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Constructing representations of arguments

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Abstract

Three experiments were conducted to test whether presentation order affects the reading and later recall of simple two-clause arguments. Participants read arguments in a claim-first order or in a reason-first order. Three experiments found that arguments were read faster when claims preceded reasons and this effect was independent of whether the reason began with a subordinating conjunction. Shorter reading times were observed for claims when they occurred in the initial position. Claims were also recalled better than reasons and claim-first arguments were recalled more accurately than reason-first arguments. Experiments 3a and 3b showed that readers identified claims by the presence of markers (e.g., modals and qualifiers) and that arguments with modals are read more quickly and recalled better in a claim-first order. These results suggest that readers use a claim-centered argument schema to guide the processing of persuasive prose.

Argumentation should be taught along side reading, writing, and arithmetic (as the 4th "R") because learning in many subject matter domains requires students to be adept at comprehending and evaluating arguments.

Simple arguments like the one in the preceding sentence are commonly used to convince readers of some fact or to persuade readers to change an attitude or opinion. Such arguments are also used to justify the many public policy and personal decisions that affect our daily lives. The ability to produce and comprehend arguments is an essential element of literacy and is a major component of personal and social decision-making, learning, and even interpersonal conflict. Engaging in argumentation, whether by comprehending another's argument or by producing one's own, presupposes the ability to mentally represent arguments. The experiments presented here investigate the nature of the discourse structures that readers use to guide their comprehension of written arguments.

There is a considerable body of research on argument strength and persuasiveness related to attitude change and behavior (Anderson, Lepper, & Ross, 1980; Eagly & Chaiken, 1993; Lord, Ross, & Lepper, 1979; Petty & Cacioppo, 1977; Schul & Goren, 1997), but comparatively little is known about how people comprehend and represent arguments while they are reading. In contrast, the processes and structures involved in the comprehension of narrative texts have been extensively researched (Goldman, Graesser, & van den Broek, 1999; Mandler & Johnson, 1977; Omanson, 1982; Stein & Glenn, 1979; Thorndyke, 1977; Trabasso & van den Broek, 1985) and have identified a standard representational structure for representing narrative texts. The experiments in this paper examine whether such representations can be extended to persuasive texts or whether a different type of representational structure is required.

Discourse structures

Acquiring standard structures for organizing information is an important part of learning to read. Early text research proposed that genre-specific schemata explain systematic patterns in what material is processed

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more fully and what information is reliably recalled from a text (Rumelhart, 1975; Stein & Glenn, 1979). The bulk of research on text structures has focused on the three genres highlighted by Brewer (1980): narrative, exposition, and description. For at least two of these genres (narrative and exposition), researchers have proposed that expert readers, as a result of reading many diverse instances, construct an abstract representation of the general elements and their interrelations. This representation provides a structure for interpreting and organizing the text information; it guides a reader's expectations about upcoming information and helps him or her organize subsequent memory searches.

Narratives have a clearly defined text structure that has been captured as a "story grammar" (Mandler & Johnson, 1977; Nezworski, Stein, & Trabasso, 1982; Rumelhart, 1975; Stein & Glenn, 1979). Story grammars describe the hierarchical relationships among components of a story. Stories can be broken down into a setting + episode, where episode is comprised of an initiating event, an internal response, goal attempts, a consequence, and a reaction. Research on narrative schemata has found that children as young as 4 years old possess some elements of a standard story schema (Stein & Glenn, 1979) and that this schema influences both the amount and structure of information recalled from a text (Rumelhart, 1975; Thorndyke, 1977).

Expository texts also have a clearly defined structure that influences what readers recall (Meyer, Brandt, & Bluth, 1980; Meyer & Freedle, 1979). More specific forms of expository schemata have been shown to influence the reading of technical texts (Kieras, 1980, 1985), scientific texts (Dee-Lucas & Larkin, 1986, 1988), and written instructions (Dixon, 1982, 1987a, 1987b; Dixon, Faries, & Gabrys, 1988). For these types of texts, a goal-oriented, hierarchical structure appears to provide a way of organizing text propositions. It flags what is central or important (Dixon et al., 1988; Kieras, 1980, 1985), directs attentional patterns (Dee-Lucas & Larkin, 1988), and guides subsequent recall (Dee-Lucas & Larkin, 1988).

Representing argumentative information

Unlike narrative and expository genre, relatively little is known about how readers mentally represent argumentative texts. An informal argument entails providing one or more reasons (datum or premise) with the intent of persuading the audience to accept the truth of a refutable conclusion (claim). Toulmin (1958) described an argument in terms of the syntactic relations among key elements. He identified these as: claim, datum, warrant, qualifier, rebuttal, and backing. A claim is a controversial assertion, or conclusion, that an author is trying to persuade the reader to accept. It is controversial in that not all readers will necessarily agree with it. The claim for Argument 1 below is that "Recycling should be federally mandated."

