiment 4, except that the target sentence always contained a realistic event (see Table 7 for a sample story). For example, the Superman story described Superman, an alien from Krypton, or an ordinary bank teller being killed by bullets during a bank robbery.

Though the three hypotheses are about how readers comprehend fantastic events, I can extrapolate from them to make predictions about how readers will comprehend the realistic events. All three hypotheses predict that readers will slow down when Superman is killed by bullets, because this is inconsistent with prior knowledge. The minimal-departure hypothesis predicts that readers will be equally fast to comprehend the unfamiliar fantastic and ordinary characters experiencing realistic events because it specifies that unfamiliar characters should be treated like people in the real world. The graded-departure hypothesis predicts that readers will be faster to read about unfamiliar ordinary characters experiencing realistic events relative to unfamiliar fantastic characters because readers may expect ordinary characters to behave like people in the real-world, but do not have these expectations for unfamiliar fantastic characters. Finally, the anything-goes hypothesis only makes predictions about how people comprehend unfamiliar characters experiencing fantastic events, and therefore does not make any specific predictions about reading times for the unfamiliar characters.

Method

Participants

Forty-five Stony Brook undergraduates participated for credit towards their psychology classes. All participants were native English speakers.

Materials

The stories for Experiment 5 were identical to those in Experiment 4, except that I rewrote the target sentence to contain a realistic event (see Table 7 for an example).

Design, Apparatus, and Procedure

The design, apparatus, and procedures were identical to the Experiment 4.

Results and discussion

I omitted the data from 1 participant who scored low on the comprehension questions and 8 participants who rated themselves as unfamiliar with more than 20% of the characters. I ran this experiment at the end of the semester and the beginning of the summer. As in Experiment 4,

this pool of participants was less familiar with the characters in the story than participants from earlier in the semester. Pruning resulted in a loss of 5.4% of the data. The minimal-departure hypothesis predicted that readers would be slowest to comprehend the familiar fantasy characters experiencing realistic events and equally fast for the unfamiliar ordinary and fantasy characters. In contrast, the graded-departure hypothesis predicted that readers would be slowest for the familiar fantasy characters, somewhat faster for the unfamiliar fantasy characters, and fastest for the unfamiliar ordinary characters. The mean reading times are displayed in Table 9. A Shapiro-Wilkes test revealed that the data for the subject analysis did not meet the assumptions of normality. I therefore conducted a log transformation on the data. A repeated-measures ANOVA revealed a significant effect by subjects, ($F_1(2, 70) = 4.86, p = .01$), and a trend by items, ($F_2(2, 34) = 1.41, p = .10$). Follow-up comparisons revealed that participants were faster to read realistic events with ordinary characters ($M = 1693$ ms) than sentences with familiar fantastic characters ($M = 1885$ ms) by subjects, ($F_1(1, 35) = 7.50, p = .01$) and a trend by items ($F_2(1, 17) = 3.50, p = .079$). Additionally, participants were faster to read realistic sentences for ordinary characters relative to unfamiliar fantastic characters ($M = 1830$ ms) by subjects ($F_1(1, 35) = 7.97$), but not by items ($F_2(1, 17) = 3.50, p = .194$). There were no significant differences in reading times between the unfamiliar and familiar ordinary characters, ($F_1(1, 35) = .533, p > .05$; $F_2(1, 17) = .98, p = .336$). These results suggest that readers found it easier to comprehend ordinary characters experiencing realistic events than fantastic characters.

I also analyzed reading times for the spillover sentences to see if they were affected by character type. A repeated-measures ANOVA revealed a significant effect of character type that was significant by subjects, ($F_1(2, 70) = 3.76, p = .028$) and a trend by items ($F_2(1, 17) = 2.74, p = .079$). Follow-up comparisons revealed reading time patterns that mirrored the target sentences. Participants were faster to read spillover sentences for the realistic characters ($M = 1573$ ms) than the familiar fantastic characters ($M = 1740$ ms), ($F_1(1, 35) = 5.95, p = .02$; $F_2(1, 17) = 8.64, p = .009$). Participants were also faster to read spillover sentences for realistic characters relative to unfamiliar fantastic characters ($M = 1698$ ms), by subjects ($F_1(1, 35) = 4.68, p = .037$) but not by items ($F_2(1, 17) = 2.58, p = .127$). There were no differences in reading times for spillover sentences with unfamiliar and familiar fantastic characters ($F_1(1, 35) = .44, p > .05$; $F_2(1, 17) = .11, p = .336$). These findings suggest that, unlike previous experiments, reading times for the spillover sentences were affected by the type of character in the target sentence.

