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The Role of Memory-Based Processing and Coherence Building in Retrieval interference

Ryan D. Kopatich
z1709781@students.niu.edu

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Characters in narratives often behave in ways that are inconsistent with their beliefs, values, and previous actions. What effect do these contradictions have on a reader’s memory of character’s prior beliefs? One model, the Knowledge Revision Components framework (KReC) argues that a passive memory-based process is responsible for reducing access to information that is no longer true (e.g., when a character who is afraid of heights gets help facing her fears, it is harder to recall that she was afraid of heights). This possibility is called the general interference hypothesis. Subsequent research on KReC has shown that this process only occurs after a reader must resolve a contradiction (e.g., a character is afraid of heights later decides to go skydiving), suggesting that coherence building about contradictory information may be necessary to decrease access to outdated information. This possibility is called the coherence building hypothesis. The current dissertation aimed to test these hypotheses in two experiments.

In Experiment 1, participants read stories that described characters possessing a trait (e.g., “Carol was extremely scared of heights”) and a subsequent behavior which contradicted this trait (e.g., “She [Carol] now really wanted to go skydiving”). In a causal elaboration condition,
participants were given information that indicated the character no longer possessed that trait (e.g., the character sought psychological help to get rid of her fears) and in a contradiction condition, that information was not provided. Participants responded to verification probes about the character’s trait (e.g., “Carol was very afraid of heights”) to assess accessibility of the trait information. Response times to these probes were analyzed. The location of the probe occurred either immediately before or immediately after the target sentence about the behavior. A 2 (causal elaboration vs. contradiction condition) X 2 (probe before target vs. probe after target) within-participants design was used. Results indicated an interaction such that participants were slower to respond to probes when given an explanation for the contradictory behavior, but only if the probe occurred after the contradictory behavior. This indicates that when there is a coherence break where a reader must use the explanation to resolve the break, access to the outdated information is diminished. However, when the explanation is not used in resolving a coherence break, access to the outdated information is unimpeded. Experiment 1 thus supported the coherence building hypothesis.

In Experiment 2, a similar procedure was used with slight modifications. First, because Experiment 1 demonstrated the importance of coherence breaks in reducing access to outdated information, verification probes always occurred after the contradictory behavior. Second, the character who performed the contradictory action was either the same one with the trait or a different character. Response times to the verification probes were once again analyzed. A 2 (causal elaboration vs. contradiction condition) X 2 (same character vs. different character) within-participants design was used. Unfortunately, due to massive data loss (63% of participants), no firm conclusions could be made about Experiment 2.
The current dissertation offers some support for the coherence building hypothesis. This suggests that KReC be modified to emphasize the importance of coherence building around contradictions as a necessary mechanism for knowledge revision to occur. Additionally, the findings of the current dissertation also demonstrate that memory-based and constructionist perspectives operate in tandem to support comprehension.
THE ROLE OF MEMORY-BASED PROCESSING AND COHERENCE BUILDING IN RETRIEVAL INTERFERENCE

BY

RYAN D. KOPATICH
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A DISSERTATION SUBMITTED TO THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE DOCTOR OF PHILOSOPHY

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Doctoral Co-Directors:
Keith K. Millis
Joseph P. Magliano
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DEDICATION

For my wife, Brooke, thanks for pushing me, inspiring me, and copyediting for me every step of the way.
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CHAPTER 1
INTRODUCTION

An interesting aspect of characters in narratives is that their behaviors often contradict their stated goals, beliefs, and affective states, much as is the case for real humans. Consider, for example, the film The Shawshank Redemption and the novella that inspired it (King, 1982). In both the book and the film, a banker, Andy Dufresne, is convicted of murder and sent to Shawshank State Penitentiary under Warden Samuel Norton, who “believe[s] in two things: discipline and the Bible.” Norton is thus portrayed as a devout Bible-quoting Christian. However, as the story progresses, Dufresne works as an accountant for the warden and it is revealed that Norton is severely corrupt. In fact, the warden worries so much about Dufresne’s knowledge of his corruption that he murders (or, in the novella, bribes) an inmate who can prove Dufresne’s innocence (King, 1982). When people encounter the evidence of Norton’s corruption, what happens to the accessibility of the information that he is a devout Christian? Does new information prevent access to older information?

Characters are an ideal means to understand how accessibility of information in narratives is affected by new information, as a large amount of research supports the idea that characters are central to understanding narratives (e.g., Lynch & van den Broek, 2007; Trabasso & Magliano, 1996; Trabasso & Nickels, 1992; Trabasso & van den Broek, 1985; Zwaan, Langston, & Graesser, 1995). The importance of characters to narrative experience is such that
readers will often experience characters as if they have a social relationship with them (e.g., Gerrig & Jacovina, 2009). That is, while readers cannot directly interact with characters in narrative, they do engage emotionally with the characters (e.g., Bezdek, Foy, & Gerrig, 2013; Gerrig & Egidi, 2003), monitor their decisions (e.g., Jacovina & Gerrig, 2010), and evaluate them in ways they would evaluate a real person (Bezdek et al., 2013). It is also known that people monitor internal states of characters, such as what they represent, their emotions, their traits, and their goals (e.g., Albrecht & Myers, 1995; 1998; Cook, Halleran, & O’Brien, 1998; Graesser, Bowers, Olde, White, & Person, 1999; Magliano, Taylor, & Kim, 2005; Richards & Singer, 2001; Suh & Trabasso, 1993; Trabasso & Suh, 1993). Doing so provides one basis for establishing coherence because these internal states typically explain behaviors (Graesser, Singer, & Trabasso, 1994), at least when internal states and behaviors are consistent. As such, understanding how characters’ behaviors may contradict their stated beliefs, value systems, and goals may be important for comprehending narratives, such as The Shawshank Redemption.

Memory-Based Processing and Constructionism

There are two primary theoretical perspectives that can help explain how a reader notices and ultimately resolves contradiction in general and contradictions between character traits and behaviors in particular: the memory-based perspective (e.g., Gerrig & O’Brien, 2005; McKoon & Ratcliff, 1998; Myers & O’Brien, 1998) and the constructionist perspective (e.g., Graesser et al., 1994; Trabasso, van den Broek, & Suh, 1989). Although these two perspectives have been often pitted against each other (e.g., Albrecht & Myers, 1995), they are not incompatible with each other (Long & Lea, 2005).
The memory-based perspective argues for a passive resonance process in which a retrieval cue sends a signal to long-term memory stores; items that “resonate” (i.e., items that are related to the retrieval cue) are then activated in long-term memory and are thus brought into working memory (Kintsch, 1988; Myers & O’Brien, 1998; Ratcliff, 1978). Crucially, this passive mechanism allows readers to connect portions of the discourse in order to establish and maintain global and local coherence (Albrecht & O’Brien, 1993; Kintsch, 1988; McKoon, Gerrig, & Greene, 1996; McKoon & Ratcliff, 1992; Myers & O’Brien, 1998) and to connect the text with other world knowledge that a reader may have (e.g., Cook & Guéraud, 2005). Thus, when a reader encounters a concept that is inconsistent with prior discourse, resonance would activate the relevant prior information in working memory, resulting in the reader detecting the inconsistency.

In contrast to the passive bottom-up resonance process, the constructionist perspective argues that processing causality is central to establishing coherence, and reader goals are important for comprehension. Specifically, readers are motivated to establish a certain level of explanatory coherence when reading a text and engage in a top-down “search after meaning” in an attempt to reach their desired level of explanatory coherence within their mental models (Graesser et al., 1994; Long, Seely, & Oppy, 1996; Singer, Graesser, & Trabasso, 1994). Central to this search after meaning in the context of narratives is establishing explanatory coherence by drawing inferences about causal relationships (e.g., putting water on a fire extinguishes it) and characters’ goals and behaviors in relation to those goals (Singer, Halldorson, Lear, Andrusiak, 1992; Suh & Trabasso, 1993; Trabasso & Magliano, 1996; Trabasso & Suh, 1993). This does not, however, preclude the memory-based perspective’s passive resonance process. Instead, the
constructionist perspective’s emphasis is on establishing explanatory coherence which operates on the output of passive activation (e.g., Long & Lea, 2005; van den Broek, Rapp, & Kendeou, 2005). Readers will detect contradictions within a text or with general knowledge as part of the process of establishing causal coherence (Singer et al., 1992). One possibility is that the likelihood of detecting contradictory information between character traits and behaviors increases when that information is both accessible in working memory via memory-based processes and important in the process of establishing coherence.

An interesting juxtaposition of these two perspectives comes from work by Cook, Halleran, and O’Brien (1998). They had participants read stories containing two characters. In these stories, either the protagonist of the story would have a trait and would later go on to perform a contradictory behavior (the primary character condition, “Carol was extremely scared of heights…Carol now really wanted to go skydiving. She immediately accepted the offer”) or the secondary character would have the trait and the protagonist would later go on to perform the contradictory behavior (the secondary character condition, “Lori was extremely scared of heights…Carol now really wanted to go skydiving. She immediately accepted the offer”). Cook and colleagues (1998) found that reading times of the critical sentence where the contradictory behavior occurred were longer when there was no explanation for why the contradictory action was performed, but only in the primary character condition. In a follow-up experiment focused on verification probes, the authors found that probe verification times showed a consistent pattern (i.e., slower before the trait was reactivated by the target sentence than immediately following the trait or after the target sentence occurred), regardless of which character had the trait (Cook et al., 1998). From the perspective of both the memory-based and the constructionist
position, this is intriguing. The prior text information is not relevant to coherence building in the secondary character condition and readers have no problems understanding the characters’ behaviors as coherent, yet there is evidence that this information is still activated.

Contradiction Detection

Inconsistencies in narrative can be relatively subtle, implicit, and require inferences to detect, such as in the Shawshank Redemption example described above, where the status of being a devout Christian may activate the traits of honesty and integrity, which are antithetical to corruption. Alternatively, the inherent meaning of a trait can be contradicted more directly, such as when a character is described as a strict vegetarian who then orders a cheeseburger. Although both of these are inconsistencies that readers may need to rectify, contradictions are defined as inconsistencies in which a character’s behavior is in direct conflict with an earlier trait without qualifying information that could signal a change in the trait has occurred. Sometimes readers do not notice such contradictions even when they are explicitly instructed to find them (e.g., Epstein, Glenberg, & Bradley, 1984; Glenberg, Wilkinson, & Epstein, 1982). However, in many circumstances, readers can recognize when recent text contradicts the prior discourse (e.g., García-Arista, Campanario, & Otero, 1996; Yussen & Smith, 1990).

There is a rich literature that has found that people often detect contradictions in expository (e.g., Baker & Anderson, 1982; Jacovina, Hinze, & Rapp, 2014; Rapp, 2008; Singer & Gagnon, 1999; see Glenberg et al., 1982, for a counterexample) and narrative texts (e.g., Albrecht & O’Brien, 1993; Kendeou, Smith, & O’Brien, 2013; McKoon & Ratcliff, 1992; O’Brien, Rizzella, Albrecht, & Halleran, 1998; Rapp, Gerrig, & Prentice, 2001). However,
research on contradictions in narrative text has been primarily conducted to explore the role of passive memory-based retrieval (e.g., Albrecht & O’Brien, 1993; Kendeou et al., 2013). That is, these studies have used character contradiction to examine how memory becomes passively reactivated and the factors that affect this reactivation process. There are a plethora of factors that affect the degree to which reactivation will occur, including referential distance (Myers & O’Brien, 1998; O’Brien, 1987; O’Brien, Albrecht, Hakala, & Rizzella, 1995; O’Brien, Plewes, & Albrecht, 1990), elaboration of the information in semantic networks (Albrecht & O’Brien, 1993; Kendeou et al., 2013; Myers & O’Brien, 1998; O’Brien et al., 1990), and feature overlap (Greene, McKoon, & Ratcliff, 1992; McKoon & Ratcliff, 1980; Myers & O’Brien, 1998; O’Brien, Duffy, & Myers, 1986).

These studies utilize a contradiction paradigm in which participants read stories that have a common structure. First, a character is introduced and given a trait (e.g., “Carol was extremely scared of heights and would only work on the ground level”), after which a backgrounding section occurs which does not mention the character’s trait. Finally, the initial trait is contradicted in a target sentence (e.g., “She [Carol] now really wanted to go skydiving”) and a short conclusion is given. Reading time for the sentence in which the trait is contradicted is recorded as an indicator of processing difficulty. Variants of the contradiction paradigm have also been used in which the character’s trait is either elaborated with a causal change of events (e.g., “Because this was disrupting her life, her therapist suggested she try to do exciting activities involving heights”) or where a non-causal change of events is described (e.g., “Now Carol enjoyed working high above the city and even volunteered to work on the high beams”).
This paradigm has been used to explore some of the key determinants of reactivation of information.

One of the primary determinants of how much reactivation occurs is referential distance, or the amount of information in between a retrieval cue and its antecedent (O’Brien, 1987; O’Brien et al., 1995; O’Brien et al., 1990). O’Brien (1987) had participants read texts that had two antecedents: one that was early in the discourse and therefore further from the retrieval cue and one that was later in the discourse and therefore closer to the retrieval cue. Either the early or late cue was then followed by a sentence in which one of the antecedents was reinstated (see Table 1). Reading times on the reinstatement sentence were significantly longer when the early antecedent was reinstated as compared to when the late antecedent was reinstated (O’Brien, 1987). This finding is consistent with a passive memory-based account that would suggest that one reactivates prior discourse by sending a retrieval cue back through the hierarchy of one’s textbase and situation model. The textbase is a representation of the ideas mentioned explicitly in the discourse (van Dijk & Kintsch, 1983), and the situation model is a representation of the explicit ideas and inferences based on world knowledge (van Dijk & Kintsch, 1983). Further work has corroborated this finding (O’Brien et al., 1995; O’Brien et al., 1990).

Table 1

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<tr>
<th>Section</th>
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<tbody>
<tr>
<td>Introduction</td>
<td>Mark had grown up in the city, but he had always wanted to live in the country</td>
</tr>
<tr>
<td>Filler</td>
<td>The first chance he got, he bought some land and moved out there…</td>
</tr>
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<tr>
<th>Section</th>
<th>Text</th>
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<tbody>
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<td>Early Antecedent</td>
<td>On holidays, he would travel by train into the city to visit his parents.</td>
</tr>
<tr>
<td>Elaboration</td>
<td>While riding in it, he liked to watch the countryside as it raced passed him…</td>
</tr>
<tr>
<td>Late Antecedent</td>
<td>His brother had also moved out of the city and was now living in Colorado. Last summer Mark traveled by plane to visit him.</td>
</tr>
<tr>
<td>Filler</td>
<td>…Ever since Mark moved to the country he had made a lot of friends…</td>
</tr>
<tr>
<td>Reinstatement</td>
<td>Mark’s neighbor asked him how he had traveled to his parents’. OR Mark’s neighbor asked him how he had traveled to his brother’s.</td>
</tr>
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In addition to referential distance, the degree to which an antecedent is elaborated affects the ease of reactivation with more elaborated antecedents being easier to reactivate (Kendeou et al., 2013; O’Brien et al., 1990). O’Brien and colleagues (1990) used a similar paradigm as O’Brien (1987); that is, they had participants read passages with early and late antecedents and reinstated one of them during the last sentence of the narrative. In addition, O’Brien and colleagues also elaborated either the early or late antecedent. This revealed that, as with O’Brien (1987), later antecedents were more quickly reinstated. More importantly, the degree of elaboration also had a significant moderating effect on reinstatement, with more elaborated antecedents reinstating the later antecedents more quickly (O’Brien et al., 1995; O’Brien et al., 1990). Thus, more elaborated text elements are easier to reactivate than less elaborated text.
Other experiments using the contradiction paradigm have found that readers track the instrumental and trait affordances a character has (i.e., the behaviors which a character may engage in given that they have some tool or attribute) when these are relevant to characters’ goals (O’Brien, Cook, & Guéraud, 2010). That is, participants slow down when reading a contradictory sentence that involves a character using an instrument that is not available to the character (e.g., “[Bobby] remembered that he had lost his hammer… Bobby began pounding the boards together with the hammer”) or when a character behaves in an anomalous way given a particular trait (e.g., a feeble old man carrying a boy out of a busy street; O’Brien et al., 2010). This also appears to be the case with characters’ spatial positions. Specifically, when given spatial information, readers appear to monitor what characters can do in their current location and can detect contradictions, but only when this information is relevant to the characters’ goals (de Vega, 1995). Thus, it appears that when readers are presented with a character’s trait or environmental information, they infer the actions that are available to that character and use this information to interpret future behaviors.

