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Connectives and Causal Relatedness in Expository Text

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CONNECTIVES AND CAUSAL RELATEDNESS IN EXPOSITORY TEXT

by

BENJAMIN G. SIMPKINS

(Under the Direction of John D. Murray)

ABSTRACT

The combined influence of causal connectives and varying levels of causal relatedness on online and offline comprehension of expository texts was investigated. The current hypothesis was that causal connectives would encourage elaborative processing and online generation of bridging inferences, particularly in the moderately to low causally-related sentence pairs. This was predicted because past research has noted causal connectives' capacity to elicit generation of inferences online. Connectives were not predicted to encourage inference generation in the higher-related items because the causal bridging inference should be obvious to the reader. To test this, a new set of 24 expository items was generated with four versions of each item representing varying levels of causal relatedness. Results show little evidence supporting the hypotheses. To account for the null findings, the potential difficulty and participants' lack of familiarity with the text content are discussed as factors. Suggestions for future research are presented.

INDEX WORDS: Discourse Processing, Connectives, Conjunctions, Causality, Causal Relatedness, Bridging Inferences, Elaborative Inferences, Local Coherence, Expository Text

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CHAPTER 1

INTRODUCTION

The influence of connectives (e.g., *furthermore, because, on the other hand*) on discourse has been the focus of considerable research attention (e.g., Caron, Micko, & Thuring, 1988; Millis & Just, 1994, Murray, 1997; Singer & O'Connell, 2003). Connectives are a linguistic device that helps readers establish coherence among sentences in a discourse. Local coherence is the most distinct form of coherence, as it allows the reader to semantically connect adjacent clauses and sentences. Other mechanisms that contribute to the establishment of local coherence are argument overlap (Kintsch & van Dijk, 1978), coreference (Carpenter & Just, 1977; Degand, Lefevre, & Bestgen, 1999), and causal inferences (Duffy, Shinjo, & Myers, 1990; Millis, Golding, & Barker, 1995; Myers, Shinjo, & Duffy, 1987). Connectives establish coherence by explicitly stating the relationship between adjacent elements in text (Halliday & Hasan, 1976).

Dynamics of Connectives

Connectives occur as words (often conjunctions) and short phrases, and often occur between clauses in a single sentence or at the beginning of a new sentence, thus implying the sentence's relation to the prior statement. In their classic work, Halliday and Hasan (1976) identified four types of connectives: temporal, additive, causal, and adversative. Temporal connectives, such as *before, then,* or *meanwhile,* specify how the adjacent clauses are related in time. These often appear as an indicator of a sequence of events. Additive connectives, such as *and, moreover,* or *furthermore*, elaborate on the information stated initially by simply providing additional information or an example.

Causal connectives, for instance *because, thus,* or *therefore*, imply a causal relationship between two clauses. Finally, adversative connectives, such as *but, nevertheless,* or *however*, signal a contrasting or contradictory relationship between clauses. There may be other types of connectives. For instance, Millis, Graesser, and Haberlandt (1993) noted a subtype of causal connectives that includes an additional implication of intentionality. Millis et al. pointed out that intentional connectives, such as *in order that* or *so that*, imply a causal relationship between the clauses as well as a notion of goal-orientedness. However, the authors speculated that the participants did not interpret the intentional connectives much differently than the causals.

Researchers disagree over the precise role played by connectives in a discourse. Some researchers (Kintsch, 1977; van Dijk, 1977) argue that connectives' role in reading is passive, and that these devices basically add nothing relevant to a text. Others (Fayol, Gombert, Lecocq, Sprenger-Charolles, & Zagar, 1992) argue that connectives and similar discourse markers promote shallow processing of material. That is, connectives encourage the reader to be "lazy" by explicitly stating relations, thus preventing the reader from actively computing the interclausal relation. This passivity hypothesis was unsupported in a study by Degand, Lefevre, and Bestgen (1999). In this study, after reading each text, participants made metacognitive judgments on how they would perform on subsequent comprehension questions. After reading the texts containing connectives, participants underestimated how they performed on the follow-up questions. On the other hand, the judgments appeared to be quite accurate after reading texts lacking connectives. If participants in the connectives-present group processed the text shallowly, then they would have judged their performance more accurately, or possibly have

overestimated. However, based on the metacognitive judgments and increased comprehension question performance, presence of connectives does not appear to promote shallower processing of text.

Other researchers have also provided evidence against the passivity hypothesis. In their simplest form, appropriately-placed connectives provide clarity and flow to text (Goldman & Murray, 1992; Millis, Graesser, & Haberlandt, 1993; Murray, 1997). Murray's (1997) continuity hypothesis states that, in narrative texts, certain connectives (additive, temporal, and causal) promote coherence by signaling a continuous flow of ideas whereas others (adversatives) signal a break in the continuity of the discourse. Based on online processing findings, Murray found that adversative connectives, in particular, are beneficial, since they allow for signaling of discontinuities. Because discontinuities are rarer in text and usually increase reading difficulty, the placing of a signal (adversative connective) to inform the reader about an imminent discontinuity is helpful with respect to online processing (Murray, 1997).

More evidence of connectives' immediate benefit to the reader comes from research involving second-language speakers. Goldman and Murray (1992) found that both native English speakers and ESL (English-as-second-language) speakers had similar preferences for types of connectives when they were to choose which connective worked best between certain sentence pairs. Both groups were more accurate in choosing connectives for the additive and causal items. Furthermore, the authors found that native and ESL speakers made similar errors. In particular, both tended to incorrectly chose causal connectives when an additive connective was the correct choice and vice versa. The overall preference for continuous connectives also supports Murray 's (1997)

continuity hypothesis, showing that speakers acquiring a second language pick up on connectives' contributions to continuity and discontinuity quickly. Finally, Goldman and Murray's (1992) study showed that both types of speakers could easily explain the function of different types of connectives in a discourse.

Further evidence that connectives make a discourse clearer comes from a study by Degand and Sanders (2002). Using sentence pairs, connectives were supplied in one condition to make explicit the causal relationship between the adjacent clauses. Without the causal connective in these items, the intersentential relation would most likely be interpreted as temporal. The presence of connectives was found to increase performance on comprehension questions for both first and second-language readers. The comprehension questions were sensitive to the causal and content information presented in the sentences. Connective presence was associated with increased comprehension.

Although the evidence discussed so far indicates that connectives benefit the establishment of local coherence, there is other evidence indicating that connectives may play a role in global coherence, particularly through the use of speech acts (Schiffrin, 1987). Speech acts are potential indicators of global shifts in the narrative, such as a turn of events. An example is: *Albert has always held the reputation of being a calm and sensible man. But suppose, hypothetically speaking, that Albert did react emotionally. He may have killed the man out of blind jealousy.* In the second sentence, the connective *but* marks a major turning point in the narrative that affects the understanding of the text for sentences afterwards. However, since this approach does not take into account the interclausal influence of connectives (Kintsch, 1977), the concentration of the remainder of this literature review will be on connectives' effects on local coherence.