Participants were fastest to read about ordinary characters experiencing realistic events, supporting the idea that readers expect ordinary characters to be subject to real-world principles. Additionally, participants were equally slow to read about unfamiliar and familiar fantastic characters experiencing realistic events. Though these results do not fit with the patterns predicted by either the graded-departure or minimal-departure hypotheses, they are consistent with the results from Experiment 4, in which participants were equally fast to comprehend sentences with familiar and unfamiliar fantastic characters experiencing fantastic events. The results from Experiments 4 and 5 suggest that readers treat both familiar and unfamiliar fantastic characters similarly. Thus, the fantastic or realistic nature of the character plays an important role in how people judge the plausibility of events in narratives.

In Experiments 4 and 5, the unfamiliar fantastic characters were similar to the familiar fantastic characters. For example, in the Superman story the unfamiliar fantastic character was from Krypton, Superman's home planet. And for the story about Rapunzel, the unfamiliar fantastic character was Rapunzel's daughter. This similarity may have led participants to be

unsurprised when Rapunzel's daughter let down her long hair for another character to climb or for bullets to bounce off the Kryptonian's chest, events which would likewise be plausible for the familiar fantastic character. Perhaps if the unfamiliar fantastic characters had been more different from the familiar characters, readers may have treated them differently. Future research can clarify whether readers always treat familiar and unfamiliar fantastic characters the same way.

Chapter 8: General Discussion

The goal of this project was to explore how ordinary memory processes allow readers to construct mental models of narrative worlds. I argued that the accessibility of real-world knowledge may pose a problem for how people comprehend narratives that violate the rules of the real world. In Experiment 1, I provided evidence that, when readers are familiar with a narrative world, they find it easy to comprehend real-world violations that are consistent with the story world. For example, readers were faster to read a story about Peter Pan flying to visit Wendy rather than one about him driving. When reading a realistic narrative with an ordinary character, people were faster to read about that character driving than leaping into the air to fly. These results suggest that, when readers have a strong base of prior knowledge about a narrative world, they find it easy to comprehend unrealistic events that are consistent with the narrative world.

I then proposed three hypotheses about how readers judge the plausibility of fantastic and realistic events in narratives. The minimal-departure hypothesis predicted that people use the real world as a model for narrative worlds, and make minimal adjustments only when required. This hypothesis specifies that readers rely solely on prior knowledge when judging the plausibility of narrative events. The graded-departure hypothesis predicted that people would use both prior knowledge and textual cues to determine the plausibility of events in narratives. On this hypothesis, readers would find it easiest to comprehend events that are specified in prior knowledge (e.g., that Superman can fly). This hypothesis also predicted that readers would find some events to be more plausible than others. For example, this hypothesis predicted that readers would find it easier to comprehend a story about Zeus sending a swarm of locusts to punish a village than one about him sending aliens, because the latter should more strongly violate readers' sense of what can happen within Zeus's particular type of narrative world. I predicted that this hypothesis would be correct because it captures the idea that there is a gradient of plausible events within a narrative world. The anything-goes hypothesis predicted that readers would rely solely on textual cues, and would find it easier to comprehend fantastic events involving a fantastic story world or character.

I had predicted that readers would show a consistent pattern across experiments, supporting one of the hypotheses. However, the results did not provide such consistent support for one of the hypotheses. In Experiment 2, participants were fastest to read about familiar fantastic characters experiencing plausible events, but showed no difference in reading times for mildly and very implausible events. The results provided tentative support for the minimal-adjustment hypothesis, though the experiment may have lacked the power to detect a significant difference between the mildly and very implausible events. In Experiment 3, participants were always slower to read about ordinary characters experiencing fantastic events, regardless of whether the event occurred within a realistic or a fantastic narrative. This finding supported both the minimal-departure and graded-departure hypotheses. In Experiment 4, participants read about familiar fantastic characters, unfamiliar fantastic characters, and unfamiliar ordinary characters experiencing fantastic events. Participants were slowest to read target sentences with