Finally, the contradiction paradigm has also shed light on the parameters under which people remember characters’ contradictory behavior. For example, Kendeou and colleagues (2013) found that short causal explanations for why characters may behave differently than what a trait implied could eliminate the reactivation of the trait. This implies that participants may update their mental models of a character given a pertinent explanation. However, the explanations have to be causally related to the character’s deviation from their trait—that is, non-causal elaborations that described a change of events were not sufficient—and they had to be
sufficiently elaborated (i.e., three sentences) in order to eliminate reactivation (Kendeou et al., 2013).

A variation of the contradiction paradigm has also been used in the context of refutation of previously established information. These refutation texts activate a misconception that a reader may have (e.g., humans only use 10% of their brains) and then offer a contrary account of the phenomenon (e.g., humans use their entire brains). Refutation texts have applications in both expository (e.g., Sinatra & Broughton, 2011; Tippet, 2010) and narrative contexts (e.g., Gordon & Rennie, 1987). One refutation study using narratives demonstrated that simple refutations with or without explanations took longer to read than control or trait context conditions. The slowdown in reading time suggests that readers have difficulties when they encounter general trait information that contradicts characters’ specific behaviors. Thus, it appears that readers attempt to update their understanding of characters when confronted with these contradictions (Rapp et al., 2001). Additionally, refutations are integrated into readers’ mental models and are then used to assess the probability of future outcomes (Rapp & Kendeou, 2007).

In sum, the findings of these studies delineate many of the memory processes that occur while one reads. By doing this, they have demonstrated that a passive memory-based retrieval process appears to be sensitive to referential distance (Myers & O’Brien, 1998; O’Brien, 1987; O’Brien et al., 1995; O’Brien et al., 1990), featural overlap (Greene et al., 1992; McKoon & Ratcliff, 1980; Myers & O’Brien, 1998; O’Brien et al., 1986), and the degree of elaboration in semantic networks (Albrecht & O’Brien, 1993; Kendeou et al., 2013; Myers & O’Brien, 1998; O’Brien et al., 1990). In addition to contributing to our knowledge of how memory processes operate during reading, these studies have also offered valuable clues as to what features of
characters readers monitor and under what conditions they notice inconsistencies. Specifically, readers appear to form early and durable mental models of characters (Cook et al., 1998; O’Brien et al., 1998), monitor spatial and instrumental information that is relevant to a character’s goals (de Vega, 1995; O’Brien et al., 2010), integrate characters’ trait information and use it to predict their future behaviors (Rapp et al., 2001; Rapp & Kendeou, 2007), and recall inconsistent behavior (Albrecht & O’Brien, 1993) unless the trait is sufficiently elaborated (Kendeou et al., 2013).

Resolving Contradictions

From the literature on memory-based retrieval, it is clear that readers will often detect when a character behaves inconsistently with prior traits and behaviors. When a reader notices these inconsistencies, they have two main choices: first, they may ignore the contradiction if they are not motivated to resolve it. Alternatively, they may try to update their mental model of the character in order to account for the contradiction (e.g., Kendeou & O’Brien, 2014). While the question of when and why people ignore characters’ contradictions is an interesting and important one, the focus of the current study is to understand how readers actually resolve these inconsistencies when they are noticed.

Many models of mental model construction do not describe knowledge revision but assume that the breaks in coherence that may be created by character contradictions could be resolved through explanatory inferences (e.g., Graesser et al., 1994). More recently, the Knowledge Revision Components (KReC) framework has proposed that a passive memory-based interference mechanism is responsible for updating mental models (Kendeou & O’Brien, 2014). Specifically, KReC is based on five principles. First, the encoding principle states that
Once information is encoded, it is permanently in long-term memory; thus, information cannot be erased or overwritten. This implies that even when information is no longer relevant or correct, it may still be activated and cause interference. However, whereas information cannot be erased from long-term memory, connections with other information may be reduced, thus making it less accessible to retrieval. Second, the passive activation principle assumes that memory is activated passively, consistent with other memory-based views of comprehension (e.g., Kintsch, 1988; Myers & O’Brien, 1998). Note that just as with other instantiations of passive memory retrieval, this process occurs without regard to relevance. Thus, if information is semantically related to a segment of previously read text, it will become activated. Together, the encoding and passive activation principles create a problem: how can one update a mental model if inaccurate information is consistently reactivated? The remaining KReC principles attempt to rectify this issue. The third principle of KReC, the co-activation principle, states that updating of old information in the mental model based on new information requires both the old and new information be simultaneously available in working memory. The fourth principle of KReC, the integration principle, states that in order for updating to occur, new information must be integrated with previous long-term memory representations. If information is not integrated with previously encoded memory representations, there cannot be mental model updating. Finally, the competing activation principle states that once new information is integrated with a mental model with outdated information, the new information will begin to dominate the memory network. As a result, as more information supports the new interpretation, the new interpretation will draw activation away from the outdated information (Kendeou et al., 2019; Kendeou & O’Brien 2019; Kendeou, Smith, & O’Brien, 2013). This, in turn, reduces the amount of
interference that the outdated information creates (Kendeou & O’Brien, 2014). See Table 2 for an overview of KReC principles.

Table 2
Overview of KReC Principles

<table>
<thead>
<tr>
<th>Principle</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Encoding</td>
<td>Encoded information is permanently stored in long-term memory; information cannot be erased</td>
</tr>
<tr>
<td>Passive Activation</td>
<td>Long-term memory stores are passively activated by a resonance process</td>
</tr>
<tr>
<td>Co-Activation</td>
<td>Previously acquired and new information may be passively co-activated; necessary step for updating to occur</td>
</tr>
<tr>
<td>Integration</td>
<td>New information must be integrated into a mental model in order for updating to occur</td>
</tr>
<tr>
<td>Competing Activation</td>
<td>New, more elaborated information will draw activation away from outdated information; interference now prevents reactivation of outdated information</td>
</tr>
</tbody>
</table>

With respect to the contradiction paradigm, KReC would predict that when there is a neutral elaboration, trait information is encoded into long-term memory (encoding principle) and this information is activated when one reads the contradictory sentence (passive activation principle). This contradictory action and the previously stated trait information may be co-activated (co-activation principle) and the behavior may be integrated into the new mental model (integration principle). However, because there is no indication that the trait is irrelevant, there is insufficient information to draw activation away from the trait to the new state of affairs (competing activation principle). On the other hand, when there is an elaboration that contradicts the original trait, trait information and elaboration information are encoded into long-term memory (encoding principle) and both are retrieved when the contradictory sentence is read (passive activation principle). The original trait and contradictory elaboration will be co-
activated when reading the contradictory sentence (co-activation principle) and both sets of information should be integrated into the reader’s mental model (integration principle). The information in the contradiction sentence is consistent with the contradictory elaboration over the original trait and should therefore reduce the activation of the trait information (competing activation principle). One interpretation is that there is reduced proactive interference from the trait information but increased retroactive interference from the elaboration information.

The KReC model relies on a passive interference process that impairs access to outdated information. Although KReC explicitly mentions this passive memory-based process, it is also compatible with the constructionist view that readers search after meaning by generating global inferences to resolve contradictions (e.g., Graesser et al., 1994; Singer et al., 1994). KReC does not explicitly endorse or preclude this view but instead argues that if constructionist processes occur, they are driven by readers’ attention and supported by passive memory-based processes (Kendeou & O’Brien, 2014; see also Lassonde, Smith, & O’Brien, 2011). Importantly, Kendeou and O’Brien (2014) argue that causality has a special status in memory, as is consistent with constructionist views (Graesser et al., 1994; Zwaan & Radvansky, 1998). Specifically, causally integrated information is able to draw activation away from outdated information better than other types of information due to its rich connection to readers’ mental models (Kendeou, Butterfuss et al., 2013; Kendeou et al., 2019).

The KReC framework can account for a wide variety of findings in the literature. For example, Blanc, Kendeou, van den Broek, and Brouillet (2008) had participants read constructed news reports that suggested two possible causes for an event. These texts contained one of three elaboration sentences that either suggested the first cause was more likely, that the second cause
was more likely, or that they were neutral as to which cause was more likely. Results indicated that when the second cause was suggested as more likely, participants judged the second cause as more likely, but there were no differences between the other two conditions. That is, in the case where the first cause was suggested to be more likely, participants rated both explanations as equally likely (Blanc et al., 2008). In line with KReC’s predictions, this suggests that there is retroactive interference that occurs when there are alternative explanations for an event such that newer causes prevent reactivation of the older explanations. Indeed, follow-up studies demonstrated that participants’ verbal protocols were similarly affected; that is, they were more likely to mention the second cause after reading the sentence that suggested the second cause was more likely, but they were equally likely to mention either cause after reading that the first cause was more likely or the neutral sentence (Blanc et al., 2008).

Although Blanc and colleagues (2008) found that newer information prevents reactivation of outdated information, their study used causally elaborated explanations. KReC argues that this causes more outdating to occur than if the elaborations were non-causal because causal relationships are relatively strong (e.g., Trabasso et al., 1989; Zwaan & Radvansky, 1998). In line with this prediction, O’Brien and colleagues (2010) gave participants texts in which a character was either enabled to use an instrument (e.g., “Bobby took out his hammer”), disabled from using an instrument (e.g., “[Bobby] remembered that he had lost his hammer”), or re-enabled to use an instrument (e.g., “After some searching, he [Bobby] found the hammer”). The character later used the instrument in a target sentence (e.g., “Bobby began pounding the boards together with the hammer”) and participants’ reading times for this sentence were recorded. Results indicated that even though participants recognized that the character was able to use the
instrument in the re-enabled condition, the reading times in this condition were slower than in the enablement condition (O’Brien et al., 2010). These results suggest that the outdated information was not eliminated from participants’ situation models even though they consciously knew that it was no longer relevant. Other studies have corroborated this finding using similar methods (e.g., Butterfuss & Kendeou, 2020; Guéraud, Harmon, & Peracchi, 2005; O’Brien et al., 1998). Again, KReC accounts for this because information is passively encoded permanently into long-term memory, and reactivation can still occur if new information does not have strong connections with the reader’s mental model.

Further work using Magliano and Graesser’s (1991) three-pronged method of drawing on theory, verbal protocols, and behavioral measures has tested the role of competing activation in resolving cognitive conflict (Kendeou, Butterfuss, Kim, & Van Boekel, 2019). Specifically, Kendeou and colleagues (2019) had participants read a series of refutation and control texts and complete a comprehension post-test about the incorrect beliefs in the texts. Results indicated that there was increased cognitive conflict and monitoring when reading the refutation section, but there was less cognitive conflict when participants read an outcome that was aligned with the refutation, relative to those who read control texts. Additionally, participants showed improved posttest comprehension scores after the refutation texts (Kendeou et al., 2019). Together, these findings suggest that readers integrate new information into their mental models and the co-activation of contradictory information results in competing activation that interferes with outdated information, as is predicted by KReC.

As stated by Kendeou and O’Brien (2014), causal information is more integrated within the mental model of the discourse than non-causal information, and it is possible that when
elaborations are more causally related to outdated information, they draw activation away from outdated information more effectively. To test whether causal explanations have a stronger outdated effect than non-causal explanations, Kendeou and colleagues (2013) conducted a series of studies using the contradiction paradigm. Specifically, they conducted two sets of experiments: one set (Experiments 1, 3, and 6) tested whether readers would slow down when reading information about a character’s behavior that contradicted an earlier established character trait. Slowdowns when reading the contradictory behavior suggested difficulties in processing. Another set (Experiments 2, 4, 5, and 7) tested whether the character’s outdated trait information could be reactivated. Slowdowns in reaction times to a probe verification task indicated more difficulty in reactivating the trait information. In both sets of experiments, the authors used the contradiction paradigm and varied the type of elaboration (i.e., non-causal trait change vs. causal trait change) as well as the amount of elaborating information (1 vs. 3 sentences) that explained why the central character might behave in a manner that is contradictory to their established trait (see Table 2 for an example). In the first set of experiments, Kendeou and colleagues found that whenever there was an elaboration of why the character may violate the established trait, the slowdown in reading time of the target sentence was diminished or eliminated. Similarly, in the probe verification experiments, it was shown that whenever there was a causal elaboration for why the character may have behaved inconsistently, verification times of outdated trait information were slower than when there was a non-causal explanation. They interpreted their results in terms of a passive memory-based interference mechanism. The causal elaboration interferes with trait information, thus making the trait less accessible to reactivation when reading the target sentence or responding to a verification probe.
Experiments 5 and 7 are of particular importance for the motivation of the present study. In these experiments, they manipulated the location of a verification probe referring to the trait (e.g., “Carol was very afraid of heights”) such that it either occurred before or after the target sentence where the contradictory behavior occurred (e.g., “She [Carol] now really wanted to go skydiving”) and also manipulated the elaboration of trait information. Specifically, in Experiment 5 they compared a 1-sentence causal elaboration condition to a 3-sentence causal elaboration condition and in Experiment 7 they compared a 3-sentence causal elaboration condition to a 3-sentence non-causal elaboration condition (see Table 3). They found significant interactions between elaboration conditions and location. Specifically, for Experiment 5, verification response times were faster in the 1-sentence causal elaboration condition relative to the 3-sentence causal elaboration condition, but only after the target sentence. For Experiment 7, verification probe times were faster in the 3-sentence qualified elaboration condition relative to the 3-sentence causal elaboration condition, but only after the target sentence. As these quicker response times indicated quicker reactivation of the trait from reading the target sentence, Kendeou et al. (2013) interpreted the effects on the probe times as the result of interference created in the 3-sentence causal elaboration condition relative to 1-sentence causal and 3-sentence non-causal conditions.