The Influence of Connectives on Text Memory

Because the nature of a connective is to explicitly state the relation between two units of text, it has been proposed that the presence of a connective should increase retention of the surrounding text (e.g., Caron, Micko, & Thuring, 1988; Degand, Lefevre, & Bestgen, 1999; Murray, 1994). The simple rationale for this is that any device that clarifies the relation between ideas in text should promote integration and make for a more robust memory representation (Loman & Mayer, 1983). Evidence for the direct effect of connectives on memory came from a study by Caron, Micko, and Thuring (1988). Using sentence pairs, the researchers manipulated the presence of three types of connectives (causal, additive, and adversative) and assessed recall for the second sentence (when cued by the first) of each item. Findings showed that only causal connectives significantly increased subsequent cued recall. However, other researchers (Degand, Lefevre, & Bestgen, 1999; Millis, Graesser, & Haberlandt, 1993) pointed out that the texts were quite unnatural in that the pairs of sentences were completely unrelated. Subsequent studies tested the effect of connective presence on cued recall in the context of coherent sentences (Millis, Graesser, & Haberlandt, 1993; Murray 1994). These findings failed to replicate Caron et al.'s (1988) findings that showed that connectives are beneficial to memory. In fact, Millis et al.'s (1993) findings supported connective interference. However, Golding, Millis, Hauselt, and Sego (1995) demonstrated that the presence of a causal connective led to a benefit on recall of the second sentence when cued by the first when a causal connective was present. Due to the relatively small number of studies in this area, and because of the differences in the nature of the texts used (narrative versus expository), definitive conclusions regarding

connectives' effect on memory are difficult to make. It is reasonable to argue that causal connectives should facilitate memory for surrounding texts, since information in a causal chain is better remembered than information not linked causally (Black & Bern, 1981). This should be especially pertinent when the causal relation between two clauses is not explicitly stated in the context of the sentences. Many adjacent clauses are interpreted temporally without a causal connective present to bridge the cause-effect relation (eg. Degand & Sanders, 2002; Singer & O'Connell, 2003).

In an attempt to reconcile the equivocal findings pertaining to the benefit of connectives on perception of text sensibility and text memory, a recent study by Simpkins (2005) was conducted using expository texts to test how connective presence influences perceived sensibility of text and memory performance. Expository texts were selected because very few studies have examined this type of text (e.g., Millis, Graesser, & Haberlandt, 1993, Singer & O'Connell, 2003). Furthermore, in the only study that used expository text to examine the impact of connectives on memory, the texts used were quite unnatural. Perhaps most important, expository texts differ from narrative texts in several respects: Because their content is unfamiliar to the reader, expository texts are much less predictable than narratives (Miller, 1985). Furthermore, the content is usually quite abstract. Also, because expository texts provide information that is usually unfamiliar to the reader, the reader's goal while reading such texts is to learn. For these reasons, it is hypothesized that the presence of coherence markers, such as connectives, should play a more important role in expository text, given that they enhance the comprehensibility of local text relations.

In Simpkins' (2005) study, separate text versions were generated for each relation type (additive, causal, adversative) so that the surrounding text would coincide appropriately with the connective. In order to control for reading time and cued recall, the target (second) sentence was identical in every version of each text. Therefore, the target sentence was kept ambiguous concerning relation type and the first sentence was changed to coincide with the appropriate relation.

Murray's (1994) method was adopted for Simpkins' study. Three text booklets were created so that each participant received only one version of each item. Connective type was manipulated within-subjects. While reading the texts, participants were told to indicate, using a 5-point Likert-type scale, how sensible the items appeared as a unit. In other words, participants rated how sensibly the second sentence flowed from the first. In addition to providing an online measure of comprehension, the rating task also encouraged the participants to read for comprehension. Participants read a total of 30 items, each with three versions, as well as twenty non-sensible filler pairs. The experimental items were pretested to ensure that they would be perceived as sensible. After reading and rating the items, participants completed an incidental cued recall test of the 30 experimental items (recall of target sentence when cued by the preceding sentence).

Sensibility ratings showed that causal relations (both with and without connectives) were perceived as the most sensible. However, there was not a significant facilitation of perceived sensibility when a connective was present in the casual relations. On the other hand, adversative connectives significantly increased perceived sensibility,

compared to the connective-absent condition. Additive connectives did not increase perceived sensibility of the surrounding text.

Recall protocols were scored according to a gist criterion. Gist, in this case, was operationally defined as a clear understanding of the subject and predicate (including the object of the predicate). Overall, recall was better, for those items conjoined by a connective, compared to items where a connective was absent. However, this effect interacted with relation type: The presence of a causal connective increased recall compared to the no connective condition. Adversative connectives also aided significantly in recall but not to the same extent as causal connectives. The presence of additive connectives was not associated with improved recall performance compared to the connective-absent condition. These findings strongly support the notion that causal and adversative connectives facilitate memory for expository sentence pairs. Furthermore, similar to the recall findings of Caron et al. (1998) and Golding et al. (1995), Simpkins' study provides support for the idea that causally-linked ideas are more sensible and memorable (Black & Bern, 1981) than either the adversative or additive relations. It appears that placing a causal marker between the clauses strengthens the causal-memory link all the more.

Influence on Comprehension

The presence of connectives is associated with improved performance on comprehension questions (Degand et al., 1999; Degand & Sanders, 2002; Millis et al., 1995; Millis & Just, 1994). Furthermore, comprehension questions are answered more quickly when connectives are present in the text (Millis et al., 1995; Millis & Just, 1994; Noordman, Vonk, & Kempff, 1992; Singer, Harkess, & Stewart, 1997; Singer &

O'Connell, 2003). Both of these findings include questions testing knowledge of cause-effect relationships between clauses as well as content questions (Millis et al, 1995; Noordman et al., 1992; Singer et al., 1997; Singer & O'Connell, 2003). Several researchers (Degand et al., 1999; Degand & Sanders, 2002; Millis et al., 1995) have argued that comprehension questions are a more sensitive measure than recall tasks at examining connectives' effects on offline processing.

Overall, findings regarding the benefit of connectives indicate that causal connectives in particular increase the perceived comprehensibility of the immediately surrounding text. However, still unclear is whether or not connectives actively increase memory for a text by specifying local text relations. The research pertaining to how connectives influence online processing may provide clarity on this issue.