unfamiliar ordinary characters, and showed no difference in reading times for the familiar and unfamiliar fantastic characters. This pattern supported the anything-goes hypothesis, which predicted equal reading times for both the familiar and unfamiliar fantastic characters. As in Experiment 2, Experiment 4 may have lacked the power to detect a significant difference between the familiar and unfamiliar fantastic characters. In Experiment 5, participants read about familiar fantastic characters, unfamiliar fantastic characters, and unfamiliar ordinary characters experiencing realistic events. Participants were fastest to read realistic events with unfamiliar ordinary characters, and equally slow for realistic events with unfamiliar and familiar fantasy characters. These results suggest that readers process realistic and fantastic events differently, depending on the nature of the character.

My experiments extend prior research, which has focused on how readers construct mental models of situations and events in realistic narratives, by exploring how readers construct mental models of different types of narrative worlds. My experiments suggest that readers use prior knowledge and textual cues to construct mental models of narrative worlds. These mental models influence how readers evaluate the plausibility of events in narratives. As indicated by Experiment 1, readers find it easy to comprehend events that are consistent with their prior knowledge, regardless of their plausibility in the real world. The findings from Experiment 2 suggest that, when readers have prior knowledge about a particular character, they find it difficult to comprehend stories that are not consistent with their prior knowledge. For example, readers found it easy to comprehend a story about Zeus sending storms to punish villagers, but found it difficult to comprehend stories about Zeus sending a swarm of locusts or aliens to punish villagers. These findings indicate that prior knowledge constrains the actions that readers find plausible for familiar characters. Future experiments could directly compare the range of actions that people find plausible for familiar and unfamiliar fantastic characters. For example, readers may find it equally plausible for an unfamiliar superhero shooting lasers from his eyes or using his eyes to hypnotize a criminal. For Superman, however, it should be plausible for him to fire lasers from his eyes because this is one of his superpowers, whereas it should be implausible for him to hypnotize a criminal because this is not one of his superpowers.

Experiments 3 through 5 suggest that readers take into account the nature of unfamiliar characters (i.e., whether they are ordinary or fantastic) when determining the plausibility of events. The results of Experiment 3, in which readers always slowed down when an ordinary character experienced a fantastic event, indicate that readers expect ordinary characters to be subject to real-world principles, even when they inhabit a fantasy world. In Experiment 4, people were equally fast to read about familiar and unfamiliar fantastic characters experiencing fantastic events, indicating that the fantastic nature of the character made it easier to comprehend the fantastic events. For Experiment 5, participants were slower to read about familiar and unfamiliar fantastic characters experiencing realistic events relative to ordinary characters. These results suggest that the ease with which readers comprehend fantastic events is affected by the nature of the character experiencing the event. The lack of a significant difference in reading times in Experiments 4 and 5 between familiar and unfamiliar fantastic characters may indicate that readers treat all fantastic characters the same. However, as noted earlier, the unfamiliar fantastic characters (e.g., Shrek's cousin Krug) were very similar to the familiar fantastic characters (e.g., Shrek). It is plausible that if the stories had more dissimilar characters (e.g., Shrek and a fairy), readers would have treated the characters differently.

The experiments that I have discussed provide evidence that, when readers have sufficient knowledge about a narrative world, they find it easy to comprehend fantastic events

that fit within that narrative world. However, my experiments relied on reading times for complete sentences, in which small effects of contradicting real-world knowledge that may show up in a particular region of a sentence may be diminished across the whole sentence. Other methods, such as eye-tracking, may be able to detect if there is a small, immediate effect of contradicting real-world knowledge, as in Ferguson & Sanford (2006).

In the introduction, I discussed a study by Nieuwland and Van Berkum (2006) in which participants registered fantastic events as anomalous in the first and third sentence of a narrative, but not in the fifth sentence. I suggested that readers may have to build up a sufficient context to easily comprehend fantastic events. Further research can help clarify how readers build up context when reading unfamiliar fantastic narratives. For some types of stories, such as Nieuwland and Van Berkum's story about a singing peanut, readers may require several sentences to build up a context in which a fantastic event is easy to comprehend. The presence of a fantastic event early within a narrative may render subsequent fantastic events easier to comprehend. For example, readers may find it easy to comprehend a sentence about a character flying if, earlier in the story, they had encountered a character who could become invisible. The genre of a story may also cue readers to expect certain types of fantastic events. For example, setting a story on Mars may make it easier for readers to comprehend fantastic elements that are commonly found in science fiction stories, such as aliens and interplanetary travel. Readers may be surprised, however, if Mars is populated by dwarves, wizards, and unicorns, as these creatures are more commonly found in fantasy stories. Thus, further research can help to clarify how readers use different cues within a narrative to comprehend fantastic events, and the ways in which these cues constrain what readers find believable within a story.