Table 3
Example Item from Kendeou et al. (2013)

<table>
<thead>
<tr>
<th>Sentence</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Carol had always wanted to be a construction worker…</td>
</tr>
<tr>
<td>Trait</td>
<td>… Carol was extremely scared of heights and would only work on the ground level…</td>
</tr>
<tr>
<td></td>
<td>(Continued on next page)</td>
</tr>
</tbody>
</table>
Table 3 (continued)

<table>
<thead>
<tr>
<th>Sentence</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Causal Elaboration (3-Sentence Version)</td>
<td>Because this was disrupting her life, her therapist suggested she try to do exciting activities involving heights. (As a result of these activities, Carol was able to work in high areas easily. Now, she no longer needed to depend on coworkers to do any part of her job.)</td>
</tr>
<tr>
<td>Qualified Elaboration (3-Sentence Version)</td>
<td>Now Carol enjoyed working high above the city and even volunteered to work on the high beams. (Carol was proud she had the courage to work on the highest levels. She was thrilled by the high winds and felt exhilarated watching the activity on the street below.)</td>
</tr>
<tr>
<td>Backgrounding Section</td>
<td>Carol always ate lunch with her fellow workers...</td>
</tr>
<tr>
<td>Verification Probe (Before)</td>
<td>*Carol was very afraid of heights.</td>
</tr>
<tr>
<td>Target Sentences</td>
<td>She now really wanted to go skydiving. Carol immediately accepted the offer.</td>
</tr>
<tr>
<td>Verification Probe (After)</td>
<td>*Carol was very afraid of heights.</td>
</tr>
<tr>
<td>Conclusion</td>
<td>To celebrate, she offered to take Lori out to dinner. Over dinner they finalized the plans for the trip. They would leave Lori’s house the following Saturday at 6 am.</td>
</tr>
</tbody>
</table>

Note: Statements with an asterisk require true/false responses from participants.

Note that Kendeou and colleagues (2013) only found evidence for interference after the target sentences. Similarly, in Trabasso and colleagues’ computational implementation of the causal network model, they showed that causal elaboration affects the accessibility of semantically related content (Langston & Trabasso, 1999; Langston, Trabasso, & Magliano, 1999; Trabasso & Wiley, 2005). That is, the activation of a node (i.e., a particular idea or word) spreads to causally related content, which affects the activation of that node. As such, it is reasonable to expect interference to operate in the causal elaboration conditions anytime that one is trying to access the trait. However, the interactions reported by Kendeou et al. (2013) suggest that interference is only operating when the elaboration content is semantically related to the sentence prior to the verification probe and is potentially important for establishing coherence.
This finding is consistent with the assumption derived by the constructionist position that contradiction detection would be facilitated when the contradictory information is relevant to coherence building. The present dissertation will further explore coherence building about causal elaborations and its role in retrieval interference. The importance of doing so is apparent in the context of research showing that potentially contradictory, outdated information or information associated with another character can slow down processing despite the fact that it is not relevant to coherence building (Cook et al., 1998).

The Current Study

The current study seeks to understand the conditions under which interference affects the reactivation of information within the KReC framework by extending Experiments 5 and 7 from Kendeou et al. (2013). While KReC explicitly states that a passive resonance process is involved in generating retroactive interference, the role of the constructionist perspective’s processes are underspecified in the model (Kendeou & O’Brien, 2014). The current study therefore seeks to explore the role of coherence building processes in KReC. To do this, Experiment 1 compared verification response times of a character’s trait by manipulating the location of the verification probe (i.e., before the target sentence or after the target sentence) and by manipulating the elaboration condition (i.e., a causal elaboration condition where there is a causal reason for a behavior to be inconsistent with the character’s stated trait or an inconsistent condition where the elaboration does not suggest that change has occurred). In Experiments 5 and 7 of Kendeou et al. (2013), the manipulation of elaboration always involved a condition in which there was information that contradicted the trait. That is, there was either a causal explanation for why the behavior might be inconsistent or there was a non-causal explanation for inconsistent behavior.
As such, interference could have been operating before the critical sentence where the inconsistency occurs, but in varying degrees based on the level of elaboration condition. Thus, in the current study, the inconsistent condition in which a neutral elaboration did not suggest a change in the character’s trait served as the baseline control because interference is not operating with the trait content in that condition.

Experiment 1 was therefore an extension of Experiments 5 and 7 from Kendeou et al. (2013). Specifically, it employed a 2 (Elaboration: causal elaboration, inconsistent) X 2 (Probe Location: before critical sentence, after critical sentence) within-participants design with latencies on the trait verification statements as the primary dependent variable. This experiment tested the role of coherence building about trait information in retrieval interference by testing verification probe response times before and after the contradictory behavior was performed. It should be noted that in Experiment 1 there are two possible retrieval cues that resonate with the initial trait information. First, the verification probe itself contains semantic information that resonates with the trait information. Second, the target sentence in which the character performs the contradictory behavior also contains information that is semantically related to the initial trait information. Because the verification probe can occur either before or after the target sentence, this creates a situation where the number of retrieval cues varies as a function of where the verification probe occurs (see Table 4).

<table>
<thead>
<tr>
<th>Retrieval Cues in Experiment 1 Materials</th>
<th>Verification Before</th>
<th>Verification After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verification Probe</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Target Sentence</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Experiment 2 was designed as a follow-up to Experiment 1 to determine the parameters of when retrieval interference occurs. To do this, Experiment 2 controlled for the possible confounding effect of having different sources of retrieval for the probe locations in Experiment 1. Experiment 2 used only one probe location (i.e., after the target sentence), thus controlling for different levels of semantic content that were present in Experiment 1.

Experiment 2 compared verification response times by manipulating the elaboration condition (i.e., the causal elaboration condition or the inconsistent condition) and by manipulating the character who has the contradictory trait (i.e., the primary character has the trait or the secondary character has the trait) while keeping semantic content constant. This second manipulation is based on work by Cook and colleagues (1998). They manipulated the character who had the trait that was inconsistent with the action in the target sentence and showed that there was a slowdown in the target sentence even when the character performing the action was not associated with the trait. They argued that the semantic content of the action served as a passive retrieval cue for the trait, even if that character didn’t possess it. As such, it is reasonable to assume that there could be interference between the elaboration content and the trait even when that elaboration content is not important to establish coherence.

**Hypotheses**

There are two possibilities of how interference operates in contradictions. First, in line with a purely memory-based perspective, the general interference hypothesis would predict that interference occurs whenever semantically related information is encountered that would lead to activation for the trait. Consistent with KReC, information is encoded into memory, passively activated, and the trait and contradictory information are co-activated and integrated into one’s
mental model. According to the *general interference hypothesis*, the inconsistent elaboration condition should not carry sufficient information to cause competing activation that reduces access to the original trait. On the other hand, provided that the contradictory elaboration carries enough information, it should create competing activation that reduces access to the original trait information. Thus, in Experiment 1, the general interference hypothesis would predict a main effect of elaboration condition, such that verification response times would be slower in the causal elaboration condition, regardless of when the verification probe occurs, because the verification item serves as a retrieval cue for both trait and elaboration information at both locations. When there are two characters present, a general interference interpretation of KReC would predict that semantically related information is co-activated and therefore may result in the different character causing competing activation. Thus, in Experiment 2, the general interference hypothesis would predict a main effect of elaboration condition, such that verification response times would be slower in the causal elaboration condition, regardless of which character has the contradictory trait (see Figure 1).

**Figure 1**: Predictions for verification response times in the current study.
Alternatively, in line with the constructionist perspective, the *coherence building hypothesis* predicts that interference between the causal elaboration and the trait information would only occur when the trait information is relevant in establishing coherence with the prior text discourse. Thus, there would need to be a coherence break in which a reader needed to re-establish coherence. This would suggest that while co-activation may occur during the contradictory elaboration, it would not cause interference in retrieving the trait information. However, once the contradiction is resolved (i.e., the contradictory behavior), the reader would then co-activate trait and elaboration information and integrate the elaboration to their mental model. This would then allow competing activation to increase interference and reduce access to the trait information.

Note that the constructionist perspective says that coherence, causality, and goal-directed behavior are all important for forming mental representations of text, but in the current study, the coherence building hypothesis focuses primarily on the coherence and causality aspects of mental model construction. In Experiment 1, the coherence building hypothesis would therefore predict an interaction such that verification response times would be slower in the causal elaboration condition, but only if the verification probe is after the target sentence in which the contradictory behavior occurs. Additionally, when a character performs an action that another character would not perform, this does not create a coherence break (e.g., Cook et al., 1998). Thus, in Experiment 2, the coherence building hypothesis would predict an interaction such that verification response times would be slower in the causal elaboration condition, but only when the primary character (i.e., the character who performs the action) has the contradictory trait (see
Figure 1). Appendix A displays a table delineating the predictions for the general interference and coherence building hypotheses with relevant text.
CHAPTER 2
EXPERIMENT 1

The purpose of Experiment 1 was to test the general interference and coherence building hypotheses. Kendeou and colleagues (2013) compared the causal elaboration and qualified elaboration conditions but did not compare either one to the inconsistent condition to get a true baseline for time to verify the trait information probe. The coherence building hypothesis would predict causal elaboration verification to take longer, but only after the target sentence. On the other hand, the general interference hypothesis would predict that verification would be slower in the causal elaboration, regardless of when it appears.

Method

Participants

An a priori power analysis was conducted using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007). G*Power does not currently support power analyses for linear mixed-effects modeling, but it does support power analyses of repeated measures ANOVA, which is an analogous but less statistically powerful technique (e.g., Richter, 2006). Based on $F$-values from Kendeou et al. (2013), main effects would require 24 participants to have sufficient power ($\beta = .95$). G*Power currently does not have the capability to calculate power analyses for within-factor interactions, so to ensure adequate power for interactions, an initial 53 undergraduates (21
female) enrolled in Introduction to Psychology at Northern Illinois University were recruited from the Psychology Department’s subject pool. Participants had an average age of 19.41 (SD = 1.61). Two sets of participants’ data were lost due to computer malfunction, leaving data from 51 participants.

**Research Design**

Experiment 1 utilized a 2 (inconsistent vs. causally elaborated conditions) X 2 (verification prompt before vs. after) within-subjects design with four observations per cell. The experimental stories (described below) were assigned to stimuli lists (see Appendix B). One of the four stimuli lists was then presented in a randomized order to participants. The primary dependent variable was verification response times. To analyze the data, linear mixed-effects modeling was used to control for random effects of item and participant. All analyses were conducted using the lme4 package in R (Bates, Mächler, Bolker, & Walker, 2015).

**Materials**

Materials used in the current study were 16 of the stories used by Kendeou et al. (2013). These stories were constructed with inconsistent, causal elaboration, and non-causal qualified elaboration versions of each story. However, in the current study, only two conditions were used. Specifically, participants read eight of these stories’ inconsistent versions (i.e., the versions in which the character’s central trait is contradicted with no explanation of why this might have happened) and eight of these stories’ causally elaborated versions (i.e., the versions in which a causal reason is given as to why the character’s central trait may be contradicted). Additionally, half of the stories from each category had a verification prompt (e.g., “Carol was very afraid of
heights”) that occurred before the contradictory information (e.g., “She [Carol] now really wanted to go skydiving”) and half of the stories from each category had the verification prompt after the contradictory information. The correct answer to the verification prompt was always true. Note that in Kendeou and colleagues’ stories (2013), the inconsistent condition was created by the absence of elaborating information. However, referential distance is an important factor in information retrieval (e.g., O’Brien, 1987; O’Brien et al., 1990), so in the current study, sentences were added to correct for differences in distance that would occur between conditions. To ensure participant compliance, yes or no comprehension questions followed each story (e.g., “Was Carol liked by her co-workers?”). An additional 16 filler stories were also used. These stories were similar in structure to the critical stories, but the filler verification probe was always false to ensure an equal number of true and false responses. See Appendix C for Experiment 1 materials.

Note that in the Experiment 1 materials, there are two potential sources of retrieval cues that can be operating when the participant reads and responds to the verification probe: the target sentence with the contradictory information and the verification probe itself. The reader is always exposed to the verification probe (see Table 4). However, the target sentence only serves as a retrieval cue when the verification probe occurs after the target sentence.

Procedure

Participants read a randomized order of the 32 items (16 critical, 16 filler) one sentence at a time, pressing the spacebar to advance. Once the participant advanced, the previous text was erased and inaccessible to the participant. Additionally, participants were asked to respond to two types of prompts as quickly and accurately as possible. First, participants responded to
verification probes described previously by pressing the “F” button to indicate that the probe is false or by pressing the “J” button to indicate that the probe is true. Second, participants responded to comprehension questions after the stories by pressing the “F” button to indicate that the answer is no or by pressing the “J” button to indicate that the answer is yes. All reading and verification response times were recorded with millisecond accuracy.

Results and Discussion

Data Cleaning

Only trials with correct verification probe responses were used for the analyses. An additional eight sets of participant data were excluded for answering less than 75% of the comprehension questions correctly. Additionally, trial verification response times that were faster than 500ms were rejected as outliers, as were those that were more than 2.5 SDs above the mean (cf. Kendeou et al., 2013). Removing outliers resulted in the deletion of 2.5% of the valid trials. Probe verification times are displayed in Figure 2.

![Mean Verification Probe Response Times (Experiment 1)](image)

Figure 2: Experiment 1 verification probe reaction times (error bars represent standard errors).
Probe Verification Response Times

The purpose of Experiment 1 was to compare the verification response times in the causal elaboration condition to the inconsistent condition to determine the effect of elaboration on participants’ ability to retrieve a character’s central trait. To test this, trials with correct verification probe responses were used in a linear mixed-effects model with elaboration condition (inconsistent vs. causal elaboration) and probe location (before contradiction sentence vs. after contradiction sentence) as fixed predictor variables and probe response time as the outcome variable. Participant and story were entered as random effects. The random effects accounted for a substantial proportion of total variance (ICC = .36), suggesting that it is necessary to treat the data as nested within participants and stories. Next, the fixed main effects (i.e., elaboration condition and verification probe location) and their interaction were added to the model. The fixed effect of elaboration condition was nonsignificant, $b = -0.48, t(420.29) = -0.00, p = .997$, as was the fixed effect of probe location, $b = -200.67, t(421.15) = -1.50, p = .134$; however, there was a significant elaboration condition by location interaction, $b = 424.03, t(419.93) = 2.28, p = .023$. The pattern of results is consistent with the prediction of the coherence building hypothesis (see Figure 2). Specifically, there was no difference in verification response times before the target sentence, but when the verification probe came after the target sentence, response times in the inconsistent elaboration condition were faster than in the causal elaboration condition.

Reading Time Analysis

As a complementary analysis, reading times of the critical sentence were analyzed to ensure that participants noticed the contradiction of earlier trait information. Previous studies
(Cook et al., 1998; Kendeou et al., 2013; O’Brien et al., 1998) have consistently found that reading times are slower when participants read the target sentence in the inconsistent elaboration condition. To test this, reading times of the target sentence were entered into a linear mixed-effects model with elaboration condition, probe location, and the elaboration X probe location interaction as fixed predictor variables. Participant and story were entered as random effects. Target-sentence reading times are displayed in Figure 3. The random effects accounted for a substantial proportion of total variance (ICC = .15), suggesting that it is necessary to treat the data as nested within participants and stories. Next, the fixed effect of elaboration condition was added to the model. There was a significant effect of elaboration condition, $b = -386$, $t(429.9) = -2.20, p = .028$, and a significant effect of probe location, $b = -466, t(432.2) = -2.67, p = .008$. However, there was no significant interaction between elaboration condition and probe location, $b = 187, t(430.2) = 0.76, p = .445$. Overall, this suggests that the participants in Experiment 1 noticed the inconsistency between the main character’s central trait and the behavior they later perform. Additionally, the effect of the elaboration condition suggests that the causal elaboration facilitates their comprehension of the target sentence.