Connectives and Online Processing

Besides specifying the relation between adjacent clauses, connectives also serve as a signal about the nature of the upcoming text (Murray, 1994, 1997). In his work, Murray (1997) examined this signaling function closely by focusing on continuity. He argued readers expect, by default, that the flow of ideas in a text is continuous. Based on this, connectives that signal continuity should impact processing (and therefore, reading time) to a lesser extent than connectives that signal a discontinuity. Murray's findings confirmed this hypothesis. Specifically, when adversative connectives were placed inappropriately (i.e., between adjacent clauses that were additively or causally related), readers experienced a greater processing disruption than when additive and causal connectives were place inappropriately. Consistent with these findings are results from earlier studies (Golding, Millis, Hauselt, & Sego, 1995; Murray, 1994), where greater

signaling advantages were found for adversative connectives than for causal and additive connectives.

No facilitative effect emerged from additive and causal connectives for processing of the post-connective sentence compared to the no connective conditions (Murray, 1994). Actually, Murray found a slight increase in reading time when a causal connective was present between the clauses. The reason for this is unclear. Murray argued that causal connectives act as a signal of importance; that is, they indicate to the reader that there is a need for additional processing of the following information. Other researchers have not replicated this finding. Millis and Just (1994) and Millis et al. (1995) observed a slightly quicker second clause reading time in the presence of "because," and Golding et al. (1995) found no difference between conditions. The discrepancy in findings here may be due to other factors. The causal connectives that Murray (1994) and Golding et al. (1995) were studying were forward causal relations (the cause is followed by the effect), whereas Millis and Just (1994) and Millis et al. (1995) examined "because," which indicates an effect-cause relation. Furthermore, the two clauses present in these two studies were joined by "because" in a single sentence, whereas in the connective-absent condition the two clauses were two separate sentences.

Millis and Just (1994) and Millis et al. (1995) used a self-paced reading paradigm to understand more how connectives influence online processing. In this paradigm, participants read phrases one word at a time and pressed a key to advance each word. This method allowed the researcher to examine which words and text regions were read slower or faster than others. Millis and Just (1994) showed that causal connectives facilitate integration of the surrounding clauses by allow them to be encoded as a single

representation. Without the connective, the representations of the two clauses are constructed separately. This was discovered by testing level of activation of probe words from both clauses after reading. By combining this with reading time data, Millis and Just showed that the causal connective cues the reader to postpone integration and reactivate the first clause at the point they reach the end of the second clause. Combining this finding with improved performance on comprehension questions in the connective condition, the authors argued that connectives encourage integration while reading is taking place. (See also Millis et al., 1995).

In sum, whereas the experimental findings pertaining to offline findings (memory performance, comprehension questions) are unclear, the evidence is clearer for connectives aiding in online processing (reading time). As mentioned earlier, there are certain text-based variables that may influence the effects of connectives which have not yet been accounted for, such as whether participants are reading expository versus narrative text, or text difficulty. Text difficulty may be especially pertinent in the context of expository text. Singer, Harkess, and Stewart (1997) explored the issue of text difficulty and showed that less difficult texts were associated with reduced error rates compared to more difficult texts.

Why do causal connectives potentially facilitate memory for a text? Recall that several studies (Degand et al. 1999; Degand & Sanders, 2002; Millis et al., 1995; Millis & Just, 1994) found that the presence of causal connectives is associated with better performance on comprehension questions. Could the improved recall be due to the same phenomenon that allows causal connectives to increase comprehensibility of a text? Millis and Just (1994) provided concrete evidence that causal connectives facilitate

integration of adjacent clauses online. But, what is it about causal connectives that facilitates integration? Looking at how connectives influence inference generation may provide some answers to this issue.

Inference Generation

The study of causal connectives has primarily focused on their effects on inference generation, (Millis et al., 1995; Noordman, Vonk, & Kempff, 1992, Singer & O'Connell, 2003; Singer et al., 1997) especially causal bridging inferences. These inferences are a form of backward inference that the reader, in some situations, must make in order to identify the unstated causal relation between two text ideas. For example, in the sentence *Water spilled on the glass stand near the bookshelf because the little girl stuffed flowers in the vase*, the absence of *because* would inhibit the reader from readily making the causal connection between the two clauses. As in the case of all backward inferences, a causal connective is needed here in order to maintain passage coherence. Also inherent in the generation of causal bridging inferences is the notion that readers generally attempt to validate bridging inferences by checking them against some semantic knowledge structure, be it an isolated piece of knowledge or schema-related (Noordman et al., 1992; Singer, Harkess, & Stewart, 1997; Singer & O'Connell, 2003). In fact, there is some controversy over how much of a role world knowledge plays in generation of bridging inferences (Noordman et al. 1992; Singer et al. 1997). This is of particular concern for expository texts, because narrative texts mostly pertain to situations where general knowledge concerning inference validation is available to the majority of readers. With expository texts, however, Noordman et al. (1992) showed that readers rarely generate causal bridging inferences in the presence of "because" while reading

unfamiliar texts. That is not to say that readers are unable to generate inferences while reading without the knowledge to make the connection. Noordman et al. examined this issue in detail and found that readers only generate causal bridging inferences when it is relevant to the purpose in reading the text. That is, if the reader is looking for information pertinent to the subject matter in the clauses, a causal bridging inference will be generated online. Otherwise, the reader will not attempt to make the causal connection online, but may later if they are subsequently asked a comprehension question concerning information relevant to the inference.

As mentioned previously, Singer et al. (1997) found different results compared to those of Noordman et al. (1992) when using a less difficult text. Particularly, Singer et al. discovered evidence that text structure (e.g., wording, sequence of words) is a factor when determining whether readers will make causal bridging inferences online while reading unfamiliar text. They pointed out the high error variance in reading and question-answering times in Noordman et al.'s (1992) study as well as a generally slower reading time when controlling for text length. Therefore, it is not completely implausible that readers will actively make causal bridging inferences when they are reading text that is unfamiliar.

Millis, Golding, and Barker (1995) examined the impact of connective presence on the generation of causal bridging inferences. They tested online activation of the causal inference using a lexical decision task. The influence effect was determined by subtracting the response time (RT) to the lexical target that was the subject of the inference (e.g., "FULL" from the flowers-in-vase example given above) from the RT to a lexical decision target that was unrelated to the item. If the difference was significantly

greater than zero, the inference was said to be activated. Results consistently showed that "because" regularly elicited activation of the target inference, compared to the no connective condition. Follow-up experiments showed that additive and temporal connectives failed to elicit inference generation. It was concluded that causal connectives are unique in their ability to precipitate generation of bridging inferences.

Using expository texts, Singer and O'Connell (2003) replicated the findings of Singer et al. (1997) by actively manipulating the presence of "because" in conditions where the causal bridging inference was explicitly stated in the text as well as in conditions where it was left implicit. After reading the items, participants were asked comprehension questions regarding the bridging inference. Results showed that connective presence in the implicit condition led to a slow down in reading time, indicating that readers needed extra time to compute the bridging inference. Furthermore, question-answering response time was about the same in both the implicit and explicit conditions when "because" was present. This indicates that the inference was extracted when "because" was present, regardless of whether the inference information was made explicit or not.