Up to this point, I have focused on how readers construct mental models of fantastic worlds. It is important to note that all narratives, including narratives set in realistic worlds, transport people to a different world. Even realistic stories may take place in unfamiliar settings, and depart from the readers' everyday experiences to varying degrees. Readers' familiarity with the particular setting of a realistic narrative may influence the types of events that they deem plausible. For example, consider a narrative in which a person encounters a lion. This event should be easier to comprehend when the story is set in the jungles of Africa than when it is set in Manhattan. Readers may find this event easier to comprehend in Africa because it is consistent with their prior knowledge about wildlife in Africa, or because readers lack knowledge about Africa that would render this event implausible. However, readers should experience difficulty if the lion starts talking, regardless of whether the story is set in Africa or Manhattan, because animals cannot talk in the real world. Thus, both the nature of a particular narrative world (i.e., whether it is fantastic or realistic) and readers' prior knowledge about that narrative world constrain what readers deem plausible within a narrative.

I began this paper by discussing how narratives, such as *Frankenstein*, transport readers to different worlds. I have argued that readers construct mental models of narrative worlds using information that is made readily available by ordinary memory processes. My experiments indicate that readers have a sense of what is plausible within a narrative world based on real-world knowledge, prior knowledge about particular narrative worlds, and textual cues (e.g., whether a character is fantastic or ordinary). These experiments serve as the basis for further research on how people construct mental models of different narrative worlds, and how these mental models affect readers' experiences of narratives.

Bibliography

- Albrecht, J. E., & O'Brien, E. J. (1993). Updating a mental model: Maintaining both local and global coherence. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 19, 1061–1070.
- Bransford, J. D., Barclay, J. R., & Franks, J. J. (1972). Sentence memory: A constructive versus interpretive approach. *Cognitive Psychology*, 3, 193-209.
- Ferguson, H. J., & Sanford, A. J. (2008). Anomalies in real and counterfactual worlds: An eye-movement investigation. *Journal of Memory and Language*, 58, 609-626.
- Ferguson, H. J., Sanford, A. J., & Leuthold, H. (2008). Eye-movements and ERPs reveal the time course of processing negation and remitting counterfactual worlds. *Brain Research*, 1236, 113-125.
- Ferguson, H. J., Scheepers, C., & Sanford, A. J. (2010). Expectations in counterfactual and theory of mind reasoning. *Language and Cognitive Processes*, 25, 297-346.
- Filik, R. (2008). Contextual override of pragmatic anomalies: Evidence from eye movements. *Cognition*, 106, 1038-1046.
- Filik, R., & Leuthold, H. (2008). Processing local pragmatic anomalies in fictional contexts: Evidence from the N400. *Psychophysiology*, 45, 554-558.
- Gerrig, R. J. (1989). Suspense in the absence of uncertainty. *Journal of Memory & Language*, 28, 633-648.
- Gerrig, R. J. (1993). *Experiencing narrative worlds*. New Haven: Yale University Press.
- Gerrig, R. J., & O'Brien, E. J. (2005). The scope of memory-based processing. *Discourse Processes*, 39, 225-242.
- Gerrig, R. J., & McKoon, G. (1998). The readiness is all: The functionality of memory based text processing. *Discourse Processes*, 26, 67–86.
- Green, M. C., & Brock, T. C. (2002). The role of transportation in the persuasiveness of public narratives. *Journal of Personality and Social Psychology*, 79, 701-721.
- Gueraud, S., Harmon, M. E., & Peracchi, K. A. (2005). Updating situation models: The Memory-based contribution. *Discourse Processes*, 39, 243-263.
- Harmon-Vukić, M., Guéraud, S., Lassonde, K. A., & O'Brien, E. J. (2009) The Activation and Instantiation of Instrumental Inferences. *Discourse Processes*, 46 467-490.
- Huitema, J. S., Dopkins, S., Klin, C. M., & Myers, J. L. (1993) Connecting goals and actions during reading. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 19, 1053-1060.
- Johnson-Laird, P. N. (1983). *Mental models: Towards a cognitive science of language, inference, and consciousness*. Cambridge, MA: Harvard University Press.
- Long, D. L., & Chong, J. L. (2001). Comprehension skill and global coherence: A paradoxical picture of poor comprehenders' abilities. *Journal Experimental Psychology: Learning, Memory, and Cognition*, 27, 1424–1429.
- Long, D. L., & Lea, R. B. (2005). Have we been searching for meaning in all the wrong places? Defining the “search after meaning” principle in comprehension. *Discourse Processes*, 39, 279-298.
- McNamara, D. S., & Magliano, J. P. (2009). Towards a comprehensive model of comprehension. In B. Ross (Ed.). *The Psychology of learning and motivation* (vol. 51, pp. 297-384). New York, NY, US: Elsevier Science.