> 1. Recycling should be federally mandated because recycling will save the environment. The federal government should mandate cost-effective processes that preserve the environment unless the agents used for recycling are themselves hazardous because our lives depend on the health of our environment.

An argument *by definition* requires support, and Toulmin refers to this support as a *datum*. A datum is a fact used as a foundation for the claim. In this paper, a datum is referred to as a *reason* as suggested by Voss and Means (1991). In the example, the supporting reason is that "Recycling will save the environment." The most basic argument must contain a claim and at least one reason in order to be classified as an argument.

Many arguments include, at least implicitly, other elements as well. The most significant extra component, the *warrant*, forms the connection or "bridge" from the reason to the claim. It is a general rule, law, principle, or practice that permits the conclusion to be logically deduced given the reason. With respect to Argument 1, the warrant is that "The federal government should mandate processes that save the environment." Warrants are frequently domain-specific and delineate the agreed upon connections that are acceptable to connect a reason with a claim in a particular field or domain. Warrants are usually omitted by an author and it is unclear to what extent one automatically infers them during the normal course of reading (Noordman, Vonk, & Kempff, 1992). Because a warrant determines the strength of the conclusion that can be made based on the reason provided, it influences the type of explicit modal qualifiers and rebuttals that can modify the claim. *Qualifiers* (e.g., "cost-effective" in Argument 1) and *rebuttals* (e.g., "unless the agents used for recycling are themselves hazardous" in Argument 1) state the limits or conditions under which the claim is a valid conclusion from the reason given the warrant. The final component, *backing*, provides support for the acceptability of the warrant. Like the warrant itself, the type of backing necessary to establish a warrant may be field or domain specific.

The manner in which readers coordinate these basic argument components is presently unclear. Because the claim is the conclusion that the rest of the argument is intended to support, it is reasonable to assume the structure of argument information is hierarchical with the main claim in the top position as shown in Fig. 1. The claim occupies the top position and the processing of the reason as well as other argument elements is dependent on establishing the claim. Although claims are not always signaled explicitly for the reader, there are several possible markers preceding or included in a claim that can be used as signals. These signals include:

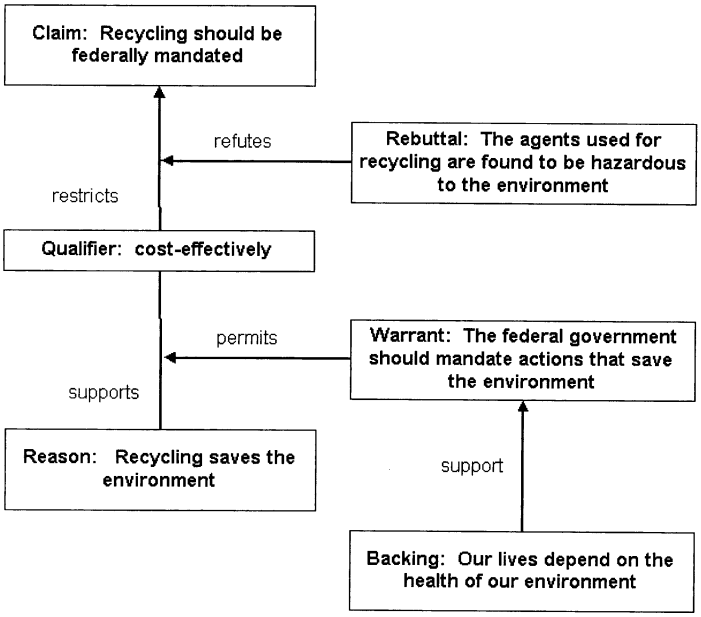

Fig. 1. An illustration of a general argument model including the structural relationship between the basic components of an argument (e.g., claim, data, warrant, qualifier, rebuttal, and backing).

"should," "causes," "therefore," "it is clear that," "as a result," "consequently," "so," and "thus" as well as qualifiers like "probably" or "possibly." The claim in Argument 1 is signaled by the marker "should." As with claims, reasons also frequently include signals to mark the reason such as "because," "since," "the reasons are," "whereas," and "as indicated by." In the example, the supporting reason is marked with the connector "because" to signal the relationship between the claim and reason.

Although sometimes similar in appearance, it is important to distinguish arguments from explanations. Arguments are attempts to persuade someone of the veracity of a controversial statement (i.e., the claim); explanations are presentations of a cause for an event or phenomenon. For example, in 2a below, there is no controversy or dispute over the fact that the government did sue the tobacco companies; rather, this statement provides an explanation for *why* the government did this.