Although they play an important role in facilitating causal bridging inferences, the impact of causal connectives on elaborative processing (e.g., forward inferencing) has been less documented. Caron, Micko, and Thuring (1988) explained the increased memory associated with causal connective presence with the idea that these connectives indicate to the reader the need to make elaborative inferences. That is, they argued that the presence of "because" may motivate the reader to make inferences concerning the relationship between the two clauses. Generated elaborations should increase recall for

texts because inferences supply extra routes for retrieval (Anderson, 1983). What is interesting about Caron et al.'s (1988) finding has to do with the nature of the text involved. An example of one of the texts is: "The priest was able to build the new church. The computer had made a serious error." The sentence pairs all had an arbitrary relation. Thus, if participants' increased recall in the connective condition was actually due to extra elaborations, the subsequent effect on recall was due only to the extra processing. That is, if there was a chance that the pair of sentences could be connected intuitively, presence of a causal connective may simply allow for integration. In the absence of any semantic connection, as in Caron et al. (1988), elaboration due to the connective's presence alone facilitated recall. It has been found that recall was facilitated when participants were instructed to elaborate on the link between two sentences (Duffy, Shinjo, & Myers, 1990). In the same study, when another group was asked to study the sentence pairs for later recall, the elaborative encoding group showed much less of a decay in recall performance when tested again 24 and 48 hours later. Therefore, compared to active studying of the texts, elaborating on interclausal relations actually was more beneficial to LTM storage. Thus, there is ample evidence that motivation to generate elaborative inferences can benefit memory.

Connectives and Causality

The strength of the causal link between two adjacent units of texts alone can influence the probability of elaborating. Keenan, Bailet, and Brown (1984) manipulated causal relatedness between pairs of sentences. Specifically, they varied how likely the first sentence was a cause for the second. For example

        Statement 1:

Level   1. Joey went to play baseball with his brother.
                 2. Joey got angry at his brother in a game.
                 3. Joey began fighting with his older brother.
                 4. Joey's brother punched him again and again.

        Statement 2:
        The next day his body was covered with bruises.

The authors examined both reading time for statement 2 as well as recall of the first sentence (when cued by the second). They found that reading time sped up as causal relatedness increased. More interestingly, recall was found to increase from levels 1 to 3, but then drop off at level 4 to performance comparable to level 2 of causal relatedness. That is, the best recall emerged when the statements were moderately related. In response to this finding Myers, Shinjo, and Duffy (1987) developed a new set of narrative texts and pretested them by having participants rank them on causal relatedness. Using the pretest scores as the predictor variable in a regression analysis, the researchers obtained an elaborate display of the effects of causal relatedness on reading time and recall. Based on this and a follow-up study (Duffy et al., 1990), the authors confidently concluded that moderately-related sentence pairs elicited the most generation of elaborations. At the lowest levels of causal relatedness, there is no immediately implied causal relation, so readers have little motivation to elaborate on the intersentential relation. When there is some evidence pointing towards a cause-effect relation at level two, some participants may begin generating elaborations. With the sample item, such an elaboration at level 2 may be "Joey's anger may have affected his performance while playing the game" or even "Joey could have had a physical altercation with his brother." At level 3, the cause-effect relationship is somewhat stronger, and more participants will generate elaborative

inferences that "Joey's bruises the next day could have been due to the fight with his brother." However, at level 4, the fact that Joey had bruises the next day was obviously caused by his brother punching him is obvious. There is no need to generate elaborations to make the causal connection. Once again, based on the impact of elaboration on memory (Duffy, et al., 1990) and spreading activation's account for the contribution of elaborating to retrieval (Anderson, 1983), moderately to moderately-high related items elicit more elaborations which, in turn, aid in retrieval during a recall task.

Do causal connectives influence the generation of elaborative inferences? Golding, Millis, Hauselt, and Sego (1995) replicated Myers et al.'s (1987) methodology but also manipulated the presence of a causal connective ("therefore"). Both the reading time and recall functions for the no connective items replicated the results of Myers et al. (1987). In contrast, the presence of "therefore" at the beginning of the second sentence slowed reading time in the lowest-related pairs, compared to the no connective condition. This suggests that the presence of "therefore" motivated the readers to elaborate on the interclausal relation in the lower-related items. Based on the notion that being motivated to elaborate on text relations increases subsequent recall of text (Duffy et al., 1990), Golding et al. expected that a corresponding elevation in recall would result in the low-related items in the recall function for the connective condition. Although there was some evidence for this, the recall for the connective-present condition did not differ as much from the no connective condition as expected in the lower causally-related items.

Purpose of the Present Study

The focus of the present experiment was to examine the effects of varying levels of causal relatedness and the presence of causal connectives on the processing of

expository texts. These two factors were examined via both online and offline measures. Along with reading time, the additional measure of lexical decision latency was used to test for activation level of the bridging inference following the reading of each item. Based on the method of Millis et al. (1995), a one-word representation of the bridging inference was used as the lexical decision target. It was hypothesized that, in the connective-absent condition, level of activation of the causal inference would increase as causal relatedness increases. Also, the reading time function observed by Myers et al. (1987) and Golding et al. (1995) was expected in the connective-absent condition.

Because narrative texts have been used exclusively in testing the effects of causal relatedness, the nature of the reading time and possibly, the recall function, were predicted to be somewhat different in the present experiment than observed in previous research (Golding et al., 1995; Myers et al., 1987). Particularly, based on the findings of Singer et al. (1997) and Singer and O'Connell (2003), the presence of the connective should elicit generation of the causal inference for moderately related pairs, resulting in slower reading times and higher inference activation than the connective-absent condition. Furthermore, based on the reading time findings of Golding et al. (1995), it was hypothesized that connectives would elicit elaborative inference generation in the lower-related pairs. This was expected to heighten the activation of the causal bridging inference, especially for the moderately-low related items. This would be indicated by an elevation in reading times and higher inference activation (faster lexical decision times), compared to the connective-absent condition. Recall was expected to increase, compared to the connective-absent condition for both low and moderately-related items, due to elaborative processing and direct generation of bridging inferences, respectively. The

reading time functions for both groups were expected to converge as they both decreased in the higher causally-related items. Likewise, the recall functions were also expected to converge for the higher-related pairs, showing the typical peak and drop off at the highest-related items.

CHAPTER 2

METHOD

Participants

Fifty-six undergraduates at Georgia Southern University participated to fulfill a course requirement or receive extra credit in an introductory psychology course. Participants were treated in accordance with the "Ethical Principles of Psychologists and Code of Conduct" (American Psychological Association, 1992).