- McKoon, G., & Ratcliff, R. (1981). The comprehension processes and memory structures involved in instrumental inference. *Journal of Verbal Learning and Verbal Behavior*, 20, 671–682.
- Myers, J. L., Cook, A. E., Kambe, G., Mason, R. A., & O'Brien, E. J. (2000). Semantic and episodic effects on bridging inferences. *Discourse Processes*, 29, 179–199.
- Nieuwland, M. S., & Van Berkum, J. J. A. (2006). When peanuts fall in love: N400 evidence for the power of discourse. *Journal of Cognitive Neuroscience*, 18, 1098–1011.
- O'Brien, E. J., Cook, A. E., & Gueraud, S. (2010). Accessibility of outdated information. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 36, 979–991.
- O'Brien, E. J., Rizzella, M. L., Albrecht, J. E., & Halleran, J. G. (1998). Updating a situation model: A memory-based text processing view. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 24, 1200–1210.
- Rapp, D. N. (2008). How do readers handle incorrect information during reading? *Memory and Cognition*, 36, 688–701.
- Rizzella, M. L., & O'Brien, E. J. (2002). Retrieval of concepts in script-based texts and narratives: The influence of general world knowledge. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 28, 780–790.
- Ryan, M. –L. (1980). Fiction, non-factuals, and the principle of minimal departure. *Poetics*, 9, 403–422.
- Shelley, M. W. (1823). *Frankenstein: or, The Modern Prometheus*. London: Thomas Davison, Whitefriars.
- Warren, T., McConnell, K., & Rayner, K. (2008). Effects of context on eye movements when reading about possible and impossible events. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 34, 1001–1010.
- Zwaan, R. A., & Radvansky, G. A. (1998). Situation models in language comprehension and memory. *Psychological Bulletin*, 123, 162–185.

Appendix

Table 1

Sample story from Experiment 1.

Realistic story

Officer Wagner drove around the streets of Boston, on patrol. Over the radio, he heard that there was a disturbance at a bank. He drove to the bank to investigate the situation. When he went inside, he saw a man holding a gun. He saw the man turn towards him and fire.

Fantastic story

Superman soared over the skyscrapers of Metropolis, patrolling the city. In the distance he heard an alarm go off at a bank. He flew towards the bank to investigate the situation. When he went inside, he saw a man holding a gun. The man turned towards Superman and fired at him.

Realistic event

He died when the bullets hit him in the chest.

Fantastic event

The bullets bounced off his chest and fell to the ground.

Spillover sentence

The man turned and ran towards the exit.

Table 2

Experiment 1 mean reading times (and standard errors) in milliseconds for the target and spillover sentences.

	Target sentence		
	Fantastic event	Realistic event	Mean
Fantastic story	1983 (113)	2301 (140)	2143
Realistic story	2856 (197)	2003 (112)	2429
Mean	2419	2153	
	Spillover sentence		
	Fantastic event	Realistic event	Mean
Fantastic story	1905 (108)	1853 (112)	1879
Realistic story	1952 (115)	1962 (113)	1957
Mean	1928	1907	

Table 3

Sample story for Experiment 2.

