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Flying to Neverland: How readers tacitly judge norms during comprehension

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Abstract As readers gain experience with specific narrative worlds, they accumulate information that allows them to experience events as normal or unusual within those worlds. In this article, we contrast two accounts for how readers access information about specific narrative worlds to make tacit judgments of normalcy. We conducted two experiments. In Experiment 1, participants read stories about an ordinary character (e.g., a police officer in Boston) or a familiar fantastic character (e.g., Superman). Each story described a realistic event (e.g., the character being killed by bullets) or a fantastic event (e.g., bullets bouncing off the character's chest). Participants were faster to read events that were consistent with their prior knowledge about the story world. In Experiments 2a and 2b, participants read stories about familiar fantastic characters, unfamiliar fantastic characters (e.g., a Kryptonian named Dev-em), and unfamiliar ordinary characters. In Experiment 2a, participants were equally fast to read about the familiar and unfamiliar fantastic characters experiencing fantastic events, both of which were read faster than the unfamiliar ordinary characters sentences. In Experiment 2b, participants were fastest to read about unfamiliar ordinary characters experiencing realistic events and were equally slow for familiar and unfamiliar fantastic characters. Our experiments provide evidence that readers routinely use inductive reasoning to go beyond their prior knowledge when reading fictional narratives, affecting whether they experience events as normal or unusual.

Keywords Narratives · Comprehension · Norms · Inductive reasoning · Fiction

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One of the most enjoyable aspects of reading fictional narratives is that they provide readers the opportunity to mentally travel to other worlds (Gerrig, 1993). Each narrative world is subject to a unique set of constraints (Dolezel, 1988; Pavel, 1975; Weisberg & Goodstein, 2009). Consider the following excerpt from *Peter Pan* (1911/2008):

> "It's all right," John announced, emerging from his hiding-place. "I say, Peter, can you really fly?"
> Instead of troubling to answer him Peter flew around the room, taking the mantelpiece on the way. (p. 19)

This passage transports readers to a world in which one character, at least, can fly. As people continue reading, they have opportunities to see how far this ability generalizes beyond Peter himself. In this article, we explore how readers use their prior knowledge about familiar characters to comprehend new events within a narrative world. Specifically, we focus on whether readers generalize salient characteristics from familiar characters (e.g., Peter Pan) to unfamiliar characters (e.g., another Lost Boy).

Current theories of comprehension focus on activation of information in memory and the integration of that information with the incoming discourse (for a review, see McNamara & Magliano, 2009). An important component of comprehension is the process of validation, in which readers check incoming information against prior knowledge (e.g., Cook & O'Brien, 2014; Rapp, Hinze, Slaten, & Horton, 2014; for reviews, see Kendeou, 2014, and Singer, 2013). For example, Cook and O'Brien found that readers immediately slow down when they encounter information that is strongly inconsistent with prior knowledge (e.g., a vegetarian eating a cheeseburger) but that readers take longer to notice weaker inconsistencies (e.g., a vegetarian eating fish). As this example indicates, validation research has often shown that there is a cost, in terms of slower processing or different patterns of neural activity (e.g.,

Hagoort, Hald, Bastiaansen, & Petersson, 2004) when incoming information mismatches prior knowledge.

We can return to Peter Pan to offer additional analysis on the question of how readers experience new story information as matching or mismatching prior knowledge. Consider what might happen when readers of *Peter Pan* arrive at a passage that describes the Lost Boys flying above Captain Hook. This passage might provide a mismatch with prior knowledge because the text has not yet mentioned that the Lost Boys can fly. However, the Lost Boys are similar in many respects to Peter Pan (e.g., they live together in Neverland). The ease with which readers assimilate the new information about the Lost Boys will depend on whether they believe that the ability to fly is unique to Peter Pan or whether it is normal for other characters.

We anchor our analysis of how readers experience events as normal or not in Kahneman and Miller's (1986) *norm theory*. Kahneman and Miller provided an account of the mental processes that underlie people's judgments about what seems normal. In norm theory, new events serve as probes that resonate through memory, activating representations of related information. This process of passive activation is consistent with theories of comprehension (e.g., Gerrig & O'Brien, 2005; see McNamara & Magliano, 2009). However, norm theory also specifies that people's judgments of normality are informed by the norms that are constructed in the moment, on the basis of those representations. Importantly, people do not make these judgments through active, conscious processing. Rather, incoming information passively activates memory representations. On the basis of those representations, people may determine that Peter Pan is unique and not imagine that the Lost Boys could fly. Alternatively, people may determine that the Lost Boys are similar to Peter Pan and readily generalize his ability to fly. Below, we develop each of these proposals further.