![Target-Sentence Reading Times (Experiment 1)](image)

Figure 3: Experiment 1 target-sentence reading times (error bars represent standard errors).
Discussion

Overall, Experiment 1 is consistent with Kendeou and colleagues’ (2013) work as well as with the coherence building hypothesis. Kendeou and colleagues (2013) compared probe verification times in 3-sentence causal elaboration and 3-sentence non-causal elaboration conditions. They demonstrated that verification response times were slower in the causal elaboration condition, but only if the verification probe occurred after the target sentence. Similarly, the current study compared probe verification times in 3-sentence causal elaboration and 3-sentence inconsistent (i.e., neutral) elaboration conditions. In the current study, verification response times were slower in the causal elaboration condition, but only if the verification probe occurred after the target sentence. Both the current study and Kendeou and colleagues’ study suggest that the target sentence caused competing activation between the original trait and the elaboration to inhibit access to the original trait information. These findings are in line with the predictions of the coherence building hypothesis, which argues the importance of constructionist processes that have been relatively underspecified in the KReC framework.

However, the current study does not exclude the possibility that semantic overlap is the cause of outdated. That is, in Experiment 1, the probe location variable changes the amount of semantic information available to the reader (see Table 4). When the probe occurs before the target sentence, there is less semantic overlap for the reader to activate, which may have resulted in less interference in accessing the central trait.
CHAPTER 3
EXPERIMENT 2

To address the problem of semantic overlap, in Experiment 2 the probe was always placed after the target sentence. Additionally, a stronger test of the general interference and coherence building hypotheses was created by using modified texts from Cook and colleagues (1998). These stories are similar to those used by Kendeou and colleagues (2013) but contain a secondary character who sometimes has the central trait. Although either the primary or secondary character may have the central trait, only the primary character performs the contradictory behavior. Importantly, having the verification probe after the target sentence in all conditions ameliorates concerns that there is a confound of the number of retrieval cues across the before and after conditions in the material used in Experiment 1. The general interference hypothesis would predict slower verification in the causal elaboration condition, regardless of which character possesses the central trait. On the other hand, the coherence building hypothesis would predict slower verification in the causal elaboration, but only when the primary character has the central trait.
Method

Participants

As described in Experiment 1, based on $F$-values from Kendeou et al. (2013), main effects would require 24 participants to have sufficient power ($\beta = .95$). G*Power currently does not have the capability to calculate power analyses for within-factor interactions, so to ensure adequate power for interactions, an initial 46 undergraduates (24 female) enrolled in Introduction to Psychology at Northern Illinois University were recruited from the Psychology Department’s subject pool. Participants had an average age of 19.24 ($SD = 1.16$). One participant’s data was lost due to computer malfunction, leaving data from 45 participants.

Research Design

Experiment 2 utilized a 2 (inconsistent vs. causally elaborated conditions) X 2 (primary character trait vs. secondary character trait) within-subjects design with four observations per cell. The experimental stories (described below) were assigned to stimuli lists (see Appendix B). One of the four lists was then presented to participants in a randomized order. The primary dependent variable was verification response times. To analyze the data, linear mixed-effects modeling was used to control for random effects of item and participant. All analyses were conducted using the lme4 package in R (Bates et al., 2015).

Materials

Materials were 16 of the stories used by Cook et al. (1998), with slight modifications. These items convey the same basic stories as those used in Kendeou et al. (2013), but they have
an additional character who can have the contradictory trait (e.g., “Carol/Lori was extremely scared of heights…Carol had always wanted to go skydiving,” cf. Tables 3 and 5). However, Cook and colleagues only used the inconsistent versions in their studies, whereas in the current study, both the inconsistent and causal elaboration conditions were used. As in Experiment 1, the primary dependent variable was the response time on the verification probe, but as the current study attempted to remove the confounding factor of number of retrieval cues, verification probes (e.g., “Lori/Carol was very afraid of heights”) only occurred after the contradictory sentence (e.g., “Carol now really wanted to go skydiving”). As in Experiment 1, the inconsistent conditions were given additional sentences to correct for differences in referential distance. To ensure participant compliance, yes or no comprehension questions followed each story (e.g., “Was Carol liked by her co-workers?”). See Appendix D for Experiment 2 materials. As in Experiment 1, an additional 16 filler stories were also used. These stories were similar in structure to the critical stories, but the correct answer to the verification probe was always “false” to ensure an equal number of true and false responses.

Table 5

Example Item from Cook et al. (1998)

<table>
<thead>
<tr>
<th>Sentence</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Carol had always wanted to be a construction worker…</td>
</tr>
<tr>
<td></td>
<td>The work was exciting and she met a wonderful friend named Lori.</td>
</tr>
<tr>
<td>Primary Character Trait</td>
<td>Carol was extremely scared of heights and would only work on the ground level…</td>
</tr>
<tr>
<td>Secondary Character Trait</td>
<td>Lori was extremely scared of heights and would only work on the ground level…</td>
</tr>
<tr>
<td>Backgrounding Section</td>
<td>Carol always ate lunch with Lori and her other fellow workers…</td>
</tr>
</tbody>
</table>

(Continued on next page)
Table 5 (continued)

<table>
<thead>
<tr>
<th>Sentence</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Sentences</td>
<td>Carol now really wanted to go skydiving. She immediately accepted the offer.</td>
</tr>
<tr>
<td>Verification Probe</td>
<td>Carol/Lori was very afraid of heights.</td>
</tr>
<tr>
<td>Conclusion</td>
<td>To celebrate, she offered to take Lori out to dinner. Over dinner they finalized the plans for the trip. They would leave Lori’s house the following Saturday at 6 am.</td>
</tr>
</tbody>
</table>

Procedure

Participants read a randomized order of the 32 items (16 critical, 16 filler) one sentence at a time and pressed the spacebar to advance. Additionally, participants were asked to respond to two types of prompts. First, participants responded to verification probes described previously by pressing the “F” button to indicate that the probe is false or by pressing the “J” button to indicate that the probe is true. Second, participants responded to comprehension questions after the stories by pressing the “F” button to indicate that the probe is false or by pressing the “J” button to indicate that the probe is true. All reading and verification response times were recorded with millisecond accuracy.

Results and Discussion

Data Cleaning

Only trials with correct verification probe responses were used for the analyses. An additional 14 participants answered less than 75% of the comprehension questions correctly and were therefore deleted from the analyses. Furthermore, an additional 15 participants answered
less than 75% of the verification probes correctly and were therefore deleted from the analyses. This resulted in a sample of 16 usable participants. This is substantial loss of data and will be further explored in the Discussion. Trial verification response times that were faster than 500ms were rejected as outliers. Additionally, trial verification response times that were more than 2.5 SDs above the mean were deleted from the analyses (cf. Kendeou et al., 2013). Removing outliers resulted in deletion of 2.2% of valid trials. Probe verification times are displayed in Figure 4.

![Figure 4: Experiment 2 verification probe reaction times (error bars represent standard errors).](image)

**Probe Verification Response Times**

The purpose of Experiment 2 was to offer a direct test of the general interference and coherence building hypotheses. To test this, trials with correct verification probes were used in a linear mixed-effects model with elaboration condition (inconsistent vs. causal elaboration) and which character has the central trait (primary character vs. secondary character) as fixed predictor variables and probe response time as the outcome variable. Participant and story were
entered as random effects. The random effects accounted for a substantial proportion of total variance (ICC = .29), suggesting that it is necessary to treat the data as nested within participants and stories. Next, the fixed main effects (i.e., elaboration condition and character) and their interaction were added to the model. The fixed effect of elaboration condition was nonsignificant, $b = -92.61, t(196.96) = -0.39, p = .700$, as was the fixed effect of character, $b = 103.09, t(195.16) = 0.42, p = .675$. The elaboration condition by character interaction was also nonsignificant, $b = -183.38, t(195.47) = -0.55, p = .581$. Together, these results suggest that there is no effect of elaboration condition or which character has the trait that is later contradicted on verification response times.

**Reading Time Analysis**

As a complementary analysis, reading times of the critical sentence were analyzed to ensure that participants noticed the contradiction of earlier trait information, just as in Experiment 1. To test this, reading times of the target sentence were entered into a linear mixed-effects model with elaboration condition, character, and an elaboration condition X character interaction term as fixed predictor variables. Participant and story were entered as random effects. Target-sentence reading times are displayed in Figure 5. The random effects accounted for a substantial proportion of total variance (ICC = .11), suggesting that it is necessary to treat the data as nested within participants and stories. Next, the fixed effect of elaboration condition was added to the model. There was no significant effect of elaboration condition, $b = -168, t(202.6) = -1.23, p = .222$; no significant effect of character, $b = -90, t(201.0) = -0.64, p = .526$; and no significant elaboration condition X character interaction, $b = 189, t(201.2) = 0.99, p = .322$. This is a surprising finding given previous literature (Cook et al., 1998; Kendeou et al.,
2013; O’Brien et al., 1998) and could suggest that the participants in Experiment 2 did not notice
the inconsistency between the main character’s central trait and the behavior they later perform.

Figure 5: Experiment 2 target-sentence reading times (error bars represent standard errors).

Error Analysis

Because of the large portion of data excluded, an exploratory error analysis was
conducted. If the general interference hypothesis is accurate, it would be expected that readers
would encode the original trait and the causal elaboration. Upon reading the target sentence, both
of these pieces of information would be passively co-activated and then integrated into the
reader’s evolving mental model. At this point, the trait information and the target-
sentence/elaboration information would compete, and the target sentence and elaboration should
overcome the original trait information. This would therefore make the trait information less
accessible in the causal elaboration condition than in the inconsistent elaboration. This
hypothesis assumes that there is no need for the contradiction to be central to coherence building,
so the semantic relations between the target sentence, causal elaboration, and trait would be
sufficient to co-activate the contradictory information and cause retroactive interference for the
original trait. Thus, the general interference hypothesis would predict a main effect of elaboration condition, such that error rates would be higher in the causal elaboration condition compared to the inconsistent elaboration condition, regardless of character condition.

For the coherence building hypothesis, the initial phases of encoding and passive co-activation would be the same as in the general interference hypothesis. That is, it would be expected that readers would encode the original trait and the causal elaboration, and upon reading the target sentence, the original trait and the target-sentence/elaboration information would be passively co-activated and integrated into the reader’s mental model. At this point, the coherence building hypothesis diverges from the general interference hypothesis. According to the coherence building hypothesis, the original trait and target-sentence/elaboration information would compete, and the information from the target-sentence and causal elaboration would overcome the original trait information, but only when the contradiction was relevant to the explanatory coherence of the reader’s mental model. That is, there would only be retroactive interference from the causal elaboration if the character that possesses the trait is the same one who performs the contradictory action. As such, the coherence building hypothesis would predict an interaction between the character and elaboration conditions, such that error rates would be higher in the causal elaboration condition than the inconsistent condition when the primary character possesses the trait. However, there should be no difference in the elaboration conditions when the secondary character possesses the trait. Both of these hypotheses are displayed in Figure 6.
The original full dataset was used for this analysis. Trials where probe response time was less than 500ms or greater than 2.5 SDs above the mean were removed before analysis. Data cleaning resulted in deletion of 3.1% of the total dataset. Trial probe accuracy was entered into a logistic mixed-effects model with elaboration condition and character as fixed effect predictors. Item and participant were entered as random effects. Predicted probabilities by condition are displayed in Figure 7. The fixed effects of elaboration condition, character, and the interaction between elaboration condition and character were added to the model. There was no significant effect of elaboration condition, $b = -0.28$, $z = -1.16$, $p = .248$, and no significant effect of character, $b = -0.36$, $z = -1.44$, $p = .150$. However, there was a significant elaboration condition X character interaction, $b = 0.68$, $z = 1.97$, $p = .049$, suggesting that when there was a causal elaboration, those in the secondary character condition were more likely to answer the probe incorrectly.
Figure 7: Predicted error rates for Experiment 2 by condition. Note that due to the nature of the analysis, error bars are not attainable.

Discussion

If a passive memory-based perspective articulated by the general interference hypothesis were correct, it would not matter who possessed the contradicted trait and therefore there would be interference in the causal elaboration condition regardless of character. On the other hand, if the constructionist processes articulated by the coherence building hypothesis were important to mental model updating and it was necessary to establish coherence using the contradictory information, there would be interference only when the character with the trait and the character who performed the contradictory behavior were the same. Unfortunately, the data from Experiment 2 are not in line with either of these two predictions. Specifically, probe verification times were found to not differ across elaboration condition.

In Experiment 2, a large percentage of data was deleted due to low performance on verification probes and comprehension questions (i.e., 63% of participants). This is likely due to
the more complex nature of the experimental task relative to Experiment 1. That is, in Experiment 1, participants were only expected to track the traits and behavior of a single character in the experimental stories, whereas in Experiment 2, participants had to track the traits of two characters in each story. This may have caused confusion in which character possessed the central trait and could have impacted probe verification accuracy as a result. Moreover, it is well documented that interference across trials is possible (e.g., Anderson & Neely, 1996; Bäuml & Kliegl, 2013; Underwood, 1957), and it is possible that participants were confused about the names of characters in earlier stories as well. This idea is corroborated by the lack of an inconsistency effect in reading times. This is a relatively robust effect that has been replicated often (e.g., Cook et al., 1998; Kendeou et al., 2013; O’Brien et al., 1998), so its absence is surprising and may suggest underlying problems with the data. Because of the large percentage of data loss and lack of inconsistency effect, no firm conclusions should be drawn from Experiment 2.

To follow up on these null findings, an exploratory error analysis was conducted to determine if the patterns of errors were consistent with what the general interference and coherence building hypotheses would predict. The results of the error analysis were not in line with what either the general interference or coherence building hypotheses would predict. Specifically, neither a main effect of causal elaboration having higher error rates, nor an interaction where causal elaboration results in higher error rates (but only when the primary character possesses the original trait and behaves inconsistently with that trait) was found. Instead, there was a disordinal interaction where the secondary character condition resulted in higher error rates for causally elaborated stories and where the primary character condition
resulted in higher error rates for inconsistent elaboration stories. An explanation for this finding will be provided in the General Discussion.
Characters in narratives often behave in ways where their actions contradict their traits, beliefs, and goals. The KReC framework offers an explanation of how readers notice and resolve contradictions between aspects of the character and their actions. Specifically, KReC argues that information in the narrative can interfere with character information and thus prevent its reactivation when processing contradictory actions (Kendeou & O’Brien, 2014). There is some evidence to support this mechanism (e.g., Kendeou et al., 2013), but prior research suggests that this only occurs when the contradictory information is involved in coherence building. The purpose of the current study was to test this possibility.

Two competing hypotheses were tested. First, the general interference hypothesis predicted interference occurs whenever semantically related information is encountered that would lead to activation for the trait. Thus, the general interference hypothesis predicted that the causal elaboration condition would create interference and slow probe verification response times, regardless of when the probe occurred (Experiment 1) or who possessed the contradictory trait (Experiment 2). Alternatively, the coherence building hypothesis predicted that interference between the causal elaboration and the trait information would only occur when the trait information is relevant in establishing coherence with the prior text discourse. Thus, the coherence building hypothesis predicted that the causal elaboration condition would create
interference and slow probe verification response times, but only when the probe occurred after the contradictory behavior was performed (Experiment 1) or when the character who possessed the relevant trait was the same as the one who performed the contradictory behavior (Experiment 2).

The current study used two experiments to resolve the issue of whether coherence building about the contradictory information affects the reactivation of trait information. In Experiment 1, results indicated an interaction between elaboration condition and probe location such that participants were slower to respond to probes in the causal elaboration condition, but only if the probe occurred after the contradictory behavior. There were no differences between the elaboration conditions when the verification probe was presented before the contradictory behavior was performed. This is consistent with the pattern predicted by the coherence building hypothesis (see Figure 1). For example, the information that Carol goes to therapy to deal with her fear of heights does not prevent access to the fact that she is indeed afraid of heights. However, once we learn that Carol signs up for skydiving, the co-activation of her trait information and the causal explanation for why she may no longer be afraid causes activation to be sapped away from the original trait information and makes reactivation of her fear more difficult (Kendeou & O’Brien, 2014; also see Appendix A). Unfortunately, in Experiment 2 there was a substantial amount of data excluded from analyses (63%) and the data that were retained did not demonstrate the contradiction effect in reading times, suggesting further problems with comprehension. Because of these issues, results from Experiment 2 are uninterpretable.