Superman soared above the skyscrapers of Metropolis, patrolling the city. He heard a bank alarm go off in the distance and decided to investigate. He flew to Metropolis Central Bank and went inside. He saw a man in a ski mask pointing a gun at a teller. Superman called out to the man to get his attention.

Plausible

He fired lasers from his eyes to melt the criminal's gun.

Mildly implausible

He stared into the man's eyes until the man was hypnotized.

Very implausible

He turned the criminal to stone by looking into his eyes.

Spillover sentence

Just then, a SWAT team kicked in the front door and ran inside.

Table 4

Experiment 2 mean reading times (and standard errors) in milliseconds for the target and spillover sentences.

	<u>Plausible</u>	<u>Mildly implausible</u>	<u>Very implausible</u>
Target sentences	2102 (140)	2311 (134)	2468 (138)
Spillover sentences	2256 (142)	2164 (167)	2248 (146)

Table 5

Sample story for Experiment 3.

Realistic story

Every night before bed, Jane's parents told her stories about their travels around the world. Jane was enchanted by the stories and wished that she could have adventures like her parents. Her favorite story was about when her parents went on a safari in Africa and saw lions. One night, Jane was restless after story time and couldn't fall asleep. She opened her window and stared outside longingly.

Fantastic story

Every night before bed, Jane's parents read her stories about Peter Pan and Neverland. Jane was enchanted by Neverland and wished she could go. She dreamed about Peter Pan taking her to Neverland, where she would be with the Lost Boys. One night, Jane was restless after story time and couldn't fall asleep. She opened her window and stared outside longingly.

Realistic event

She fantasized that she could fly like a bird.

Fantastic event

She flew through the window into the night sky.

Spillover sentence

She felt the night breeze tickle her face.

Table 6

Experiment 3 mean reading times (and standard errors) in milliseconds for the target and spillover sentences.

	Target sentence		
	Fantastic event	Realistic event	Mean
Fantastic story	2819 (145)	1949 (127)	2384
Realistic story	2715 (172)	2043 (99)	2379
Mean	2767	1996	
	Spillover sentence		
	Fantastic event	Realistic event	Mean
Fantastic story	1804 (84)	1706 (82)	1759
Realistic story	1714 (77)	1737 (76)	1722
Mean	1755	1723	

Table 7

Sample story for Experiments 4 and 5.

Familiar fantasy

Shrek went to bed but was unable to fall asleep. After tossing and turning for an hour, he decided to get up. He walked around his cabin and saw that everybody else was asleep. Shrek's stomach growled loudly and he realized that he was hungry. He walked to the kitchen and decided to have a late night snack.

Unfamiliar fantasy

Shortly after Shrek married Fiona, his cousin Krug came up to visit for a week. One night Krug was having a hard time falling asleep, so he decided to get up. He walked around his cabin and saw that everybody else was asleep. Krug's stomach growled loudly and he realized he was hungry. He walked to the kitchen and decided to have a late night snack.

Unfamiliar ordinary

Thomas owned a farm nearby Shrek's swamp. Being afraid of ogres, Thomas kept a pitchfork by his bed at night. One night, he heard something outside and was unable to sleep. He lit a candle and walked around his farm to make sure that there were no ogres creeping about. His stomach grumbled when he walked into the kitchen, so he decided to have a snack.

Fantastic event (Experiment 4)

He gobbled down a big plate of tasty slugs.

Realistic event (Experiment 5)

He ate a small cup of yogurt with raisins.

Spillover sentence

Afterwards, he yawned and crawled into bed.

Table 8

Mean reading times (and standard errors) in milliseconds for the target and spillover sentences in Experiment 4.

	<u>Familiar fantasy</u>	<u>Unfamiliar fantasy</u>	<u>Unfamiliar ordinary</u>
Target sentences	2035 (114)	2230 (171)	2480 (161)
Spillover sentences	1659 (88)	1733 (101)	1780 (119)

Table 9

Experiment 5 Mean reading times (and standard errors) in milliseconds for the target and spillover sentences.

	<u>Familiar fantasy</u>	<u>Unfamiliar fantasy</u>	<u>Unfamiliar ordinary</u>
Target sentences	1693 (96)	1830 (97)	1885 (104)
Spillover sentences	1573 (81)	1698 (85)	1740 (90)