Materials

Twenty-four experimental sentence pairs were generated to resemble standard textbook-style expository text. Items were chosen randomly from *MSN Encarta* electronic encyclopedia. Particularly, articles for item generation were chosen from the subtopics of "Machines and Tools," "Computer Science and Electronics," and "Industry, Mining, and Fuels" under the primary subject of "Physical Science and Technology." These particular topics were chosen because they are rarely covered in core curriculum classes at Georgia Southern University. This reduces the possibility of Introductory Psychology students having prior knowledge of the material.

Sentence pairs were generated according to Halliday and Hasan's (1976) interclausal relation specifications. All sentence pairs involved either the second sentence containing a consequence or effect of a stimulus or event mentioned in the first sentence. All items to be generated were limited to ones with cause (first sentence)-effect (second sentence) relations.

Four versions of each of the 24 items were generated, representing different levels of causal relatedness. The four levels of causal relatedness varied based on the

accessibility of the bridging inference. For the highest level of causal relatedness, the inference was almost explicitly stated, whereas the inference was not immediately accessible in the lowest level of causal relatedness. A sample item is shown in Table 1.

For norming purposes, two pretests were conducted. The first was an inference generation exercise in which students generated potential bridging inferences for a moderately-related (causally) version of each item. Students read each sentence pair and were asked why the particular event in the first item caused the specific outcome in the second sentence (see Table 1). Following Millis, Golding, and Barker's (1995) method, a target word was generated that best represents the bridging inference. Two criteria for selecting the appropriate word were followed: 1) The word was the primary verb or noun of the bridging inference, 2) The word did not appear in the item. The representative target word was used to test for activation of the inference in the lexical decision task (See *Design and Procedure*).

Table 1

Sample Item With Four Levels of Causal Relatedness, Pretest Question, and Lexical Decision Target

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Sentence 1:

Level 1   *In 1977, the position of Uranus in the sky was being tracked closely by planetary astronomers.*

Level 2   *In 1977, an astronomer observed the momentary disappearance of a star from sight while observing Uranus.*

Level 3   *In 1977, a distant star momentarily disappeared when Uranus passed near it in the sky.*

Level 4   *In 1977, a star momentarily disappeared when something around Uranus obstructed its light.*

Sentence 2:   *(Therefore), it was suggested that there must be rings around Uranus.*

Pretest Question (To generate lexical decision target):

Why did the disappearance of a distant star when Uranus passed near it cause scientist to suggest there may be rings around the planet?

Potential Lexical Decision Target:

COVER

The goal of the second pretest was to ensure that causality was truly being manipulated. During the pretest, participants rated four versions of the items based on their causality, using a 7-point Likert-scale (1 = very unrelated, 7 = highly related). The mean ratings from the four items were used as the predictor variable in mapping the causality function for each measure in the ranked causality analysis (see below).

Twenty-seven filler pairs were also generated along with the 24 experimental items. Intersentential relations other than causal ones were used to balance out the causal experimental items. Nine of the items were additively related, nine temporally-related, and nine adversatively-related. Approximately half of the fillers contained an appropriate interclausal connective. Comprehension questions that test the content of the sentence pairs were generated for all experimental and filler items. Half of them were correctly answered "yes" and half "no." The comprehension questions were included to ensure that participants were actively reading the items.

Four sets of the texts were created and each version of every item were randomly assigned to one of the four text sets so that only one level of causal relatedness for each item will appear in each text. However, the items were sorted in the text sets so that an equal number of items representing each causal level appeared in each text set (6 low, 6 moderately-low, 6 moderately-high, and 6 highly-related).

Design and Procedure

Two independent variables were examined: presence/absence of connective and causal relatedness (four degrees on a continuum from low to high). Connectives were manipulated between-subjects and causal relatedness was manipulated within-subjects.

Three dependent measures were examined. The first was used to test the hypothesis that level of causal relatedness varies due to accessibility of the bridging inference, a lexical decision task was used. The lexical decision items were words representing the bridging inference (obtained through pretesting). Response time (RT) to the target words measured the level of activation of the bridging inference. The lexical decision targets in the filler items were non-words. The second dependent measure was

the reading time of the target sentence (the second sentence). Reading times were comparable for each condition of both factors, since the second sentence was kept the same for each of the four versions of the text and the connective, if present, was located on the line of text above the target. Thirdly, a cued recall task was given, in which participants recalled as much information in the target (second) sentences as possible when cued by the first sentence.

Items were presented one sentence at a time in a computer-based, self-paced format. Each item started with "Ready to start trial?" cue. Pressing the spacebar presented the first sentence (and the connective to begin the next sentence in the connective-present trials). When the participant was finished reading the first sentence, pressing the spacebar replaced the sentence with the second sentence in the pair. After reading the second sentence, a press of the spacebar initiated the lexical decision task. A "GET READY!" signal appeared for 2-s to allow participants to put their right and left fingers on the keys marked "Y" and "N". Then, a cue of "***" appeared for 1,500-ms and was replaced by the lexical target. Participants were told to respond "Y" or "N" indicating whether the target was an English word or not. If the target was not responded to within 2,000-ms, then it disappeared. Following the lexical decision task was a signal ("Correct," or "Incorrect") for 5 seconds followed by a comprehension question, if the item was a filler pair. If this was the case, then the participant responded by pressing either the "Y" or "N" key. Following this was feedback to whether the participant answered the question correct or not. A "press the spacebar to go on" command appeared along with the feedback. Pressing the spacebar again began the next trial. For non-filler items, the lexical decision task was followed by the "press spacebar to go on" command. The

participants were given three practice trials. At the end of the practice trials, participants were allowed to ask any questions concerning the task before moving on. Participants were instructed to read each sentence at a comfortable pace so that they understand it, but quick enough to finish all the items in time. They were not informed of the cued recall task following the reading task.

As mentioned before, there were four versions of the text to allow for counterbalancing and so that each participant received only one version of each item. Also, there were two versions of each of the four texts, one with and one without connectives. For each participant, the items were presented in a random order.

Following the reading task, participants were presented with a surprise cued recall task. Here, participants were instructed to recall as much of the information in the second sentence as they could when cued with the first. Participants were given as much time as needed to complete this task.

CHAPTER 3

RESULTS

Two separate analyses were performed on the data. First, the Item Version

Analysis was used to examine the effect of causality by comparing measures based on the

four versions of each item and their relative causality ranking. The second, the Ranked

Causality Analysis, attempted to establish a continuum of causality and compare

measures from general groupings of causality for all 96 item versions.

Means were calculated for the lexical decision latency and reading time measures.

The recall protocols were scored according to gist recall. For each item, a "1" was scored

if the participant recalled the subject and predicate (both verb and object) of the target

sentence, and a "0" if he or she did not. Two raters (the experimenter and an assistant)

scored 10% of the recall protocols (total of 6) with an inter-rater reliability of 92%. The

remainder of the protocols were scored by the experimenter. For each participant, the

number of correct responses in each condition was totaled. Means were calculated for all

conditions for the recall data.