The first proposal, which we will refer to as the *character-based norms* hypothesis, draws its inspiration from the principle of minimal departure (Ryan, 1980). This principle states that readers use the real world as a template for fictional worlds, making adjustments to the template only when specified by the text. An extension of this principle is that readers will represent attributes as belonging to specific characters and will not readily generalize to unfamiliar characters. On this account, readers will attribute the ability to fly only to characters that the text has established possess this ability. Research supports the idea that readers represent characters as possessing specific attributes (Filik, 2008; Filik & Leuthold, 2008, 2013). Using eye tracking, Filik and Leuthold (2013) found that participants were faster to read sentences in which a familiar character carried out actions that were consistent with readers' prior knowledge about the character (e.g., Peter Pan flying) than when it was inconsistent with readers' prior knowledge (e.g., Hansel and Gretel flying). Additionally, when Filik and Leuthold (2013) measured changes in electrical activity on the scalp, using event-related potentials, they found that participants exhibited a spike of negatively valenced electrical activity 400 ms after encountering information inconsistent with their prior knowledge about the specific characters, indicating that they registered the information as anomalous. These findings suggest that readers store knowledge about specific characters in long-term memory and use this knowledge to evaluate events. The character-based norms hypothesis goes a step further, predicting that readers will not generalize attributes across characters.

A second proposal, which we call the *similarity-based norms* hypothesis, is that readers will generalize features within a narrative world on the basis of similarity. Kahneman and Miller (1986) asserted that the similarity between probes and exemplars retrieved in memory play a critical role in how people assess what is normal. Prior research on inductive reasoning has found that people are more likely to extend a property from a category (e.g., *robins*) to similar categories (e.g., *sparrows*) than to less similar categories (e.g., *ostriches*) (Osherson, Smith, Wilkie, López, & Shafir, 1990). Within a narrative world, characters may be similar on a number of different dimensions, such as age, family relations, gender, and place of inhabitance. There are, for example, many similarities between Peter Pan and the other Lost Boys: They are all lost boys, children, and live together in the forests of Neverland. With respect to the similarity-based norms hypothesis, when information about Peter Pan becomes active in memory, the similarities between Peter Pan and the Lost Boys will prompt readers to find it normal that the Lost Boys can fly, even though their ability to fly wasn't explicitly established in the text. We note that not all similarities will be sufficient for readers to generalize across characters. Characters within the world of Metropolis may share many features with Superman (e.g., be male, wear tights, have dark hair, etc.). However, readers will be unlikely to generalize Superman's ability to other characters unless the similar features are causally relevant (e.g., being from Krypton; for a discussion of the role of relevance in induction, see Medin, Coley, Storms, & Hayes, 2003). This hypothesis predicts that readers will read a passage about the Lost Boys flying quickly because of their similarity to Peter Pan. In contrast, readers should slow down if a dissimilar character (e.g., Wendy's father George Darling) were to fly. These hypotheses capture different ideas about how readers experience events as normal or unusual as a consequence of the information they've acquired about particular narrative worlds.

We conducted two experiments that used familiar fantasy worlds, so that readers would have abundant past experience to inform their experiences of the stories. We note that people frequently revisit narrative worlds. They may do so by either rereading familiar books or reading new books set within the

same world. For example, J. M. Barrie presented *Peter Pan, or the Boy Who Wouldn't Grow Up* as a play (1904/2003) and a novel (*Peter Pan and Wendy*, 1911/2008a) and wrote *Peter Pan in Kensington Gardens* (1906/2008b), which takes place before Peter meets Wendy. Barrie's work has also spawned others to write numerous stories set in the world of Peter Pan, including movies, books, comics, and video games. Our experiments explored how readers' prior experience with familiar narrative worlds affected the way that they comprehended new stories set within those worlds.

Consider the following narrative:

> 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.