An exploratory analysis of error rates was conducted to determine if participants had increased error rates in the conditions where the general interference and coherence building
hypotheses would predict reduced access to information. Results of the error analysis suggested a pattern of data inconsistent with both the general interference and coherence building hypotheses. Instead, there was a disordinal interaction where the secondary character condition resulted in higher error rates for causally elaborated stories and where the primary character condition resulted in higher error rates for inconsistent elaboration stories.

Although caution is warranted in interpreting these data considering the high error rates, a tentative explanation for the pattern of the results obtained suggests there may be two processes operating on these data. First, in the primary character condition, there is a break in global coherence in the inconsistent condition, but not in the causal elaboration condition. When reading the inconsistent elaboration condition, the participant is told that the primary character has a particular trait (e.g., fear of heights) and later is told that the character is inexplicably performing an action antithetical to the trait (e.g., skydiving). This results in a global coherence break as the action contradicts the previously established trait. On the other hand, in the causal elaboration condition, there is a plausible explanation for why the character may perform the action (e.g., they receive therapy to conquer their fear of heights), thus preventing the global coherence break. It is well documented that when there is a break in global coherence, the reader will engage in strategic meaning-making strategies in order to rectify the anomaly and re-establish explanatory coherence (Graesser, Bertus, & Magliano, 1995; Graesser et al., 1994). These explanatory processes may in turn make access to the trait information more difficult, resulting in relatively higher error rates in the inconsistent condition, though not significantly so.

On the other hand, in the secondary character condition, there is no break in coherence because the character that possesses the trait is different than the one who performs the action. In
this case, because there is no coherence break in the inconsistent version, the resting activation of trait information may remain relatively high and thus facilitate access to the information. This would therefore result in lower error rates relative to the causal elaboration condition since the initial trait is refuted in the causal elaboration condition, which could prevent access to the trait information, resulting in higher error rates. Given the high error rates and unpredicted pattern of results, this interpretation is speculative and should be considered with caution.

There is a large body of research that demonstrates that when there is no interfering information, contradicted information is accessible even when it is not relevant to the causality of the narrative (e.g., Cook et al., 1998; McKoon et al., 1996; O’Brien et al., 1995). However, Kendeou and colleagues (2013) found that when the interfering information was involved in coherence building, there was less reactivation. Because of these disparities, it is crucial to understand how these memory-based and constructionist processes are coordinated. KReC offers a framework to integrate these processes. Specifically, KReC proposes that memory is reactivated by a passive memory-based mechanism and that the co-activation of new information and prior information results in new information drawing activation away from the prior information, assuming the discourse supports the new information (Kendeou & O’Brien, 2014). This explicitly endorses the role of memory-based processing. Additionally, the KReC framework gives special weight to causal elaborations because of their deep connections with discourse comprehension (Kendeou & O’Brien, 2014), which is a central tenet of the constructionist view (Graesser et al., 1994; Trabasso & Sperry, 1985; van den Broek & Trabasso, 1986; Zwaan & Radvansky, 1998). However, KReC does not explicitly include or exclude the operation of constructionist processing.
The current study sought to test the role of coherence building within KReC to understand the parameters under which the KReC model operates. The coherence building hypothesis was corroborated by Experiment 1 results. Specifically, information in the causal elaboration (e.g., Carol is seeking help for her fear of heights) co-activates with prior information (e.g., “Carol was very afraid of heights”); however, there is no effect on the reactivation of information until the target sentence occurs (e.g., “She [Carol] now really wanted to go skydiving”). This is because the target sentence requires the reader to alter their understanding of the character’s trait in order to establish explanatory coherence. Once they have achieved explanatory coherence, information to the original trait becomes less accessible because the text has more information that pushes competing activation between the original trait and the information to more strongly activate new information about the trait. A stronger test of this interpretation was developed in Experiment 2. Unfortunately, as mentioned above, the results from Experiment 2 were uninterpretable due to problems with the data. The current study can therefore only partially support the importance of constructionist processes in the KReC framework.

Coherence building appears to play an important role in the accessibility of information from prior text discourse. This is consistent with the proposition by Long and Lea (2005) that memory-based retrieval is refined by later search after meaning. Specifically, Long and Lea (2005) argue that the information that is passively activated by memory-based retrieval is then evaluated by the reader for relevance to the text. If there is sufficient information present to establish explanatory coherence, then the information retrieved via passive memory retrieval is used to generate necessary inferences. On the other hand, if there is not enough information, then
readers will actively search through their long-term memory structures to find sufficient information to draw inferences (Long & Lea, 2005). Thus, in this conceptualization, coherence acts as a standard that must be met in order to comprehend the text (cf. van den Broek, Bohn-Gettler, Kendeou, Carlson, & White, 2011; van den Broek, Young, Tzeng, & Linderholm, 1999). Note, however, that this does not mean that conscious top-down processing is necessary to influence the activation of information via passive bottom-up processing. For example, the construction-integration model suggests a passive coherence building process reduces the activation of information that is not relevant to the discourse (Kintsch, 1988).

In general, the current study illustrates the compatibility of memory-based and constructivist accounts. Rather than being antagonistic, these processes appear to complement each other and describe different aspects of the comprehension process. Passive memory-based retrieval is essential for activation and co-activation of information that helps lay the foundation for comprehension to occur (e.g., Kendeou & O’Brien, 2014; Myers & O’Brien, 1998). However, sometimes the information that is activated creates a break in coherence that the reader notices (e.g., a contradiction between a character’s trait and their behavior). When this occurs, constructionist processes are used to resolve the coherence break and re-establish explanatory coherence (e.g., Trabasso & Magliano, 1996). It is possible that coherence building is necessary to prevent the reactivation of outdated information, but a more likely scenario is that coherence building amplifies interference to reduce access to outdated information. Although some research has examined how these memory-based and constructionist processes interact (e.g., Wolfe, Magliano, & Larsen, 2005), the current study underscores the need to further explore how these processes interact to aid comprehension.
Of particular importance to exploring memory-based and constructionist processes is a replication of Experiment 2. However, one potential modification is warranted. It is well known that readers tend to track character traits and goals (Singer et al., 1992; Suh & Trabasso, 1993; Trabasso & Magliano, 1996; Trabasso & Suh, 1993; Zwaan & Radvansky, 1998), so it is likely that having so many characters with different traits in Experiment 2 (64 characters including filler stories) could create substantial proactive interference of the names of characters from prior stories (Loess, 1967). Future work should retest this finding using simpler materials to facilitate comprehension and contradiction detection. For example, instead of using a verification probe with both trait information and character information (e.g., “Carol was very afraid of heights”), a less demanding verification probe may only ask participants to verify the trait information (e.g., “was very afraid of heights”).

Alternatively, other methods of testing retrieval interference may help elucidate how memory-based and constructionist processes interact to update mental models. For example, lexical decision tasks, in which participants must determine whether a string of letters presented in their left or right visual field is a real word or a pseudo-word, have been used to assess word and sentence reading processes (e.g., Michael, 2009) as well as the generation of inferences (Allbritton, 2004; Chow, Kaup, Raabe, & Greenlee, 2008; Virtue & Joss, 2017). In the context of testing KReC, lexical decision tasks could be used in place of probe verification with words semantically related and unrelated to the trait taking the place of probe verification. Slower responses to words related to the trait could indicate that the elaboration has reduced access to the trait information. Instead of lexical decisions, word naming could be used to similar effect. That is, instead of deciding on the legality of a target word, the participant could simply be asked
to read the target word, with faster naming speeds indicating more active information (e.g., Ferguson, Robidoux, & Besner, 2009). While lexical decision and word naming tasks are an elegant way to probe the reader’s memory representation of a text, slow performance on the task may be the result of poor information extraction or based on the “boundary” that a reader must meet before executing a decision (McKoon & Ratcliff, 2016). Additionally, lexical decision tasks may be more appropriate for understanding the neural processes that occur under different reading circumstances, due to their emphasis on hemispheric differences (i.e., testing reactions to words in the left or right visual field; Chow et al., 2008; Virtue & Joss, 2017). Unfortunately, lexical decision tasks, word naming tasks, and verification probe tasks like the one used in the current study all disturb the reading process and may interfere with natural reading (Magliano & Graesser, 1991).

Instead of measures that interfere with readers’ natural text-processing behaviors, measurements can be derived from the fixations that participants make while reading or from electrical activity changes in the brain. Eyetracking measures such as fixation time have been shown to correlate with readers’ strategic reading goals (Kaakinen & Hyönä, 2005) and the quality of readers’ comprehension (Metzner, von der Malsburg, Vasishth, & Rösler, 2017). Thus, the fixation time on key words in the target sentence (e.g., “skydiving”) could indicate the degree to which competing activation has resulted in the trait information being reactivated, with longer fixations indicating more difficulty in processing. However, eyetracking is not without its drawbacks, as pinpointing the changes in fixations is difficult and the inferences that can be made by such methods are still a matter of debate (Vasishth, von der Malsburg, & Engelmann, 2013).
Alternatively, event-related potentials (ERPs) measure brain activity in response to stimuli presented to the participants (Luck, 2014). ERPs have components that could be of interest to understanding how readers interpret contradictions. For example, the N400 component of an ERP has been found to be sensitive to semantic incongruities in sentences (Kutas & Federmeier, 2011; Kutas & Hillyard, 1980). Thus, to test KReC, one could extend the current study by using N400 deflections on ERPs as a dependent variable. More negative deflections of the N400 could suggest that the elaboration information is not generating enough competing activation to prevent the reactivation of the outdated trait information. Unfortunately, ERPs can be heavily distorted by eye movements, which creates issues with data quality (Luck, 2014), and to reduce these effects would create unnatural reading situations (e.g., reading a passage word by word at a fixed presentation speed).

In sum, there are many complementary ways to test the boundaries of the KReC framework. Future research should explore these methodologies in order to provide converging evidence for the role of coherence building in KReC. Some work on KReC has begun to take this approach. For example, Kendeou and colleagues (2019) used converging evidence from theory, think-aloud protocols, and reading time and posttest memory data to explore the five principles of KReC.

Previous research has shown that there are circumstances in which readers are unable to detect contradictions even when explicitly instructed to do so (e.g., Epstein et al., 1984; Glenberg et al., 1982). While the current study’s methodology does not answer the question of when readers detect contradictions in text, it does underscore the importance of this question. Because the materials in these two experiments differed in the amount of information that a reader had to
track, it is possible that there was proactive interference disrupting the ability to detect contradictions. Although there is no work that directly examines how contradiction detection in stories like those used in the contradiction paradigm is influenced by proactive interference, there is evidence that proactive interference is an important factor in comprehension (e.g., Borella, Carretti, & Pelegrina, 2010; Jäger, Engelmann, & Vasishth, 2017). It is therefore important to address this issue because the contradiction paradigm implicitly assumes that each narrative is independent, whereas the current study suggests that the materials may create some proactive interference for subsequent narratives.

Conclusion

What happens to our understanding of characters in narratives when we encounter them behaving inconsistently with their goals, beliefs, or prior behaviors? The present research suggests three main possibilities that are dependent on the causal structure of the narrative. First, a reader may not notice when a behavior contradicts prior character traits and goals. In this case, there is no effect on the memory for the prior trait. Second, if the reader notices the character’s contradictory behavior but that information is not central to the causal structure of the narrative, there will be no effect on the memory for the previous trait. That is, although the behavior of a character may seem to be in conflict with an earlier goal or trait, that goal or trait will still be easily accessible to the reader. Finally, when the contradiction is central to the narrative and it is noticed, the current study suggests that readers will have more difficulty accessing older information.

Returning to the example of The Shawshank Redemption (King, 1982), Warden Norton appears to be a devout Christian, but at a pivotal point in the narrative, his Christianity is
contradicted by his own corrupt behavior (i.e., ordering a guard to execute a prisoner for testing on behalf of another prisoner). If a reader notices this contradiction, it is likely that they will have a more difficult time remembering Warden Norton’s supposed virtue over his more apparent vice.
REFERENCES


APPENDIX A:

TABLE OF PREDICTIONS WITH ACCOMPANYING TEXT
<table>
<thead>
<tr>
<th>Sentence</th>
<th>Text</th>
<th>General Interference Hypothesis</th>
<th>Coherence Building Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Carol had always wanted to be a construction worker. It was hard getting started but she found this job two years ago. It was exciting for her and she couldn't have been happier.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inconsistent elaboration</td>
<td>Carol was extremely scared of heights and would only work on the ground level. She even refused to climb anything higher than a step ladder. While the others worked on the upper levels she worked on projects where she could stay safely on the ground. Carol felt comfortable working on laying the foundations of buildings that her company made. She had become something of an expert on pouring and setting the concrete that a foundation needed. Carol could even tell when someone didn’t properly do this without the help of any special tools.</td>
<td>Trait Information encoded into long-term memory</td>
<td>Trait Information encoded into long-term memory</td>
</tr>
</tbody>
</table>

(Continued on following page)
<table>
<thead>
<tr>
<th>Sentence</th>
<th>Text</th>
<th>General Interference Hypothesis</th>
<th>Coherence Building Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Causal elaboration</td>
<td>Because this was disrupting her life, her therapist suggested she try to do exciting activities involving heights. As a result of these activities, Carol was able to work in high areas easily. Now, she no longer needed to depend on coworkers to do any part of her job.</td>
<td>Contradictory information encoded into long-term memory. Co-activation and integration occur.</td>
<td>Contradictory information encoded into long-term memory. Co-activation and integration occur.</td>
</tr>
<tr>
<td>Backgrounding Section</td>
<td>Carol always ate lunch with her fellow workers. She was well liked and felt that she belonged. They were a friendly group of people she could depend on. She thought of them as a family and had developed several close friendships. In fact, one of her coworkers, Lori, invited Carol to join her on a trip. As Lori described the weekend adventure, Carol became very excited.</td>
<td>Trait and contradictory information are less activated.</td>
<td>Trait and contradictory information are less activated.</td>
</tr>
<tr>
<td>Sentence</td>
<td>Text</td>
<td>General Interference Hypothesis</td>
<td>Coherence Building Hypothesis</td>
</tr>
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<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Verification Probe (Before)</td>
<td>Carol was very afraid of heights.</td>
<td>Semantic information in probe reactivates all knowledge of character’s relevant trait. <strong>If in causal elaboration condition, slowdown occurs due to competing activation</strong></td>
<td>Semantic information in probe reactivates all knowledge of character’s relevant trait. <strong>No slowdown in either condition because reader hasn’t had to build coherence around contradiction.</strong></td>
</tr>
<tr>
<td>Target and Spillover Sentences</td>
<td>She now really wanted to go skydiving. Carol immediately accepted the offer.</td>
<td>Semantic information in target sentence reactivates all knowledge of character’s relevant trait.</td>
<td>Semantic information in target sentence reactivates all knowledge of character’s relevant trait. <strong>Co-activation of trait and contradictory information cause coherence break. Reader must resolve contradiction. Competing activation prefers elaboration information, reducing access to trait information</strong></td>
</tr>
<tr>
<td>Verification Probe</td>
<td>Carol was very afraid of heights.</td>
<td>Semantic information in probe reactivates all knowledge of character’s relevant trait. <strong>If in causal elaboration</strong></td>
<td>Semantic information in probe reactivates all knowledge of character’s relevant trait. <strong>If in causal elaboration</strong></td>
</tr>
</tbody>
</table>
condition, slowdown occurs due to competing activation condition, slowdown occurs because competing activation causes elaboration to draw activation away from trait.
## Stimuli Lists for Experiment 1 Items

<table>
<thead>
<tr>
<th>Item #</th>
<th>List 1</th>
<th>List 2</th>
<th>List 3</th>
<th>List 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item #1</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
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<tr>
<td>Item #2</td>
<td>D</td>
<td>A</td>
<td>B</td>
<td>C</td>
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<tr>
<td>Item #3</td>
<td>C</td>
<td>D</td>
<td>A</td>
<td>B</td>
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<tr>
<td>Item #4</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>A</td>
</tr>
<tr>
<td>Item #5</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>Item #6</td>
<td>D</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Item #7</td>
<td>C</td>
<td>D</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Item #8</td>
<td>B</td>
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<td>D</td>
<td>A</td>
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<tr>
<td>Item #9</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
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<tr>
<td>Item #10</td>
<td>D</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Item #11</td>
<td>C</td>
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A = Inconsistent Elaboration, Verification Before; B = Inconsistent Elaboration, Verification After; C = Causal Elaboration, Verification Before; D = Causal Elaboration, Verification After
Stimuli Lists for Experiment 2 Items

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A = Inconsistent Elaboration, Primary Character; B = Inconsistent Elaboration, Secondary Character; C = Causal Elaboration, Primary Character; D = Causal Elaboration, Secondary Character
APPENDIX C

EXPERIMENT 1 CRITICAL ITEMS
Introduction

Carol had always wanted to be a construction worker. It was hard getting started but she found this job two years ago. It was exciting for her and she couldn't have been happier.