Item Version Analysis

For the item version analysis, each of the four versions of each item was assigned

to one of the following categories: low, moderately-low, moderately-high, or high causal-

relatedness. Note that assignment to conditions here was based on the ordering of

causality ratings obtained from the norming test. All four versions of each item did not

differ equally with respect to ratings of causality. For example, a version of one item

assigned to the low-related condition could have a causality rating of 1.56, the

moderately-low version a rating of 2.47, the moderately-high version a rating of 4.84, and

the highly-related version a rating of 5.39, whereas the mean ratings for versions of another item may have been more equally spread out (e.g., low = 1.75, mod-low = 3.5, mod-high = 5.25, high = 7).

After calculating means for each condition, a 2(Connective Presence) X 4(Relative Causality) mixed Analysis of Variance was performed on all three dependent variables.

Lexical Decision Latency

The means for lexical decision response time to the causal bridging inferences are presented for each condition in Table 2. The connective-absent group responded consistently more quickly to lexical targets than the connective-present group, however, this effect was not significant, $F(1, 54) = 1.10$, $p > .05$. Furthermore, there was no main effect of causality or connective X causality interaction ($F(3, 162) = 1.43$, $p > .05$ and $F < 1$, respectively).

Table 2

Lexical Decision Latency Descriptive Statistics of Four Item Versions in Both Connective Conditions

Relatedness	Connective Present (*n* = 28)		Connective Absent (*n* = 28)	
	Mean	SD	Mean	SD
Low	572.21	56.90	552.73	73.78
Moderately-Low	574.97	85.51	557.03	85.51
Moderately-High	580.83	71.33	567.80	76.52
High	569.76	59.84	549.22	71.11

Reading Time of Target Sentence

Mean target sentence reading times for all conditions are shown in Table 3. Overall, reading times were faster as a function of causality, $F(3, 162) = 6.419, p < .001$. However, the main effect of connective presence and the interaction were not significant ($F(1, 54) = 1.62, p > .05$ and $F < 1$, respectively).

Investigation of the aggregate means across the four levels of causality reveals an overall speeding up of reading time as causality increased. Least Significant Difference (LSD) post hoc tests revealed significant pair-wise differences between the high causally-

related condition and the other three levels (low, moderately-low, and moderately-high).

However, there were no significant differences between the three.

Table 3

Reading Time Descriptive Statistics of Four Item Versions in Both Connective Conditions

	Connective Present ($n = 28$)		Connective Absent ($n = 28$)	
Relatedness	Mean	SD	Mean	SD
Low	4149.94	855.05	4234.39	890.70
Moderately-Low	3996.62	980.24	4305.12	915.92
Moderately-High	3782.44	892.80	4210.43	866.64
High	3668.60	743.67	3905.85	900.91

Recall of Target Sentence

The mean number of target sentences correctly recalled in each condition (out of 6) is shown in Table 4. No significant effects emerged from this analysis (causality: $F(3, 162) = 1.53$, $p > .05$; Fs < 1 for connective presence and connective X causality interaction).

Table 4

Target Sentence Recall Descriptive Statistics for Four Item Versions in Both Connective Conditions (maximum recall for each condition = 6)

Relatedness	Connective Present ($n = 28$)		Connective Absent ($n = 28$)	
	Mean	SD	Mean	SD
Low	2.08	1.62	2.12	1.61
Moderately-Low	1.85	1.26	2.27	1.51
Moderately-High	2.31	1.87	2.50	1.79
High	2.35	1.65	2.62	1.30

Ranked Causality Analysis

For the connective-present and connective-absent group separately, means for each item were calculated and all 96 item version means placed in order based on their causality ratings. Eight groups of 12 items each were created and ranked based on their mean causality ratings (e.g., group 1 = ratings 1.15 through 2.15, group 2 = 2.16 through 2.17, etc.). Means were then calculated for these 8 groups for connective-present and connective-absent conditions separately. This allowed for an analysis more sensitive to causality than the items version analysis. Furthermore, this allowed for a more precise displaying of the dependent variables as a continuous function of causality.

These data were submitted to a 2(Connective Presence) X 8(Causality Ranking) between-subjects Analysis of Variance. Because there was not a systematic manipulation of causality ranking for each subject, a true within-subjects analysis could not be performed on the causality ranking variable.

A curve estimation regression analysis was also performed on each of three dependent functions for both connective conditions, using pretest ratings of causal-relatedness as the predictor variable. This technique was the same used in the causal-relatedness analyses in Myers, Shinjo, & Duffy (1987) and Golding, Millis, Hauselt, & Sego (1994). As well as determining significance of fit to a linear pattern, this analysis could also examine for curvilinear fits, in this case quadratic or cubic functions. This technique was specifically used to examine if presence of a causal connective changes the nature of the causality function (from linear to curvilinear, for example).

<u>Lexical Decision Latency</u>

Means for the eight causality rankings in both the connective-present and connective-absent groups are shown in Table 5. Upon looking at Figure 1, it appears that causality varied systematically for both connective groups. However, the effect of causality rank did not reach significance, $F(7,176) = 1.75, p > .05$. Also, similar to means in the item version analysis, the connective-absent group responded more quickly to lexical targets than the connective-present group ($M = 571.35$ versus 559.38). Once again, this effect, as well the interaction, did not reach significance ($F(1, 176) = 2.43, p > .05$ and $F < 1$, respectively).

Table 5

Lexical Decision Latency Descriptive Statistics of Eight Ranked Causality Conditions for Connective Groups

Causality Rank	Connective Present (*n* = 28)		Connective Absent (*n* = 28)	
	Mean	SD	Mean	SD
1	592.21	62.65	576.26	50.87
2	568.27	41.80	549.67	46.63
3	550.96	47.73	520.02	37.81
4	578.85	54.18	558.57	58.77
5	569.07	49.06	564.85	44.44
6	567.44	65.36	562.13	69.20
7	578.31	58.60	582.56	56.27
8	565.68	56.30	560.63	45.20

Figure 1. Lexical Decision Latency as a Function of Causality Ratings

Target Sentence Reading Time

Mean target sentence reading times for the ranked causality analysis are shown in Table 6. Although the reading time function (see Figure 2) shows some evidence for connective facilitation in the lower to moderately-related items, the main effect and interaction were both not significant ($F(1,176) = 2.74$, $p > .05$ and $F < 1$, respectively). Also, the main effect of causality found in the item version analysis was not replicated in this analysis ($F < 1$).