This narrative introduces an ordinary character named Thomas who inhabits the fairy tale narrative world of Shrek. Now consider a different version of the same story:

> 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.

This version of the story introduces Krug, who also inhabits the same world as Thomas. However, while Thomas is an ordinary person, readers may infer that Krug, who is related to Shrek, is an ogre. The last sentence of this story contains a fantastic action:

> He gobbled down a big plate of tasty slugs.

This action, eating a plate of slugs, should be consistent with people's prior knowledge about Shrek, who routinely eats things the readers would deem disgusting. In the following experiments, we will explore how people's knowledge about what is normal for characters like Shrek applies to other characters within a narrative world.

The goal of Experiment 1 was to establish a set of plausible actions for familiar fantastic characters and to further confirm that readers experience difficulty when characters act inconsistently with readers' prior knowledge of specific narrative worlds. Participants read stories about ordinary or familiar fantastic characters (e.g., Shrek) carrying out a realistic action (e.g., eating nonfat yogurt) or a fantastic action (e.g., eating slugs). In Experiments 2a and 2b, we contrasted the character-based norms and similarity-based norms hypotheses by having participants read stories about an ordinary character, a familiar fantastic character, or an unfamiliar fantastic character carrying out a fantastic action (Experiment 2a) or a realistic action (Experiment 2b). We measured reading times on the realistic and fantastic actions to determine the ease with which characters comprehended the actions.

Experiment 1

Our main goal for Experiment 1 was to provide evidence that readers store knowledge about specific characters in long-term memory and use this knowledge to determine norms for particular characters within narrative worlds. This experiment supplements earlier research (e.g., Filik & Leuthold, 2013) that has shown that readers find it easy to comprehend familiar fantastic characters carrying out fantastic actions that are consistent with their abilities. We also wish to extend those findings by demonstrating that there are also realistic actions that are implausible for familiar fantastic characters, suggesting that readers make efficient use of past experiences to make tacit judgments of the normalcy of characters' actions.

Additionally, we needed the stories from Experiment 1 to serve as the basis for the stimuli in Experiments 2a and 2b, in which we explored how readers assess norms for unfamiliar characters using their prior knowledge about familiar characters. To this end, it was important to establish that our stories contained actions that participants would deem plausible or implausible for familiar fantastic characters. Participants read short stories set in realistic or familiar fantastic worlds. Here is a sample 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, rendering any events that are implausible in the real world difficult to assimilate. Each story continued with a realistic or fantastic event in the sixth sentence, which we call the *target sentence*. Here are the continuations for the sample story (including the final sentence of the story, which was equivalent across the versions):

> *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 assimilate the realistic event because it fits with their real-world knowledge. In contrast, readers should experience difficulty assimilating 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, activating reader's prior knowledge about that narrative world. Prior research by Filik and colleagues (Filik, 2008; Filik & Leuthold, 2008, 2013) demonstrated that readers find it difficult to comprehend stories in which characters act inconsistently with readers' prior knowledge. We therefore predicted that readers would be faster to read realistic events, relative to fantastic events, for the realistic stories but would show the opposite pattern for the fantastic stories.

Method

Participants

We recruited 36 undergraduates from the psychology department participant 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, we recruited 20 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 7-point Likert scale (1 = *unfamiliar*, 4 = *somewhat familiar*, 7 = *very familiar*). We instructed participants to make their ratings on the basis of their familiarity with the character and the information described in the sentence. 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. We 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 On the basis of the norming, we chose 20 sentences (focused on 20 different characters) that participants rated as containing familiar information about a particular fantasy world (M = 6.23). These sentences served as the basis for the fantastic events. We also chose 20 sentences that participants rated as being unfamiliar for a particular fantasy character (M = 1.58) to serve as the basis for the realistic events. We 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 based on sentences from the norming. Because we were comparing reading times for the target sentences, the two versions of the target sentence were matched on number of words and syllables. The final sentence concluded the event and was the same across all story versions. Each story appeared in four versions, with a realistic or fantastic setting and a realistic or fantastic event.

We also wrote 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 were less likely to make strategic adjustments based on expectations of the content and outcomes of the stories set in fantastic worlds.

All of the stories ended with a yes/no comprehension question. The answer to half of the comprehension questions was yes.