Inconsistent (Distance Correction/Causal Elaboration)
Carol was extremely scared of heights and would only work on the ground level. She even refused to climb anything higher than a step ladder. While the others worked on the upper levels she worked on projects where she could stay safely on the ground. Carol felt comfortable working on laying the foundations of buildings that her company made. She had become something of an expert on pouring and setting the concrete that a foundation needed. Carol could even tell when someone didn’t properly do this without the help of any special tools. Because this was disrupting her life, her therapist suggested she try to do exciting activities involving heights. As a result of these activities, Carol was able to work in high areas easily. Now, she no longer needed to depend on coworkers to do any part of her job.

Filler
Carol always ate lunch with her fellow workers. She was well liked and felt that she belonged. They were a friendly group of people she could depend on. She thought of them as a family and had developed several close friendships. In fact, one of her co-workers, Lori, invited Carol to join her on a trip. As Lori described the weekend adventure, Carol became very excited.

Probe: Carol was very afraid of heights.
She now really wanted to go skydiving. Carol immediately accepted the offer.

Probe: Carol was very afraid of heights.

Closing
To celebrate, she offered to take Lori out to dinner. Over dinner they finalized the plans for the trip. They would leave Lori’s house the following Saturday at 6 am.

Question: Was Carol liked by her co-workers?
Introduction
Bill had always enjoyed walking in the early morning and this morning was no exception. During his walks, he would stop to talk with some of his neighbors.

Inconsistent (Distance Correction/Causal Elaboration)
Bill had just celebrated his eighty-first birthday. He didn't feel as strong as he was twenty years ago. In fact, Bill began using a cane as he hobbled along on his morning walks. He could not walk around the block without taking numerous breaks.

**Bill loved the scenery of his neighborhood and had made it a point to notice all the beautiful details on his walks.**
He moved around the garden with astounding arrangements of flowers and trees. There was also a little public pond with a bench where Bill would stop to sit and gather his strength.

*Nevertheless, his age never prevented him from acting in emergencies because he always had boosts of adrenaline.*

*The adrenaline always gave him immediate boosts in strength and energy.*

*In fact, last month he was able to get his neighbor out of her house when there was a fire.*

Filler
Today, Bill stopped to talk with Mrs. Jones. They had been friends for quite some time. They were talking about how hot it had been. For the past three months there had been record breaking high temperatures and no rain. Soon there would be mandatory water rationing. As Bill was talking to Mrs. Jones, he saw a young boy who was lying in the street hurt.

*Probe: Bill was getting older and weaker*

**He quickly ran and picked the boy up.**
**Bill carried the boy over to the curb.**

*Probe: Bill was getting older and weaker*

Closing
While Bill helped the boy, Mrs. Jones ran into her house to call the boy's mother and an ambulance. He kept the boy calm and still until help arrived.

*Question: Did Bill hate walking in the morning?*
Introduction
Owen had just completed graduate school and now had begun looking for a job. Most jobs he looked at were academic positions which required both teaching and research.

Inconsistent (Distance Correction/Causal Elaboration)
Owen particularly liked the research that he performed while in graduate school. To him, there was nothing more enjoyable than discovering something that had not been known before. He was a successful researcher and wanted to continue along this line. He was not interested in teaching.

The laboratory space in Owen’s department was much nicer than the lecture halls. There was a researchers’ lounge with comfy chairs, fresh coffee, and even large windows that let light in. This was much nicer than the dingy classrooms in the basement of the building.

Because there were no research positions currently available, his mentor told him to find a decent teaching program. Because the job market was so bad, teaching positions were his only option. He agreed with his mentor that this was a wise decision.

Filler
An additional constraint that Owen faced was geographical location. He grew up in New England and did not want to leave. Owen enjoyed the changing seasons and the cold weather. In fact, his favorite sports were hockey and skiing. With all of this in mind, Owen searched through the paper for jobs that would suit him. Finally, he found one he liked.

Probe: Owen enjoyed conducting research.

Owen applied for a teaching position. This university discouraged research.

Probe: Owen enjoyed conducting research.

Closing
Owen hoped that he would be hired for the job. He knew many new doctorates who could not find positions that suited them and he did not want to be in that position.

Question: Was Owen an auto mechanic?
Introduction
Steven recently graduated from college and was going to graduate school. As an undergraduate, he was involved in numerous organizations. This helped Steven to narrow his interests for graduate school.

Inconsistent (Distance Correction/Causal Elaboration)
He was most proud of being an officer in the numerous clean up and recycling clubs. Steven was an active environmentalist on campus and in the surrounding community. Once, he was involved in leading a protest against companies dumping waste products into a local river.

**Steven remembered that the river had been crystal clear when he was younger, but now the river water was thick and murky with pollutants.**

**The river had become so polluted that all the fish and frog populations were dying off. Scientists worried that the ecosystem would never recover from this damage.**

Still, he never recycled trash outside of school because he only presented himself that way to build his resume.

**Because he didn’t really care about recycling, he often dumped trash anywhere. But it was important to Steven to look good because graduate schools look for students with volunteer work.**

Filler
Last Saturday, Steven had to work on his car. Steven kept it in perfect working condition. It was time for its monthly grease job, filter replacement, and oil change. He took out all of the tools that he would need. Then he jacked the car up and drained the oil into an old container. Steven took the container around to the side of his house.

**Probe: Steven recycled on campus grounds.**

**He dumped the oil out in his backyard. Steven figured that it would be okay.**

**Probe: Steven recycled on campus grounds.**

Closing
He returned to the garage and finished working on his car. After he was satisfied with the engine work, Steven waxed the finish, polished the chrome, and cleaned the interior.

**Question: Did Steven graduate from college?**
Introduction
Today, Mary was meeting a friend for lunch.
She arrived early at the restaurant and decided to get a table.
After she sat down, she started looking at the menu.

Inconsistent (Distance Correction/Causal Elaboration)
This was Mary's favorite restaurant because it had fantastic health food.
Mary, a health nut, has been a strict vegetarian for ten years.
Her favorite food was cauliflower.
Mary was so serious about her diet that she refused to eat anything which was fried or cooked in grease.
The restaurant was extremely popular with college students.
It had a great seasonal menu with many different options.
Mary noticed that the menu had changed since she was here last, so there were plenty of new tasty dishes to choose from.
She wasn’t getting enough vitamins because of her diet so her doctor said she had to start eating meat.
She agreed to begin eating meat because it would solve her health issues.
Her doctor assured her that her iron levels would soon return to normal.

Filler
After about ten minutes, Mary’s friend arrived.
It had been a few months since they had seen each other.
Because of this they had a lot to talk about and chatted for over a half hour.
Finally, Mary signaled the waiter to come take their orders.
Mary checked the menu one more time.
She had a hard time deciding what to have for lunch.

Probe: Mary used to not eat meat at all.

Mary ordered a cheeseburger and fries.
She handed the menu back to the waiter.

Probe: Mary used to not eat meat at all.

Closing
Her friend didn't have as much trouble deciding what she wanted.
She ordered and they began to chat again.
They didn't realize there was so much for them to catch up on.

Question: Was Mary meeting her husband for lunch?
Introduction
George was a senior in high school and was in the process of applying to college. During this time, he realized he needed to participate in some extracurricular activities before he graduated.

Inconsistent (Distance Correction/Causal Elaboration)
He had always been shy and detested speaking in front of strangers. When a teacher would assign an oral report he would become sick to his stomach. On the day of a report, George would often break out in hives and would have to leave school. George began skipping school on presentation days whenever his parents would let him. His teachers hated this and began to take points away from him for skipping class. George thought that this was well worth it, and he couldn’t care less about what they thought.

Because George wanted to act, he was determined to overcome his fear of speaking in front of people. So, he enrolled himself in a public speaking course. He enjoyed the course so much that he pursued more opportunities for public speaking.

Filler
His high school offered many different after school activities. He decided to join the band as one of his activities. He also became a member of the yearbook staff. He decided to check the activities bulletin board for a couple more ideas. He first noticed an announcement for wrestling tryouts and then he noticed a colorful poster. It was announcing auditions for the spring play.

Probe: George detested speaking in public.

He auditioned for the part of male lead. He was cast in the male lead of Romeo.

Probe: George detested speaking in public.

Closing
The rehearsals were to begin the next day. George picked up his script and began to study that night. He wanted to be the best Romeo anyone had ever seen.

Question: Was George applying to college?
Introduction
Jessica had always been fascinated by different cultures.
Her family had decided to take a trip to Germany last summer.
She was glad her parents had chosen Germany as a vacation spot.

Inconsistent (Distance Correction/Causal Elaboration)
It was the first time Jessica had left her small midwestern town.
She had no idea what Germany would be like.
None of the schools in her town offered foreign culture or language classes.
Her only exposure to German culture was a television documentary.
The documentary showed the horrors of World War II, but mostly what had happened to Poland.
She couldn’t believe the awful things that the Germans had done to the Polish Jews.
Jessica wondered if all the German people had been ok with these horrible crimes.
Jessica was able to learn German because she borrowed library CDs of a complete course in the language.
She carefully listened to the CDs for several weeks.
Soon, she could understand quite a bit of German and she could speak the language fairly well.

Filler
While in Germany the family went to Check Point Charlie and the Berlin Wall.
After their trip through East Germany, they agreed it was a very depressing place.
They also visited the Rhineland and many different castles.
The family attended Oktoberfest and the Faschings festival.
They had a wonderful time at both carnivals.
At the festivals, the greatest experience was eating in the huge dining halls.

Probe: Jess had little exposure to German.

Jessica ordered all her meals in German.
No one could believe how fluent she was.

Probe: Jess had little exposure to German.

Closing
Everyone agreed that German food was much better than American food.
After dinner one night the family decided to visit the Berlin zoo.
Jessica wanted to see the baby pandas.

Question: Did Jessica and her family visit Cape Cod?
Introduction
As he got out of the shower, Tim was thinking about what needed to be done. He was going to have one shot at this and he wanted to get it right.

Inconsistent (Distance Correction/Causal Elaboration)
Tim was going to propose to his girlfriend. Their evening would begin at Chez Loui, an elegant French restaurant. Chez Loui was a very formal place and Tim wanted to look his best. After he proposed a toast, Tim would ask for her hand in marriage. Tim tried to imagine how Rick Blaine from Casablanca would have proposed. He had watched the movie hundreds of times, so he could almost picture how it would have happened. Tim hoped that he could be as suave and confident as Rick was. He needed to dress casual because he didn't want her to know this was a special night. He knew if he put on dress pants and a tie she would be suspicious. So, he decided to throw her off and to wear casual clothes.

Filler
With a towel around his waist, Tim went about getting ready. He went into the bathroom and shaved. Then he returned to his bedroom and he searched for his shoes. Next, he looked through his dresser for some clothes but didn't find anything he liked. He opened his closet and turned on the light. Tim had a hard time choosing what to wear.

Probe: Chez Loui was a formal restaurant
At last he grabbed some old faded jeans. Tim pulled them on and zipped them up.

Probe: Chez Loui was a formal restaurant

Closing
Tim searched his drawers for a pair of socks. He finished getting ready and grabbed his keys and wallet. Tim locked the door behind him and was on his way.

Question: Was Tim getting ready to go to bed?
Introduction
Jennifer enjoyed walking everyday in the park near her house. During the summer months, she would often stop and watch the ducks swimming in the small pond.

Inconsistent (Distance Correction/Causal Elaboration)
Jennifer was quite old and was having problems with her hearing. She was legally deaf and could not hear anything at all. She had tried to use a hearing aid, but it had stopped helping years ago. She was in her own silent world. Despite this, Jennifer still enjoyed taking long walks around the park. However, she always got emotional when she saw the children playing on the playground equipment. She used to take such delight in their laughter as they played their games. However, now she was able to hear loud noises because her doctor gave her a newer model hearing device. The new model worked much better than any she had used in the past. She was able to hear loud noises even those far away.

Filler
One day, while Jennifer was walking in the park, a mugging took place. A young man approached an elderly woman. He demanded her money. The man was dressed in black and wore a mask over his face. Jennifer was about thirty feet from where the event was taking place. The woman screamed as the young man stole her purse and ran away.

Probe: Jennifer used to be unable to hear.

Jennifer heard the woman yell for help. She looked up to see what was happening.

Probe: Jennifer used to be unable to hear.

Closing
The police asked Jennifer to give them all of the information that she could. There had been a string of muggings in the park and the police were interested in finding the culprit.

Question: Did Jennifer enjoy swimming in the pond?
Introduction
Carl and Sarah had only been dating for about two weeks. However, Carl wanted to plan a special night for their next date. A friend suggested that they attend a baseball game.

Inconsistent (Distance Correction/Causal Elaboration)
Carl thought that this was a terrible idea. When he was younger his father had dragged him to baseball games. He hated them and vowed that he would never go again. He was sure that he would think of something better to do on their date.

He thought it would be a good idea to see a movie. Carl really enjoyed the atmosphere of movies, not to mention the great popcorn that only theaters had. He thought it would be the ideal date for Sarah. He knew, however, that Sarah would love to go to the game on their date because she loved baseball. So, he decided to ignore his own hatred for the game. On his date he was going to do what she wanted to do.

Filler
He called Sarah to set a time for their next date. After he finished talking to her, he thought about their relationship. Although they had only been dating for a short while, he really liked her. Carl enjoyed her great sense of humor. He was particularly fond of her laugh. Carl decided that this was the night to tell Sarah how he felt about her.

Probe: Carl hated to go to baseball games
He called the ballpark to order tickets. He hoped that they would get good seats.

Probe: Carl hated to go to baseball games

Closing
Carl sat back and thought about where he and Sarah would go to eat before the game. He was certain that they would have a great time together.

Question: Were Carl and Sarah married?
Introduction
Fred always wanted to go to college. He studied really hard in high school so he would be able to achieve his goal. He graduated with high honors.