Table 6

Reading Time Descriptive Statistics of Eight Ranked Causality Conditions for Connective Groups

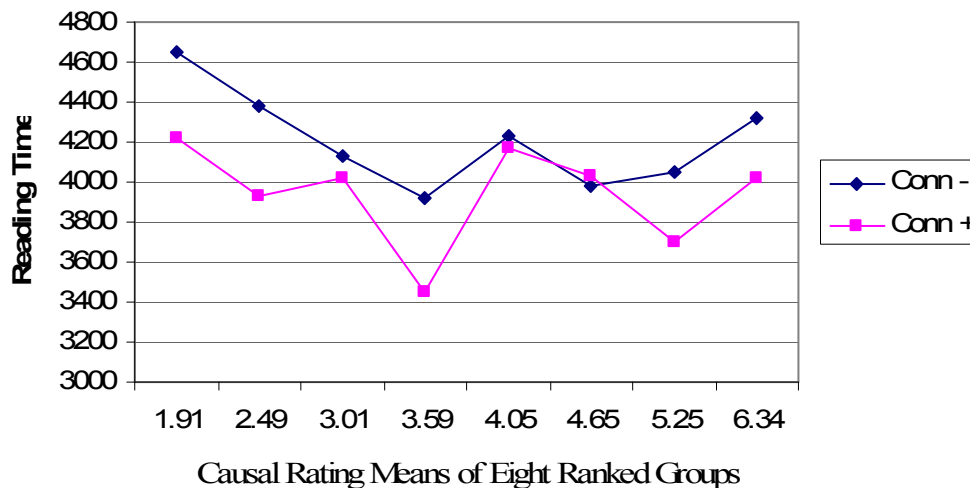| Causality Rank	Connective Present (*n* = 28)		Connective Absent (*n* = 28)	
	Mean	SD	Mean	SD
1	4216.26	1299.64	4647.38	983.38
2	3925.38	869.52	4379.31	624.67
3	4019.15	1036.52	4134.89	1111.85
4	3447.87	598.56	3294.25	921.44
5	4173.85	1111.74	4233.77	1618.90
6	4028.03	1403.78	3979.87	1164.40
7	3701.62	696.33	4053.68	1486.18
8	4022.82	1185.25	4321.52	1246.26

Figure 2. Reading Time as a Function of Causality Ratings

Recall of Target Sentence

     Mean proportion of items recalled correctly for each ranking condition in both

connective groups is shown in Table 7. Examination of Figure 3 shows little divergence

in both the connective-present and connective-absent functions. This is reflected in the

lack of a significant main effect for connective condition or connective X rank interaction

(both Fs < 1). Furthermore, the high standard deviation in both recall groups contributes

to the lack of a main effect for ranking as well ($F(7,176) = 1.82$, $p > .05$).

Table 7

Target Sentence Recall (Proportion Correct) Descriptive Statistics of Eight Ranked
Causality Conditions for Connective Groups

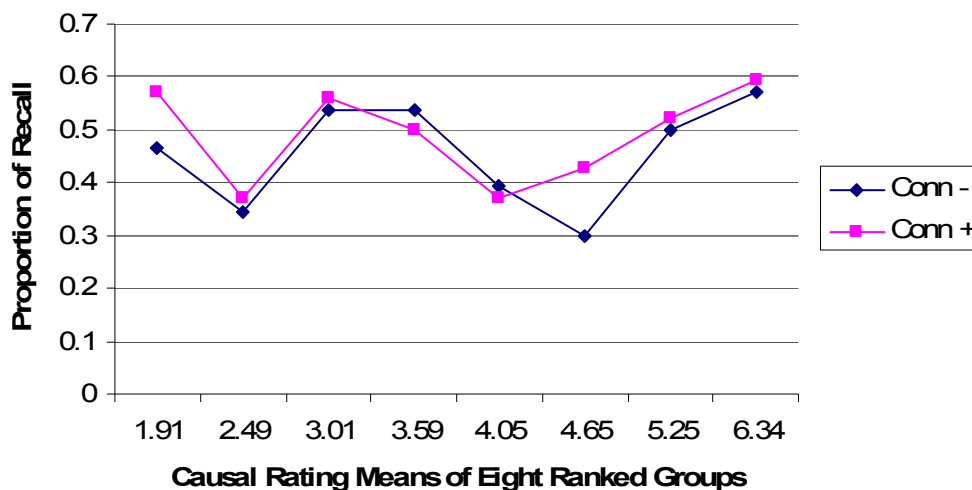| Causality Rank	Connective Present (*n* = 28)		Connective Absent (*n* = 28)	
	Mean	SD	Mean	SD
1	.57	.29	.47	.21
2	.37	.24	.34	.29
3	.56	.33	.54	.35
4	.50	.28	.54	.35
5	.37	.36	.39	.34
6	.43	.33	.30	.35
7	.52	.34	.50	.31
8	.60	.42	.57	.42

Figure 3. Recall as a Function of Causality Ratings

Curve Estimation

Finally, the curve estimation regression analyses revealed no significant fits of linear, quadratic, or cubic coefficients. Examining each of the figures reveals that this is most likely due to rapid fluctuations in the lexical latency, reading time, and recall functions. No smooth curves or linear patterns were observed; the means for each of the eight groups changed drastically in many cases as a function of causality.

CHAPTER 4

DISCUSSION

Despite the sound hypotheses generated based on evidence from past research

(e.g., Degand, Lefevre, & Bestgen, 1999; Golding, Millis, Hauselt, & Sego, 1994; Millis,

Golding & Barker, 1995; Simpkins, 2003; Singer, Harkness, & Stewart, 1997), no robust

evidence was found in the current study concerning the impact of connectives on the

processing of causally-related ideas in expository texts. Also, the general effects of the

manipulation of causality alone did not replicate what has been observed in past studies

(c.f., Golding et al., 1994; Myers, Shinjo, & Duffy, 1987).

In this section, the significant effects found in the reading time data will be

discussed first. Discussed second are reasons that the results, although providing little

firm support for connectives' benefit in an expository setting, do not provide evidence

supporting the passivity hypothesis. Third, evidence is presented that helps explain that

the primarily null findings of the current study may be attributed to the texts used.

Particularly, the generated texts may have been too difficult, and perhaps, the subject

matter too unfamiliar to the reader for the connective to have an impact on processing of

the surrounding text.

Reading Time Findings

Only a single significant effect was found for the manipulation of causal

relatedness. In the Item Version Analysis, reading time of the target sentence was faster

as causality increased across the four different causally-related versions. This provides

some support for the salience of the causal-relatedness manipulation. However, there is

little converging evidence for this in the remainder of the analyses; the significant effect

of causality did not extend to the Ranked Causality Analysis. Furthermore, a corresponding difference in lexical decision latency would be expected if this was the case, because a salient manipulation of causality should allow for causal inference activation to vary more systematically across different levels of causal relatedness. However, no such effects were observed in the lexical decision data.