Design

We 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 a realistic-event sentence and the other half contained a fantastic-event sentence. Every participant read five of each story type. Each condition contained one version

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 hit the ground.
The man turned and ran towards the exit.

of every experimental story, with all four versions of each story presented across the four conditions. All participants read the same filler and practice stories.

Apparatus

Participants read the stories on two Dell Optiplex desktop computers. We 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 the spacebar to advance to the next sentence, until they had read the entire story. Participants saw each sentence separately, allowing us to collect separate reading times for each sentence. 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 had read all the stories.

At the beginning of the experiment, participants read four practice stories to familiarize themselves 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 the stories, they rated their familiarity with each of the fantastic characters on a 1 to 7 scale (1 = *unfamiliar*, 4 = *somewhat familiar*, 7 = *very familiar*).

Results

We removed 2 participants who scored below 80 % on the comprehension questions. Additionally, we eliminated the data from 2 participants who rated themselves as unfamiliar (i.e., giving ratings of 1 or 2) with more than 20 % of the characters. We 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, we 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. We conducted separate repeated measures ANOVAs on the event sentences, using participants (F_1) and items (F_2) as random variables.

We hypothesized that there would be an interaction between story world and event type such that participants would be faster to read the events that were consistent with the realistic or fantastic narrative worlds. Indeed, the interaction between story world and event type was significant, $F_1(1, 31) = 54.63$, $MSE = 201{,}234$, $p < .001$, $\eta^2 = .64$; $F_2(1, 19) = 12.73$, $MSE = 495{,}665$, $p =. 002$, $\eta^2 = .40$. Planned comparisons largely confirmed 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 ($M = 2{,}003$ ms) than fantastic events ($M = 2{,}856$ ms), $F_1(1, 31) = 45.00$, $MSE = 259{,}077$, $p < .001$, $\eta^2 = .59$; $F_2(1, 19) = 14.62$, $MSE = 488{,}231$, $p = .001$, $\eta^2 = .44$. For the fantastic stories, participants were faster to read the fantastic events ($M = 1{,}983$ ms) than the realistic events ($M = 2{,}302$ ms) by participants, $F_1(1, 31) = 11.59$, $MSE = 140{,}135$, $p = .002$, $\eta^2 = .27$, but not by items, $F_2(1, 19) = 2.59$, $MSE = 299{,}895$, $p = .124$, $\eta^2 = .12$. We also found main effects for story type, $F_1(1, 31) = 12.46$, $MSE = 211{,}427$, $p = .001$, $\eta^2 = .29$; $F_2(1, 19) = 5.93$, $MSE = 275{,}552$, $p = .025$, $\eta^2 = .24$, and event type, $F_1(1, 31) = 11.57$, $MSE = 197{,}978$, $p = .002$, $\eta^2 = .27$; $F_2(1, 19) = 5.46$, $MSE = 292{,}420$, $p = .03$, $\eta^2 = .22$. These findings demonstrate the impact of readers' prior knowledge on how quickly they comprehend narrative events.

Table 2 Experiment 1 mean reading times (in milliseconds; with standard errors) for the target sentence

	Fantastic event	Realistic event	Mean
Fantastic story	1,983 (113)	2,301 (140)	2,143
Realistic story	2,856 (197)	2,003 (112)	2,429
Mean	2,419	2,153	

In Experiment 1, we found evidence that readers' prior experiences of narrative worlds structured their understanding of story events. In particular, readers were faster to assimilate events that were consistent with their prior knowledge about a particular narrative world, providing further support that readers store information about the attributes of specific characters in long-term memory (Filik & Leuthold, 2013). We were also able to establish a series of actions that readers considered to be plausible or implausible for a familiar character, allowing us to use these stories as the basis for stimuli in the next experiments.

Experiments 2a and 2b

In Experiments 2a and 2b, we explored how readers assess norms for unfamiliar characters within familiar fantastic worlds, allowing us to contrast the character-based norms and similarity-based norms hypotheses.