Inconsistent (Distance Correction/Causal Elaboration)
Fred had done well in all his classes except math. He had to struggle though each math course with the help of a tutor. He just did not understand the concepts behind the operations. He only took the minimum number of math courses required to graduate. Fred and his parents had gone on a couple of college tours at state schools. He was really interested in signing up for courses in the humanities. Specifically, he thought that English would be particularly easy and enjoyable for him. Because he wouldn't let his high school experience influence him, he took several summer math courses and improved his skills. He now understood many of the basic concepts of math. He even began to enjoy the more challenging math topics.

Filler
Because of Fred’s hard work, he had been accepted to Stanford University. He knew that the school had an excellent reputation. He would have little problem finding a job when he finished college. Fred decided it was time to look through the college catalogue. He looked for some classes for the fall. He wanted to pick classes he knew he would do well in.

Probe: Fred struggled with math courses.

He decided to take three math courses. He thought they would be interesting.

Probe: Fred struggled with math courses.

Closing
College would be hard, but Fred was confident that he would do well. His hard work had always paid off and he was certain it would this time as well.

Question: Did Fred want to go to college?
Introduction
Ken had been looking for a hobby for quite some time.
With his new job, he had four days a week free which would give him plenty of time to devote to a hobby.

Inconsistent (Distance Correction/Causal Elaboration)
Ken was a small man and didn't worry about staying in shape.
His small 120-pound body was all skin and bones.
Ken hated contact sports, but enjoyed non-contact sports, such as golf and bowling which he could practice alone.
His new job had him meeting with clients and trying to close sales with them.
On the rare occasions he did physical activities for work, it was usually playing golf with a client.
It was exactly the kind of job he had wanted.
Because his friends often teased him about his weight, he wanted to do a more physical sport.
Ken decided he really needed to build some muscle to stop the teasing.
So, he was looking for an appropriate class to help him do just that.

Filler
While walking downtown, Ken passed a new gymnasium.
He noticed the display in the window.
It was an advertisement for their summer sports program.
Ken started looking at the advertisement and was impressed with the long list of activities that the gym sponsored.
As he continued to look over the list, he became very excited.
It seemed interesting so Ken went inside.

Probe: Ken was a very small and thin man.

Ken decided to enroll in boxing classes.
He felt this would be the perfect hobby.

Probe: Ken was a very small and thin man.

Closing
Ken signed-up for the class and paid the registration fees.
He couldn't wait for the class to begin.
Ken exited the gym and continued his walk downtown.

Question: Was Ken looking for a hobby?
Introduction
Elizabeth’s daughter, Kim, had just started kindergarten. Elizabeth was happy that Kim had made a lot of friends. Kim would often tell her mom about her friends at school.

Inconsistent (Distance Correction/Causal Elaboration)
Unfortunately, Kim hated animals and was terribly frightened of them. In fact, she refused to go in the same room with a cat. Every time an animal approached her, she ran away and began to cry. Elizabeth didn’t know why Kim was so frightened of animals. Elizabeth recently took Kim to a nature documentary geared towards children. It was called The African Savannah and it talked about the ecosystem in the grasslands. Kim didn’t seem to like the movie at all, and she squirmed around throughout it. However, Kim wasn’t afraid of animals when her mother was in the room because her mother always protected her. In fact, as long as her mother was there, Kim seemed to enjoy animals. She was not afraid to play with them at all.

Filler
Elizabeth always dropped Kim off at school. Today, however, Kim wanted Elizabeth to come into school with her. She wanted Elizabeth to see her artwork and meet some of her friends. When they arrived, Kim ran up to the school doors. As Elizabeth and Kim entered the classroom, Kim looked around. Someone had brought in their pet and all the children were gathered around it.

Probe: Kim was very frightened of animals.

Kim ran across the room to pet the dog. She smiled as she brushed the dog’s fur.

Probe: Kim was very frightened of animals.

Closing
Kim waved to her mom and asked her to come see the dog. Elizabeth walked to the other side of the room and knelt down beside Kim and petted the dog.

Question: Was Elizabeth’s daughter in high school?
Introduction
Al and Sue were on their way to a friend's house for a party.
This was the first time in quite a while that Al and Sue had visited their friends.

Inconsistent (Distance Correction/Causal Elaboration)
They were crawling along the highway at about 30 mph.
Al described to Sue the terrible condition of his old, beat up car.
He complained about how the car would only sputter up to 35 mph then stall and over-heat.
It was an old family car that was used by all of Al’s siblings.
None of his older brothers and sisters took great care of the car either.
Al and his brother once took it on a cross-country road trip with very little oil.
Because Sue often enjoyed driving fast, she told Al to test the limits of his car and drive faster.
Al let Sue influence him and he pushed down on the gas.
He was nervous but got the car up to a speed well over the limit.

Filler
Al and Sue always enjoyed the road-side scenery on the long drive to their friend's home.
Their friends lived in the mountains.
The road was lined with large oaks and maples.
The scenery was especially beautiful in the fall.
As they were driving along the highway, Al suddenly noticed a police car in his rearview mirror.
Al pulled over to the side of the road.

Probe: Al’s car was in terrible condition.

The officer handed Al a speeding ticket.
He told Al it would cost fifty dollars.

Probe: Al’s car was in terrible condition.

Closing
Al took the ticket and put it in his wallet.
Quite upset, Al started up the car.
For the remainder of their trip, Al did not say a word.

Question: Were Al and Sue going to visit their parents?
Introduction
Karen called her friend Ralph at his dormitory. She had just returned from spring vacation and asked if he could arrange for someone to pick her up at Logan airport.

Inconsistent (Distance Correction/Causal Elaboration)
Even though Ralph had had his license for years, he was petrified of driving in Boston. Ever since he was in a terrible accident two years ago, he refused to drive in the city. If he needed to go anywhere near the city, Ralph took public transportation. Ralph found that he actually really enjoyed riding the subway around. It was cheaper than driving, and much less of a hassle since he could take a mini-nap on the train. He also saw a bunch of interesting people whenever he rode the subway. He had to get her because he couldn't find anyone else and she would be stranded if he didn't. Ralph was determined not to let his friend get stuck in the city. He printed directions so he would not get lost and walked over to his car.

Filler
Ralph and Karen were both sophomores in college. Ralph had known Karen for about a year. They had taken classes together. He thought she was a nice person and enjoyed her company. He was anxious to hear all about her vacation and he hoped that she had taken lots of pictures. Ralph had spent his vacation catching up on some overdue school work.

Probe: Ralph was afraid of city driving.

Ralph drove into Boston to pick her up. He recalled why he enjoyed city driving.

Probe: Ralph was afraid of city driving.

Closing
As he approached the airport, Ralph thought about how nice it would be to see Karen. He was anxious to hear about her vacation and tell her what had been happening at school.

Question: Did Karen call Ralph at his dormitory?
Introduction
Phil was watching television while his wife finished unpacking. They had gone away for the weekend and left the house a mess. His wife sat down and they began discussing cleaning up the house.

Inconsistent (Distance Correction/Causal Elaboration)
Phil was a true "packrat" and saved everything. In fact, he had been saving receipts, letters, and newspapers for over the past ten years. He had a large storage room in which he put important papers and other things he wanted to save.

The room also had boxes of the knickknacks that Phil had collected when he was a child. Many of these were cheap toys from fast-food chains or trinkets he found. But he had such fond memories that seeing them brightened his day.

Because his storage room was becoming crowded, he stopped saving old documents after his wife demanded that he clean.
After she asked him, he spent one full day cleaning.
He got rid of all the unneeded old papers.

Filler
As Phil and his wife were talking, she remembered that she had to find the last bank statement. They had received a notice that their car payment was overdue. Phil's wife knew they had paid it but the notice said they hadn't. The confusion was probably a computer error.
One of her friends had experienced a similar problem.
Suddenly, Phil remembered what he had done with them.

Probe: Phil used to save important papers.

He had thrown away the bank statements.
He had thrown them out a long time ago.

Probe: Phil used to save important papers.

Closing
Frustrated, they sat down and started thinking about what they should do. Phil said he would call the bank in the morning to see if they had any record of the transaction.

Question: Did Phil's wife unpack?
APPENDIX D

EXPERIMENT 2 CRITICAL ITEMS
Introduction
Bill had always enjoyed walking in the early morning and this morning was no exception. During his walks, he would meet his neighbor Dave and they would walk together.

Inconsistent (Causal Elaboration)
Bill/Dave had just celebrated his eighty-first birthday.
He didn't feel as strong as he was twenty years ago.
In fact, he began using a cane as he hobbled along on his morning walks.
Bill/Dave could not walk around the block without taking numerous breaks.
Bill/Dave loved the scenery of his neighborhood and had made it a point to notice all the beautiful details on his walks.
He moved around the garden with astounding arrangements of flowers and trees.
There was also a little public pond with a bench where Bill/Dave would stop to sit and gather his strength.
Nevertheless, his age never prevented him from acting in emergencies because he always had boosts of adrenaline.
The adrenaline always gave him immediate boosts in strength and energy.
In fact, last month he was able to get his neighbor out of her house when there was a fire.

Filler
Bill and Dave had been friends for quite some time.
While walking today they were talking about how hot it had been.
For the past three months there had been record breaking high temperatures and no rain.
Soon there would be mandatory water rationing.
As Bill was talking to Dave, he saw a young boy who was lying in the street hurt.

Bill quickly ran and picked the boy up.
He carried him to the side of the road.

Probe: Bill/Dave was getting older and weaker.

Closing
While Bill helped the boy, Dave ran into his house to call the boy's mother and an ambulance.
Bill kept the boy calm and still until help arrived.

Question: Did Bill hate walking in the morning?
Introduction
Carol had always wanted to be a construction worker. It was hard getting started but she found this job two years ago. The work was exciting and she met a wonderful friend named Lori.

Inconsistent (Causal Elaboration)
Carol/Lori was extremely scared of heights and would only work on the ground level. She even refused to climb anything higher than a step ladder. While the others worked on the upper levels Carol/Lori worked on projects where she could stay safely on the ground. Carol/Lori felt comfortable working on laying the foundations of buildings that her company made. She had become something of an expert on pouring and setting the concrete that a foundation needed. Carol/Lori could even tell when someone didn’t properly do this without the help of any special tools. Because this was disrupting Carol’s/Lori’s life, her therapist suggested she try to do exciting activities involving heights. As a result of these activities, Carol/Lori was able to work in high areas easily. Now, she no longer needed to depend on coworkers to do any part of her job.

Filler
Carol always ate lunch with Lori and her fellow workers. She was well liked and felt that she belonged. They were a friendly group of people she could depend on. She thought of them as a family, especially Lori. In fact, one of their co-workers invited Carol and Lori to join her on a trip. As Carol and Lori listened to the description of the weekend adventure, they became very excited.

Carol had always wanted to go skydiving. She immediately accepted the invitation.

Probe: Carol/Lori was very afraid of heights.

Closing
To celebrate, she offered to take Lori out to dinner. Over dinner they finalized the plans for the trip. They would leave Lori’s house the following Saturday at 6 am.

Question: Was Carol liked by her co-workers?
Introduction
Anne’s family had owned horses ever since she was a little girl. Each day Anne would ride her horse in one of the many nearby pastures with her best friend Julia.

Inconsistent (Causal Elaboration)
Midnight, Anne’s/Julia’s horse, was a tired old mare and needed special attention. She was too old to perform any strenuous tasks and was getting weaker as each day passed. Anne/Julia could sense the fatigue of the frail horse as it strained to carry her weight. Over time, Anne’s/Julia’s horse seemed to develop a mind of its own. Sometimes, the horse would simply stop moving and no amount of coaxing could get it to go. Anne’s/Julia’s family would joke that Midnight was as stubborn as a horse. However, recently the veterinarian had changed Midnight’s diet, and her health was starting to improve. Anne/Julia was amazed at how much stronger the horse became. She could even jump over obstacles for the first time in years.

Filler
Anne and Julia were experienced riders and handled horses well. Today, as Anne and Julia were riding, they were distracted by a loud cry. It sounded like an animal was in pain. They looked around to see where the cry had come from. Unfortunately, because of this, they didn’t notice the large ditch immediately in front of them. Anne and Julia were forced to kick their horses in their sides.

Anne’s horse gracefully jumped the ditch. They landed safely on the other side.

Probe: Anne’s/Julia’s horse was old.

Closing
Anne and Julia found an injured sheep that was the source of the cry. Anne rode back to the barn to find someone to help the poor animal.

Question: Did Anne ride her horse everyday?
Introduction
Today, Mary was meeting her friend Joan for lunch. She arrived early at the restaurant and decided to get a table. After she sat down, she started looking at the menu.

Inconsistent (Causal Elaboration) This was Mary's/Joan's favorite restaurant because it had fantastic health food. Mary/Joan, a health nut, had been a strict vegetarian for ten years. Her favorite food was cauliflower. Mary/Joan was so serious about her diet that she refused to eat anything which was fried or cooked in grease. The restaurant was extremely popular with college students. It had a great seasonal menu with many different options. It seemed like the menu was always changing, so there were plenty of new tasty dishes to choose from. She wasn't getting enough vitamins because of her diet so her doctor said she had to start eating meat. She agreed to begin eating meat because it would solve her health issues. Her doctor assured her that her iron levels would soon return to normal.

Filler After about ten minutes, Joan arrived. It had been a few months since they had seen each other. Because of this Mary and Joan had a lot to talk about and chatted for over a half hour. Finally, they signaled the waiter to come take their orders. They checked their menus one more time. Mary and Joan had a hard time deciding what to have for lunch.

Mary ordered a cheeseburger and fries. She handed the menu back to the waiter.

Probe: Mary/Joan used to not eat meat at all.

Closing Her friend didn't have as much trouble deciding what she wanted. She ordered, and they began to chat again. They didn't realize there was so much for them to catch up on.

Question: Was Mary meeting her husband for lunch?
Introduction
Ken and his friend Mike had been looking for summer hobbies for quite some time. They were both college professors and they had the summers off from teaching. This meant that they both had plenty of time to try new things.

Inconsistent (Causal Elaboration)
Ken/Mike was a small man and didn't worry about staying in shape. His small 120-pound body was all skin and bones. Ken/Mike hated contact sports, but enjoyed non-contact sports, such as golf and bowling which he could practice alone. His new job had him meeting with clients and trying to close sales with them. On the rare occasions he did physical activities for work, it was usually playing golf with a client. It was exactly the kind of job he had wanted. Because his friends often teased him about his weight, he wanted to do a more physical sport. Ken/Mike decided he really needed to build some muscle to stop the teasing. So, he was looking for an appropriate class to help him do just that.

Filler
While walking downtown during their lunch break one day, Ken and Mike passed a new gymnasium. They noticed the display in the window. It was an advertisement for the gym's summer sports program. They started looking at the advertisement and were impressed with the long list of activities that the gym sponsored. As they continued to look over the list, they became very excited. It seemed interesting, so Ken and Mike went inside.

Ken decided to enroll in boxing classes. He felt this would be the perfect hobby.

Probe: Ken/Mike liked non-contact sports.

Closing
Ken signed-up for the class and paid the registration fees. He couldn't wait for the class to begin. Ken exited the gym and continued his walk downtown.

Question: Was Ken looking for a hobby?
Introduction
Mrs. Dolan’s daughter, Kim, had just started kindergarten.
She was happy that Kim had made a lot of friends.
Kim would often tell her mom about her friend Amanda at school.