> 2a. The government sued the tobacco companies because they hid their findings on the addictive nature of nicotine.

Even though one may sometimes colloquially speak of an explanation as "providing a reason" for some action or occurrence, the relationship between the two clauses is not one of support but rather of causation. Any controversy in statement 2a would relate to whether in fact the proposed cause was indeed the true one (i.e., whether the government's true motive was the tobacco companies hiding of their findings). Indeed, the entire explanation could function as a claim in an argument; for instance, if 2b were to follow 2a.

> 2b. Evidence provided by an ex-tobacco company executive showed that the companies had known for years how addicting nicotine is and that they manipulated it.

This is not to say that statements of fact are never disputed in arguments, nor that claims are never presented as statements of fact, but rather that in explanations the "reason" does not support the claim but offers a cause for its occurrence. Indeed, statements of fact can easily be made into disputable claims when they are presented as value judgments, as in 2c.

> 2c. The government *was right to* sue the tobacco companies because they hid their findings on the addictive nature of nicotine.

It is important to keep in mind this distinction between arguments and explanations when considering how the different discourse types are processed.

Order effects in reading

Research on other text genres can serve as a starting point for developing hypotheses about how the elements of an argument are organized during reading. Evidence regarding the structures for narrative and expository texts has been obtained by comparing recall accuracy and reading times for different orderings of the component elements. Facilitative effects of one order over

another have been interpreted as due to a particular representational structure or processing preference.

Narratives

One explanation of how readers represent narrative texts is centered around causal-temporal relations (Trabasso & van den Broek, 1985). The processing of narratives is thought to involve attending to cues in the text that provide information about causality and temporal sequencing in an attempt to construct a model of the described situation (Clark & Clark, 1968; Emerson, 1979, 1980; Townsend, 1983). Townsend (1983) found that both causality and temporality are important to facilitate the processing of narrative texts. He had participants read two-phrase sentences joined by different types of connectors signaling the relationship between the main and subordinate clauses. If the connector signaled a causal relationship such as "because," recall was better when the subordinate clause preceded the main clause. That is, when the elements were presented in a cause-effect order (e.g., because cause, effect) rather than when the elements were presented in an effect-cause order (e.g., effect because cause). If, however, the connector signaled a temporal relationship, the optimal ordering was influenced by the meaning of the connector. Recall was better for sentences with the subordinate clause occurring first for the connector "after," but recall was better for sentences with the main clause occurring first for the connector "before." In both cases, recall was better when the clauses were presented in a first event-second event order (i.e., After ⟨first event⟩, ⟨second event⟩; ⟨first event⟩ before ⟨second event⟩) than if they were presented in a second event-first event order (i.e., ⟨Second event⟩ after ⟨first event⟩; Before ⟨second event⟩, ⟨first event⟩). These findings suggest that the processing of narratives conforms to the nature of the relations inherent in the narrative text. Events related causally (e.g., using "because") are best ordered with cause followed by effect while events related temporally (e.g., using "after" or "before") are best ordered with antecedents followed by their consequents. Thus, the processing of narratives is facilitated when the elements are ordered in a manner that helps the reader use temporal sequencing and causality to construct an appropriate model of the situation described in the text.

Procedural texts

Time and causation are also important when reading instructions and directions, but the organizing structure appears to depend on the nature of the reader's goal. Dixon (1987a) had participants read simple, two-component directions and manipulated the order of presentation of the two components: either Action-first (e.g., After pressing button A, light Y should be on) or Action-second (e.g., Light Y should be on, after pressing button A). For half of the items, the condition was presented as an antecedent (e.g., Before pressing button A, light Y should be on); for the other half, the condition was presented as a consequent (e.g., After pressing button A, light Y should be on). He found that when participants were reading to immediately carry out the instructions, Action-first sentences were read faster than Action-second sentences for both antecedent and consequent condition types and regardless of which phrase was syntactically subordinated. However, when the participants were reading to recall rather than carry out the instructions, items were read faster if they were presented in the order in which they occurred. For Antecedent conditions, reading was faster when the condition preceded the action. For Consequent conditions, processing was faster when the action preceded the condition. Thus, when reading instructions in order to execute them, people construct a different type of representation than when they read to comprehend or memorize. Dixon argued that this representation takes the form of a hierarchically organized action plan in which action information would occupy a higher position in the hierarchy than condition information.