In these experiments, participants read stories that were set within a familiar fantastic story world (see Table 3 for sample stories). Each story contained a familiar fantastic character (e.g., Shrek), an unfamiliar fantastic character (e.g., Shrek's cousin Krug), or an unfamiliar ordinary character (e.g., an ordinary farmer named Thomas). The unfamiliar fantastic character was always similar to the fantastic character through being related (e.g., Popeye's brother, Captain Cob), through being a member of the same category (e.g., mutants), or through association with characters who had fantastic abilities (e.g., Zeus's personal servant). In Experiment 2a, the characters always experienced a fantastic event (e.g., dining on slugs), whereas in Experiment 2b the characters always experienced a realistic event (e.g., snacking on yogurt).

The character-based norms hypothesis predicted that readers would encode the ability as special to the familiar fantastic character and would not generalize it to other characters. This hypothesis therefore predicted that, across both studies, reading times would be equal for the unfamiliar fantastic and unfamiliar ordinary characters. In contrast, the similarity-based norms hypothesis predicted that readers would readily generalize the ability to similar characters. This hypothesis therefore predicted no difference between reading times for familiar and unfamiliar fantastic characters.

Table 3 Sample stories for Experiments 2a and 2b

Familiar fantastic
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 fantastic
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, 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 2a)
He gobbled down a big plate of tasty slugs.
Realistic event (Experiment 2b)
He ate a small cup of yogurt with raisins.
Afterwards, he yawned and crawled into bed.
Familiar fantastic
Wolverine decided to go to a bar to have a few beers. After a few pints, he started flirting with a woman at the bar. The woman's boyfriend, who was sitting nearby, came over and started yelling at Wolverine. Wolverine got angry and punched the man. Wolverine suddenly felt somebody plunge a knife into his back.
Unfamiliar fantastic
Spike, a mutant who had just ran away to Professor Xavier's school, decided to sneak out to have a few beers. After a few pints, he started flirting with a woman at the bar. The woman's boyfriend, who was sitting nearby, came over and started yelling at Spike. Spike got angry and punched the man. Spike suddenly felt somebody plunge a knife into his back.
Unfamiliar ordinary
Wolverine decided to go to a bar to have a few beers. He watched a pair of men trying to pick up a pretty woman at the bar. After a few minutes, they started pushing each other. One man took out a knife and stabbed the other man in the stomach. The man who was stabbed screamed in pain and clutched his stomach.
Fantastic event (Experiment 2a)
He healed instantly and used his claws to attack.
Realistic event (Experiment 2b)
He had to be rushed to the emergency room.
The bartender picked up his phone and called the police.

Method

Participants

Forty undergraduates participated for course credit in Experiment 2a, and 45 participated in Experiment 2b. All participants were native English speakers.

Materials

Participants read 18 experimental stories with the same structure as Experiment 1 (see Table 3 for sample stories). In Experiment 2a, the target sentence described a fantastic event.

In Experiment 2b, the target sentence described a realistic event. The event was experienced by a familiar fantastic character (e.g., Shrek), an unfamiliar fantastic character (e.g., Shrek's cousin Krug), or an unfamiliar ordinary character (e.g., a farmer named Thomas). Thus, in each experiment, there were three versions of each story. For Experiment 2a, the filler stories all described familiar fantastic characters experiencing realistic events (e.g., The Mad Hatter boiling a pot of tea). For Experiment 2b, the filler stories all described familiar fantastic characters experiencing fantastic events (e.g., E.T. making objects levitate).

Design, apparatus, and procedure

As in Experiment 1, we created three conditions for each experiment, using a Latin Square design to counterbalance the presentation of stories. The procedure was the same as in previous experiments, and the stories were presented on the same computers.

Results

The only difference across the materials for Experiments 2a and 2b was the realistic or fantastic content of the target sentence. We controlled for length across both versions by equating the number of words and syllables. We therefore combined the data across the experiments into one omnibus ANOVA, with type of action as a between-subjects variable and character as a within-subjects variable. For Experiment 2a, we eliminated the data from 1 participant who scored below 80 % on the comprehension questions. Additionally, we dropped the data from 9 participants who rated themselves as unfamiliar with more than 20 % of the fantasy characters used in the stories, leaving 30 participants for analysis. For Experiment 2b, we omitted the data from 1 participant who scored low on the comprehension questions (i.e., below 80 %) and 8 participants who rated themselves as unfamiliar with more than 20 % of the characters, yielding a data set with 36 participants for analysis. In both studies, there was an equal number of participants in all conditions for the analyses. We followed the same pruning procedure as in Experiment 1, resulting in a loss of 6.5 % and 5.4 % of the data for Experiments 2a and 2b, respectively.