The Passivity Hypothesis and the Present Study

Although there were no robust effects of the presence of causal connectives observed, there is little to no evidence here to support the passivity hypothesis posited by Fayol, Gombert, Lecocq, Sprenger-Charolles, and Zagar (1992). Recall that the passivity hypothesis states that connectives facilitate shallow processing of text due to their inherent capacity to explicitly mark adjacent text relations. The theory argues that readers fail to actively compute interclausal relations, thus having a detrimental effect on comprehension of text ideas, particularly if adjacent text relations have any degree of ambiguity. Therefore, according to this theory, presence of connectives may particularly hinder comprehension in the context of expository text because these texts often contain semantic relations that are not immediately clear to the reader. However, the data in the current study do not support this claim.

For the passivity hypothesis to be supported, several effects would have been apparent in the reading time and lexical decision analyses. First of all, connectives would significantly facilitate reading time of target sentences. If the reader is passively processing interclausal relations then this would indicate faster reading times in the connective-present versus connective-absent conditions. Secondly, there would be an effect of connective presence or a connective presence X causality interaction in the

analyses of the lexical decision data. Activation of causal bridging inferences would not be as high in the connective-present condition (main effect) or only lower for the moderately-low related pairs because the reader would not be actively computing the potential causal bridging inference.

Recent studies of expository texts have also provided evidence not supporting the passivity hypothesis. Degand et al. (1999) have shown that presence of causal connectives in exposition leads to better performance on both content and causal inference-testing comprehension questions. Furthermore, Simpkins (2004) provided robust evidence concerning causal connectives' facilitation of recall of target sentences. Causal connectives were found to have a unique facilitative effect in expository context that has not been observed in narrative text. Finally, Millis et al. (1995) have shown that causal connectives motivate causal bridging inference generation, whereas texts without connectives or with additive or temporal connectives do not. Besides presenting disconfirmatory evidence for the passivity hypothesis, these studies show that connectives appear to aid the reader in establishing a better understanding of local text relations. The failure of this study to provide support for this contention is most likely not due to the failure of connectives to facilitate comprehension and integration of local text ideas. The problem may lie in the nature of the texts generated.

Potential Difficulty of Texts

The results of the present study also indicate a potential factor in the failure to observe significant effects. As mentioned in Singer et al. (1997), the use of more difficult expository texts can raise error rates in dependent measures (e.g., target sentence reading time) and obscure true effects. The high within-group standard deviations observed in the

current study, especially with the lexical decision and target sentence reading time measures, point to the possible presence of this dynamic. Furthermore, the recall rates observed with these items are much less lower overall than the proportion of items recalled when a different set of expository texts was used in Simpkins (2004).

Along with the high error rates, the Ranked Causality Analysis revealed target sentence reading time and recall functions inconsistent with those observed in Keenan, Bailet, and Brown (1984), Myers et al. (1987), and Golding et al. (1994). Both functions have proved to be robust phenomena, particularly when a causal connective is not present between adjacent sentences. As noted previously, in the absence of a connective, reading time is typically faster as causal-relatedness increases and the recall function usually exhibits an inverted-U shape. Because these highly-supported phenomena were not replicated, it could be speculated that the texts in the current study were processed differently by readers than texts used in the past. The lack of significant effects in the curve estimation regression analysis also supports this claim. In both Myers et al. (1987) and Golding et al. (1994), curve estimation analyses have also shown robust effects. For example, the connective-absent recall function typically exhibits a highly-significant quadratic function due to its typical inverted-U shape. Furthermore, Golding et al. (1994) showed that presence of a causal connective resulted in the function losing its quadratic (curvilinear) fit and developing significant linear features. However, because the present study revealed no significant fits of the functions to any form, it is speculated that the causal manipulation, based on pretest ratings, was not salient to readers. And, this problem was possibly due to the difficulty of the text from the standpoint of the reader.

A final implication of the current study that suggests that the texts are generally less comprehensible than texts used in the past is the lack of evidence for the online generation of inferences. Causal bridging inferences have been determined to take place while reading (Millis et al., 1995; Noordman & Vonk, 1992; Singer et al., 1997) and elaborative (forward) inferences are hypothesized to occur online under contextual constraint (Whitney, Ritchie, & Crane, 1992) and possibly due to the presence of a causal connective (Golding et al., 1994). Singer et al. (1997) have suggested that reading difficulty brought about by particular texts can prevent the online generation of causal bridging inferences. The lexical decision data in the currents study reveal no evidence for the online generation of causal bridging inferences due to the fact that there was no main effect for causality in either of the analyses. Also, the target sentence reading time data revealed little convergent evidence for inference generation; the Ranked Causality Analysis should have shown higher reading times in moderately to low-related sentence pairs (especially in the connective condition) if inferences were indeed being generated online. Finally, the lack of effects in the recall data showed no evidence for online generation of elaborative inferences. The main effect of causality in the connective-present condition in the reading time data (Item Version Analysis) should have been accompanied by a significant effect in the connective-present recall data if elaborative inferencing occurred. The presence of these inferences have been directly linked to higher recall (see Duffy, Shinjo, & Myers, 1990) and are the primary explanation for the inverted-U shape that has been observed in recall data as a function of causal-relatedness (Golding et al., 1994; Myers et al., 1987).

Text Topics and Mental Models

A final insight into the cause of the potentially obscured results of the current study comes from a comparison of texts that were used in the current study with those used in the author's previous study. The texts used in Simpkins (2004) were generated from introductory level college textbooks, exemplifying a wide range of expository topics. The reading level of these topics was probably quite familiar to the reader, due to many introductory psychology students having at least some experience with basic-level core curriculum classes. Also, participants probably had some knowledge base (mental model) for such topics. On the other hand, the texts generated in the current study were derived from topics intended to be completely unfamiliar to the reader. As well as being more difficult, the reader most likely had developed no prior knowledge base in these areas. The topics used in the current study were science-based and more technical than average introductory-level textbooks. The difficulty brought about from a lack of being able to place the new information into a context or mental model may have affected processing of the text. Suggestions for future research include replication of the current study, using participants with a stronger knowledge base or mental model for the topics, such as seniors majoring in a physical science. A new set of texts based on more familiar topics could also be generated to lower error rates in dependent measures. As recently demonstrated by Degand et al. (1999) and Simpkins (2004), connectives play a very important role in how readers comprehend expository text. More research needs to be generated examining connectives in specific contexts in order to unravel how they contribute to the processing of a discourse.

CHAPTER 5

CONCLUSION

Although this study has yielded few robust findings concerning the impact of causal connectives on the perceived causality of local text ideas, evidence has been noted concerning the limitations of connectives' utility. Specifically, when a text is difficult to the reader, due to the unfamiliarity of the topic and possibly the lack of a base from which to approach the new information, the presence of a causal connective may not necessarily facilitate comprehension. Furthermore, the clarity of local text relations (e.g., causality) may also be obscured due to difficulty expository texts. Further research with more specific subject pools or moderately-familiar expository topics will help to reconcile causal connectives' impact on causal-relatedness.

CHAPTER 6

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