Inconsistent (Causal Elaboration)
Lately, all Kim/Amanda talked about was how much she/Amanda hated animals and how frightened she was of them.
In fact, she refused to go in the same room with a cat.
Every time an animal approached her, she ran away and began to cry.
Mrs. Dolan didn't know why Kim/Amanda was so frightened of animals.

Mrs. Dolan recently took Kim and Amanda to a nature documentary geared towards children.
It was called The African Savannah and it talked about the ecosystem in the grasslands.
Kim/Amanda didn’t seem to like the movie at all, and she squirmed around throughout it.
However, Kim/Amanda wasn't afraid of animals when her mother was in the room because her mother always protected her.
In fact, as long as her mother was there, Kim/Amanda seemed to enjoy animals.
She was not afraid to play with them at all.

Filler
Mrs. Dolan always dropped Kim off at school.
Today, however, Kim wanted her mom to come into school with her.
She wanted her mom to see her art work and meet her friend, Amanda.
When they arrived, Kim was met at the school doors by Amanda.
As the three entered the classroom, they looked around.
Kim and Amanda noticed that someone had brought in their pet and all the children were gathered around it.

Kim ran across the room to pet the dog.
She smiled as she brushed the dog’s fur.

Probe: Kim/Amanda was very frightened of animals.

Closing
Kim waved to her mom and asked her to come see the dog.
Mrs. Dolan walked to the other side of the room and knelt down beside Kim and petted the dog.

Question: Was Mrs. Dolan's daughter in high school?
Introduction
Jessica and her younger sister Kelly had always been fascinated by different cultures. Their family had decided to take a trip to Germany last summer. They were glad their parents had chosen Germany as a vacation spot.

Inconsistent (Causal Elaboration)
It was the first time Jessica/Kelly had left her small midwestern town they lived in. She had no idea what Germany would be like. None of the schools in her town offered foreign culture or language classes. Jessica's/Kelly’s only exposure to German culture was a television documentary.
The documentary showed the horrors of World War II, but mostly what had happened to Poland.
She couldn’t believe the awful things that the Germans had done to the Polish Jews.
Jessica/Kelly wondered if all the German people had been ok with these horrible crimes.
Jessica/Kelly was able to learn German because she borrowed library CDs of a complete course in the language.
She carefully listened to the CDs for several weeks.
Soon, she could understand quite a bit of German and she could speak the language fairly well.

Filler
While in Germany the family went to Check Point Charlie and the Berlin Wall. After their trip through East Germany, they agreed it was a very depressing place.
They also visited the Rhineland and many different castles.
The family attended Oktoberfest and the Faschings festival.
They had a wonderful time at both carnivals.
At the festivals, the greatest experience was eating in the huge dining halls.

Jessica ordered all her meals in Germany.
No one could believe how fluent she was.

Probe: Jessica/Kelly knew little of Germany.

Closing
Everyone agreed that German food was much better than American food.
After dinner one night the family decided to visit the Berlin zoo.
Jessica wanted to see the baby pandas.

Question: Did Jessica and her family visit Cape Cod?
Introduction
Karen called her friends Ralph and Joe at their dormitory.
She had just returned from spring vacation and asked if they could arrange for someone to pick her up at Logan airport.

Inconsistent (Causal Elaboration)
Even though Ralph/Joe had had his license for years, he was petrified of driving in Boston. Ever since he was in a terrible accident two years ago, he refused to drive in the city. If he needed to go anywhere near the city, Ralph/Joe took public transportation.
Ralph/Joe found that he actually really enjoyed riding the subway around.
It was cheaper than driving, and much less of a hassle since he could take a mini-nap on the train.
He also saw a bunch of interesting people whenever he rode the subway.
He had to get her because he couldn't find anyone else and she would be stranded if he didn't.
Ralph/Joe was determined not to let his friend get stuck in the city.
He printed directions so he would not get lost and walked over to his car.

Filler
Ralph and Joe were both sophomores in college and had known Karen for over a year. They all lived in the same dorm and were taking a class together. Karen took excellent notes and they all found it helpful to study together. In fact, they had an exam to take in a few days and they were anxious for Karen to return to school. They also looked forward to hearing about her vacation. As a favor, Ralph and Joe made arrangements for Karen's return.

Ralph drove into Boston to pick Karen up.
He recalled why he enjoyed city driving.

Probe: Ralph/Joe hated driving in Boston.

Closing
As he approached the airport, Ralph thought about how nice it would be to see Karen. He was anxious to hear about her vacation and tell her what had been happening at school.

Question: Did Karen call Ralph and Joe at their dormitory?
Introduction
Jennifer and her neighbor Liz enjoyed walking everyday in the park near their house. During the summer months, they would often stop and watch the ducks swimming in the small pond.

Inconsistent (Causal Elaboration)
Jennifer/Liz was quite old and was having problems with her hearing. She was legally deaf and could not hear anything at all. She had tried to use a hearing aid, but it had stopped helping years ago. Jennifer/Liz was in her own silent world. Despite this, Jennifer/Liz still enjoyed taking long walks around the park. However, she always got emotional when she saw the children playing on the playground equipment. She used to take such delight in their laughter as they played their games. However, now she was able to hear loud noises because her doctor gave her a newer model hearing device. The new model worked much better than any she had used in the past. She was able to hear loud noises even those far away.

Filler
One day, while Jennifer and Liz were walking in the park, a mugging took place. A young man approached an elderly woman. He demanded her money. The man was dressed in black and wore a mask over his face. The woman screamed as the man stole her purse and ran away. Jennifer and Liz were about thirty feet from where the event was taking place.

Jennifer heard the woman yell for help. She looked up to see what was happening.

Probe: Jennifer used to be unable to hear.

Closing
The police asked Jennifer to give them all of the information that she could. There had been a string of muggings in the park and the police were interested in finding the culprit.

Question: Did Jennifer enjoy swimming in the pond?
Introduction
Owen and his classmate Michael would be finishing graduate school soon and had recently begun looking for jobs. Most job advertisements they found were academic positions which required both teaching and research.

Inconsistent (Causal Elaboration)
Owen/Michael particularly liked the research that he performed while in graduate school. To him, there was nothing more enjoyable than discovering something that had not been known before. He was a successful researcher and wanted to continue along this line. Owen/Michael was not interested in teaching.

The laboratory space in Owen’s/Michael’s department was much nicer than the lecture halls. There was a researchers’ lounge with comfy chairs, fresh coffee, and even large windows that let light in. This was much nicer than the dingy classrooms in the basement of the building.

Because there were no research positions currently available, his mentor told him to find a decent teaching program. Because the job market was so bad, teaching positions were his only option. He agreed with his mentor that this was a wise decision.

Filler
A constraint that both Owen and Michael faced in finding jobs was geographical location. They both grew up in New England and did not want to leave. They enjoyed the changing seasons and the cold weather. They were both actively involved in winter sports like hockey and skiing. With all of this in mind, they searched through the paper for jobs that would suit them. Finally, Owen and Michael found jobs they wanted to apply for.

Owen applied for a teaching position. This university discouraged research.

Probe: Owen enjoyed doing research.

Closing
Owen hoped that he would be hired for the job. He knew many new doctorates who could not find positions that suited them and he did not want to be in that position.

Question: Was Owen an auto mechanic?
Introduction
As best friends, Alice and Tina had a lot of the same goals. They had always wanted to go to college. They both studied really hard in high school and graduated with high honors.

Inconsistent (Causal Elaboration)
Alice/Tina had done well in all her classes except math. She had to struggle through each math course with the help of a tutor. She just did not understand the concepts behind the operations. Alice/Tina only took the minimum number of math courses required to graduate. Alice/Tina and her parents had gone on a couple of college tours at state schools. She was really interested in signing up for courses in the humanities. Specifically, she thought that English would be particularly easy and enjoyable for her. Because she wouldn’t let her high school experience influence her, she took several summer math courses and improved her skills. She now understood many of the basic concepts of math. She even began to enjoy the more challenging math topics.

Filler
Because of their hard work in school, Alice had been accepted at Stanford University and Tina was accepted at Berkeley. They knew that both schools had excellent reputations. Because of this, they would have little problem finding jobs when they finished college. It was exciting when they looked through their college catalogues together and considered what classes to take in the fall. Alice and Tina wanted to pick classes they knew they would do well in.

Alice decided to take three math courses.
She thought they would be interesting.

Probe: Alice/Tina struggled with math courses.

Closing
College would be hard, but Alice and Tina were confident that they would do well. Their hard work had always paid off and they were certain it would this time as well.

Question: Did Alice want to go to college?
Introduction
George and his best friend Sam were seniors in high school. They wanted to go to college together, so they were in the process of applying to the same schools. During this time, they realized they needed to participate in some extracurricular activities before they graduated.

Inconsistent (Causal Elaboration)
George/Sam had always been shy and detested speaking in front of strangers. When a teacher would assign an oral report he would become sick to his stomach. On the day of a report, George/Sam would often break out in hives and would have to leave school. George/Sam began skipping school on presentation days whenever his parents would let him. His teachers hated this and began to take points away from him for skipping class. George/Sam thought that this was well worth it, and he couldn’t care less about what they thought. Because George/Sam wanted to act, he was determined to overcome his fear of speaking in front of people. So, he enrolled himself in a public speaking course. He enjoyed the course so much that he pursued more opportunities for public speaking.

Filler
George and Sam decided to get involved in something at school. Their high school offered many different after school activities. George decided to join the band as one of his activities, and Sam became a member of the yearbook staff. They both checked the school bulletin boards for a couple more ideas. One day, they noticed an announcement for wrestling tryouts. Then George and Sam noticed a colorful poster announcing auditions for the spring play.

George auditioned for one of the leads. He was cast in the male lead of Romeo.

Probe: George/Sam hated public speaking.

Closing
The rehearsals were to begin the next day. George picked up his script and began to study that night. He wanted to be the best Romeo anyone had ever seen.

Question: Was George applying to college?
Introduction
The twins, Marie and Sue had recently turned sixteen. To celebrate, they decided to treat themselves by getting something that they really wanted. They decided that they each wanted to buy a new wardrobe.

Inconsistent (Causal Elaboration)
Marie/Sue always ordered her clothes online because she hated going to crowded malls. She enjoyed the comfort of trying on clothes in the privacy of her own home. Marie/Sue was also able to see what she already had to go with a new piece of clothing. Marie/Sue was very self-conscious about her appearance. She had been teased for how she looked when she was younger, and she hadn’t ever gotten over the experience. She hated the feeling of wearing something that just didn’t fit her perfectly. However, many of the items Marie/Sue really wanted were only available in stores. There was a dress that she had dreamed of wearing that was only at one store in the mall. Because of this, she had little choice but to go to the mall for it.

Filler
Marie and Sue were really excited about turning sixteen. They were tired of having to depend on their parents for everything. Up until this point, they were completely dependent on their parents to go anywhere and that often meant that they had to do things together. Now they could become a bit more independent. At sixteen, they could get their driver's licenses and jobs. Marie and Sue both looked forward to having their own spending money.

Marie asked a friend to go to the mall. She wanted help picking out new clothes.

Probe: Marie/Sue hated going to malls.

Closing
Marie was extremely happy with the clothes she picked out. She couldn’t wait to show Sue what she had found.

Question: Are Marie and Sue able to drive?
Introduction
Joe sat down by the window and looked outside. It was a beautiful evening and he wanted to spend some time enjoying it. He went outside and noticed his neighbor Doug working in his yard.

Inconsistent (Causal Elaboration)
Joe/Doug hated physical exertion. His idea of exercise was climbing up two flights of stairs. If he had a choice, he would use the elevator. He was not exactly lazy, but he generally avoided unnecessary exercise, such as jogging. Joe/Doug thought that jogging was a waste of time.

Joe’s/Doug’s office had recently implemented a wellness program to improve physical and mental health. Joe/Doug wasn’t interested in these things, and only went so that his boss saw that he was a team player. When he got home, he complained to his wife about the program. However, Joe/Doug had a heart attack a year ago, and his doctor told him he needed to exercise more. He had to exercise at least four times a week to improve his heart health. Because of this, he began to exercise more frequently than he ever had before.

Filler
Joe went over to talk to Doug as he worked in his yard. Joe had recently moved to the area. His new apartment was in the country and Doug was his nearest neighbor. Both Joe and Doug really loved the area and enjoyed having all the open space around them. They had both once lived in the city and did not miss the congestion that was its trademark. While they were talking, Joe asked Doug for some directions along some of the country roads.

Joe decided he would go for a long run. He ran five miles before heading home.

Probe: Joe/Doug disliked all exercise.

Closing
Joe felt good about his run. It was a great night to exercise and he felt good about having done it.

Question: Did Joe and Doug live in the country?
Introduction
Chris was an excellent athlete and he enjoyed outdoor activities. During high school Chris and his best friend Pete played sports together. Since graduation, they enjoyed keeping in touch and telling each other about the different activities they were involved in.

Inconsistent (Causal Elaboration)
Chris/Pete loved the warm spring weather and the hot days of summer. Because he couldn't stand the cold weather, he spent his winter vacations in the tropics. Each year Chris/Pete tried a new warm-weather sport and in the past, he had tried wind surfing, swimming, and surfing. He especially liked doing water-based sports, because they reminded him of his coastal beach hometown.
Being in a landlocked town was a little sad for Chris/Pete. Luckily, there were always things to do, so he didn’t think about it too often. This year, the stock market crashed and because of that Chris/Pete couldn’t go to the tropics. Because of this, he stayed home this winter in his snowy town. He decided that he needed to find a winter sport to stay active and ward off cabin fever.

Filler
Chris and Pete made a point of staying in shape. In addition, being involved in sports helped relieve Chris' work-related tension. Because his job was very stressful, his boss allowed him a short vacation every few months. Chris used the mini-vacations as an opportunity to get away from the hectic pace of work. Pete worked as a coach at a high school and often traveled during his school vacations. Unfortunately, Chris and Pete rarely got to see each other but they often told each other about their activities over the phone.

This year Chris tried downhill skiing. He could not believe what fun he had.

Probe: Chris enjoyed warm weather.

Closing
Chris told Pete about how much fun he had while skiing. He suggested that Pete should give it a try as well.

Question: Did Chris and Pete meet in college?
Introduction
Robin and her roommate Sarah loved to spend time at the ocean watching the waves crash against the rocks. They enjoyed the sun and the cool breeze that came off the water.

Inconsistent (Causal Elaboration)
However, Robin/Sarah was a poor swimmer and had avoided the water ever since grade school. She dreaded the feeling of being suspended in the ocean as the waves rolled past. Robin/Sarah had always preferred staying on the shore to swimming in the water. She would often look for seashells that washed ashore.
Eventually, Robin/Sarah started a collection of all the interesting shells that she had found. Her collection contained an array of colors, shapes, and sizes and was something to behold. Robin/Sarah felt like she was missing out, so she decided to take swimming lessons to conquer her fear.
Although it was scary at first, she quickly improved at swimming. Because of this, Robin/Sarah was now less afraid of being in the water.

Filler
Recently, Robin was house-sitting for a friend who owned a small cottage along a private beach. Because she would be staying there alone for a few days, she thought it would be nice to invite Sarah over.
Robin searched the newspaper for something for them to do. As she looked in the paper for a movie to see with Sarah, Robin noticed an advertisement for something she wanted to try. Robin was excited to tell Sarah about what she had found in the paper.

Robin had decided to try scuba diving. She thought that it sounded interesting.

Probe: Robin/Sarah was a poor swimmer.

Closing
Robin couldn’t wait to see all the interesting sea creatures. She hoped that Sarah was just as excited as she was.

Question: Was Robin babysitting for a friend?