The mean reading times for the target sentences are displayed in Table 4. A Shapiro–Wilkes test revealed that the participant data did not meet assumptions of normality, so we log-transformed the data. We found a significant main effect of event type, $F_1(1, 64) = 7.40$, $MSE = .052$, $p = .008$, $\eta^2 = .10$; $F_2(1, 34) = 18.33$, $MSE = .013$, $p < .001$, $\eta^2 = .35$, such that participants were faster to read realistic events ($M = 1{,}802$ ms), relative to fantastic events ($M = 2{,}249$ ms). These findings are consistent with prior research indicating that people often experience difficulty comprehending implausible events (see Warren, McConnell, & Rayner, 2008). There was no main effect for character type (all Fs < 1, $p > .20$). Our predictions focused on the relative ease with which readers comprehend realistic and fantastic events as a function of the character experiencing the event. As was predicted, there was a significant interaction for event type and character, $F_1(2, 128) = 12.53$, $MSE = .005$, $p < .001$, $\eta^2 = .16$; $F_2(2, 68) = 7.47$, $MSE = 945{,}583$, $p = .001$, $\eta^2 = .18$.

To contrast the predictions of the character-based norms and similarity-based norms hypotheses, we needed to determine the basis of the interaction. For the fantastic events, the character-based norms hypothesis predicted that readers would be fastest for the familiar fantastic characters and equally slow for the unfamiliar ordinary and unfamiliar fantastic characters. In contrast, the similarity-based norms hypothesis predicted that readers would be equally fast for the familiar and unfamiliar fantastic characters and slowest for the unfamiliar ordinary characters. Planned comparisons revealed that participants were slower to read fantastic events with unfamiliar ordinary characters ($M = 2{,}480$ ms), relative to unfamiliar fantasy characters ($M = 2{,}230$ ms), $F_1(1, 29) = 7.68$, $MSE = .005$, $p = .01$, $\eta^2 = .21$; marginally significant by items, $F_2(1, 17) = 3.78$, $MSE = .008$, $p = .07$, $\eta^2 = .18$, and familiar fantasy characters ($M = 2{,}035$ ms), $F_1(1, 29) = 12.45$, $MSE = .007$, $p = .001$, $\eta^2 = .30$; $F_2(1, 17) = 18.15$, $MSE = .004$, $p = .001$, $\eta^2 = .52$. However, there were no significant differences in reading times of fantastic events between the unfamiliar and familiar fantasy characters, $F_1(1, 29) = 1.47$, $MSE = .007$, $p > .20$, $\eta^2 = .05$; $F_2(1, 19) = 1.21$, $MSE = .006$, $p > .20$, $\eta^2 = .07$. These data support the similarity-based norms hypothesis.

For the realistic events, the character-based norms hypothesis predicted that readers would be slowest for the familiar fantastic characters and equally fast for the unfamiliar fantastic and unfamiliar ordinary characters. In contrast, the similarity-based norms hypothesis predicted that readers would be equally slow for the familiar fantastic and unfamiliar fantastic characters and fastest for unfamiliar ordinary characters. Planned comparisons on realistic events revealed that

Table 4 Mean reading times (in milliseconds; with standard errors) for the target sentences in Experiments 2a and 2b

	Familiar fantasy	Unfamiliar fantasy	Unfamiliar ordinary
Fantastic events (2a)	2,035 (114)	2,230 (171)	2,480 (161)
Realistic events (2b)	1,885 (104)	1,830 (97)	1,693 (96)

participants were faster to read realistic events with ordinary characters (M = 1,693 ms) than sentences with familiar fantastic characters (M = 1,885 ms) by participants, $F_1(1, 35)$ = 7.49, MSE = .003, p = .01, η^2 = .18, and there was a trend by items, $F_2(1, 17)$ = 3.50, MSE = .007, p = .079, η^2 = .17. Additionally, participants were faster to read realistic sentences for ordinary characters relative to unfamiliar fantastic characters (M = 1,830 ms) by participants, $F_1(1, 35)$ = 7.98, MSE = .003, p = .008, η^2 = .19, but not by items, $F_2(1, 17)$ = 1.83, MSE = .006, p = .194, η^2 = .10. There were no significant differences in reading times between the unfamiliar and familiar fantastic characters (all Fs > 1, p > .20).

Although some of the planned comparisons for 2b were not significant by items, the pattern of results from 2b resemble those from 2a in that reading times were similar for events with familiar and unfamiliar fantastic characters. We therefore take these findings as evidence for the similarity-based norms hypothesis, indicating that readers readily generalized characteristics to the unfamiliar fantastic characters. However, the marginal results for some item analyses suggest that there may have been variability in the extent of similarity between the familiar and unfamiliar characters across stories.

To assess the impact of such variability and provide evidence that similarity is driving our results, we conducted two post hoc analyses. First, we had 29 participants rate the similarity between the familiar fantastic, unfamiliar fantastic, and unfamiliar ordinary characters within each story from Experiments 2a and 2b (e.g., Shrek, Krug, and Thomas). Using a 7-point Likert scale (1 = *not similar*, 7 = *very similar*), participants made ratings for all pairs of characters (e.g., Shrek vs. Krug, Shrek vs. Thomas, and Krug vs. Thomas). We varied the order of types of characters in each pair to counterbalance presentation across participants (i.e., half of the participants rated Shrek vs. Krug, and half rated Krug vs. Shrek). We presented the pairs in a different random order for each participant. Each participant rated all 54 pairs. We found that participants rated the familiar fantastic characters as being more similar to the unfamiliar fantastic characters (M = 4.21, range = 2.28–5.38) than to the unfamiliar ordinary characters (M = 2.87, range = 2.00–4.95) [participants, $t_1(29) = 7.33$, p < .05; items, $t_2(18) = 6.77$, p < .05].

Next, we had a separate set of 23 participants complete an inductive inference task in which they read about a familiar fantastic character possessing a characteristic and rated the probability on a 9 point scale (1 = *very unlikely*, 9 = *very likely*) that the unfamiliar fantastic character and unfamiliar ordinary character would have the same characteristic (e.g., "Shrek eats slugs for a snack. How likely is it that his cousin Krug, who is an ogre, also eats slugs?"). Participants made judgments for characters for each of the 18 stories in a randomized order. We found that people were more likely to agree that the unfamiliar fantastic character would have the trait (M = 5.20) than the unfamiliar ordinary character (M = 1.35) [participants, $t_1(23)$ = 19.81, p < .05; items, $t_2(18) = 9.26$, p < .05]. Additionally, a linear regression model revealed that similarity scores predicted the probability of generating the characteristic, ΔR = .73, R^2 = .53, $F(1, 34)$ = 35.38, p < .05.

These analyses demonstrate consistent differences among the items, with respect to the similarity of, for example, the unfamiliar fantasy characters to the familiar characters. To provide further evidence, we wished to determine whether differences in the similarity ratings predicted reading times. The similarity-based norms hypothesis predicted that readers would readily generalize attributes from familiar fantastic characters to other characters based on similarity. To test this prediction, we regressed ratings for how similar the unfamiliar fantastic and ordinary characters were to the familiar fantastic characters against the difference in reading times between the familiar fantastic characters and each of the other characters (i.e., unfamiliar fantastic − familiar fantastic, ordinary − familiar fantastic). For Experiment 2a, similarity scores significantly predicted difference scores in reading times, ΔR = .38, R^2 = .14, $F(1, 34)$ = 5.62, p = .03. For Experiment 2b, exploratory analyses revealed that the difference scores in reading times did not meet assumptions of the normal distribution of residuals, due to one score that was more than three standard deviations from the mean. We eliminated the outlier and conducted the regressions on the remaining data points. As with Experiment 2a, we found that similarity ratings were a significant predictor of reading times, ΔR = .34, R^2 = .12, $F(1, 33)$ = 4.55, p = .04. Taken together, these supplementary analyses provide further evidence that similarity affects whether readers generalize features across characters.

General discussion

The goal of this project was to investigate how people experience outcomes as normal or unusual within particular narrative worlds. To this end, in Experiment 1, we tested how readers' prior knowledge about familiar characters affected how they comprehended novel stories. Participants read stories set in realistic worlds or familiar fantastic worlds (e.g., Metropolis). Each story contained an event that was either consistent or inconsistent with readers' prior knowledge about a particular narrative world. We found that readers slowed down when they encountered an event that was inconsistent with their prior knowledge (e.g., Superman being killed by bullets). Our findings are consistent with extant research showing that readers' prior knowledge affects what they consider to be normal within a narrative world (e.g., Filik, 2008; Nieuwland & Van Berkum, 2006). We also demonstrated that there are a range of realistic actions that readers had difficulty assimilating for familiar fictional characters (e.g., Peter Pan driving a car).

In Experiments 2a and 2b, we explored how readers' knowledge for familiar characters within specific narrative

worlds affects tacit judgments of what is normal for unfamiliar characters. We articulated two hypotheses that emerged from norm theory's focus on a resonance process that is initiated by incoming information (Kahneman & Miller, 1986). In Experiments 2a and 2b, we contrasted the character-based norms and similarity-based norms hypotheses. The character-based norms hypothesis predicted that, during the process of comparison, readers would consider special abilities to apply only to specific characters and would not generalize these abilities to other characters. The similarity-based norms hypothesis predicted that when an unfamiliar character was similar to a familiar character, readers would readily generalize traits from the familiar character to the unfamiliar character. Experiments 2a and 2b contrasted these hypotheses by exploring whether readers generalize their prior knowledge about familiar fantastic characters (e.g., Superman) to similar unfamiliar fantastic characters (e.g., a citizen of Krypton). In Experiment 2a, we found that readers were equally fast to assimilate information about familiar and unfamiliar fantastic characters experiencing fantastic events; participants took longer to read the same events when they occurred for ordinary characters. In Experiment 2b, readers were fastest to read about ordinary characters experiencing realistic events and were equally slow to read about familiar and unfamiliar fantastic characters experiencing those same events. Additional analyses, based on post hoc similarity judgments, provided further evidence that participants were more likely to generalize attributes to similar characters than to dissimilar characters and that similarity ratings predicted differences in reading times. Taken together, these findings support the hypothesis that readers readily generalize features to similar characters. We also note that similarity isn't all or nothing, but that characters vary in degrees of similarity and this variation is predictive of the ease with which readers generalize.

We suggest that the support for the similarity-based norms hypothesis emerges because of the causally rich relationships between familiar fantasy characters and their particular attributes. Superman has special powers because of his origins on Krypton. In that context, we suggested that readers would readily accept that those powers would apply to other characters with the same origins. More broadly, we suggest that the causal structure of narrative worlds will affect how readily readers generalize properties across characters. Consider Spiderman's ability to crawl up walls with his bare hands. Spiderman developed this ability after being bitten by a radioactive spider. The specificity of the causal link between the event and Spiderman's abilities should lead readers not to generalize wall crawling to other fantastic characters, unless the character has also been bitten by a radioactive spider. Similarly, we would expect that readers would be less likely to generalize attributes that are not causally relevant. For example, we suspect that readers would not expect all the Lost Boys to have Peter Pan's brash personality. Thus, noncausal attributes may be more tightly bound to characters, in the manner specified by the principle of minimal departure (Ryan, 1980) and the character-based norms hypothesis.

For our experiments, we needed to set our stories in worlds with which our readers were likely to have prior familiarity. For that reason, we drew upon the range of familiar fantastic narrative worlds. However, we suggest that the results have implications for how readers manage their knowledge as they read all types of narratives, including narratives set in unfamiliar worlds that are either realistic or fantastic. We believe that, when reading narratives, people will use their prior knowledge to determine what is normal for a given narrative world. When readers encounter new information, they will validate that information against their prior knowledge that defines the world's norms. Importantly, this process of validation goes beyond checking for direct matches or mismatches against prior knowledge, because the process involves generalization from prior experiences. Our research thus opens questions about how readers compare incoming information against prior knowledge during validation, such as what properties determine similarity. Additionally, there may be other cues that contribute to readers' experiences of the norms of a narrative world, such as genre (e.g., science fiction vs. mystery). Exploring these additional aspects of the process of validation will help further theories of narrative comprehension.

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