Dixon (1987b) further speculated that readers use organizational information (i.e., the goal or description of what the instructions produce) from the instructional text to set up a plan schema that could then be used to organize subsequent components of the instructions. In an experiment, he showed that people took longer to read component steps of an instruction when they were presented before a statement of the goal than when they were presented after the goal statement. He speculated that if component information is encountered first, it must be buffered in a relatively uninterpreted form until the goal information is located. This buffering would require processing resources resulting in slower reading.

Arguments

One might expect that arguments are processed in a manner similar to narratives due to the use of similar connectors to signal a relationship between elements (e.g., "because"). If arguments are processed in the same manner as narratives, then readers should show a preference for a cause-effect order with the reason preceding the claim. For instance, consider the narrative statement "he got burned because he spilt his soup on his lap." The effect was that "he got burned," the cause was that "he spilt his soup on his lap," and the cause is marked by the trigger "because." Based on Townsend's (1983) findings, the statement should be read faster if the cause precedes the effect (i.e., because he spilt his soup on his lap, he got burned) than if the effect precedes the cause (i.e., he got burned because he spilt his soup on his lap). Many arguments appear to follow the same form with a claim (e.g. recycling should be federally mandated) and a reason (e.g., because recycling saves the environment) marked by the connector "because." If these statements

were processed in a manner similar to cause-effect statements, then 3b should be read faster than 3a because the "cause" precedes the "effect."

3a. Claim-first argument: Recycling should be federally mandated because recycling saves the environment.

3b. Reason-first argument: Because recycling saves the environment, recycling should be federally mandated.

There are reasons, however, to suspect that argument processing might not be based on causal relationships. First, "because" used as a logical connector, as in 3a and 3b, does not imply causality. While some arguments may involve causes (e.g., "Cigarette smoking causes cancer"), the relationship among argument elements is logical rather than causal. Second, there is no temporal sequencing inherent in the relationship between argument components. With a narrative text, either the cause orders the elements in time or the temporal sequence of elements is assumed to follow the order of presentation unless explicitly marked otherwise. For instance, "spilt soup" precedes in time "receiving a burn." This temporal relationship is not true of an argument, that is, there is no necessary temporal relationship between the reason and the claim in an argument. For example, one could create a convincing argument by providing a past or future event as a reason (as in "Recycling should be federally mandated because we have begun to run out of landfill space" and "Recycling should be federally mandated because we will eventually run out of landfill space"). Thus, argument processing cannot utilize the causal-temporal mechanisms that one normally uses for comprehending narratives.

In the same way that understanding procedural texts appears to involve structures and processes that are specific to the nature of carrying out an action plan, the processing of arguments is likely to involve structures and processes that are specific to the nature of making the logical inferences that are required for argument comprehension. The claim (like the goal in an action plan) is the focus of the rest of the argument and it might therefore assume the top position in a hierarchical representation. The processing of the reason as well as other argument elements is dependent upon establishing the claim. There are also processing reasons for establishing a claim early during reading. Consider the following sentences:

8a. Because death penalty states do not have lower crime rates than other states, several death penalty convictions have been overturned in recent years, and the death penalty is not often used anyway, the death penalty should be abolished in every state in the US.

8b. The death penalty should be abolished in every state in the US. because death penalty states do not have lower crime rates than other states, several death penalty convictions have been overturned in recent years, and the death penalty is not often used anyway.

To all except those with very high working memory spans, sentence 8b seems easier to read than sentence 8a. Because, when arguing, people frequently provide multiple reasons for claims it is important to establish the claim early to provide an organizing structure for the subsequent reasons and reduce demand on processing resources. As Kieras (1980, 1985) argued, expert readers expect the most important statements in a text to appear first to "set-the stage" for subsequent information. Thus, if readers use the claim during processing to identify salient elements and organize material for later recall, then encountering a claim first ought to facilitate reading of the argument.

Overview of experiments

Three experiments were designed to examine whether order preferences exist in the processing of simple arguments. Undergraduates read simple 2-phrase arguments either in a claim-first order (3a) or in a reason-first order (3b). Participants read the arguments phrase-at-a-time on a computer with the task of either evaluating each argument or recognizing words from the argument. Participants were then given a surprise cued recall task to measure how the presentation order of the arguments influenced their memory of the argument elements.

The effects of an organizing structure should be revealed through a consistent order-preference effect on both reading time and recall. For instance, if the claim is the central organizing element of an argument, then one would expect to observe both faster reading times and a recall advantage for arguments presented in a claim-first order. Furthermore, one would expect to see a "canonicalization" effect on recall in which arguments presented in a reason-first order are mistakenly recalled in a claim-first order.

Experiment 1

Method

Participants

Eighty undergraduate psychology students at Northern Illinois University participated for course credit.

Materials

Twenty-four simple arguments were constructed, each with two components: a claim as in 4a and a single reason as in 4b. The 6 practice and 24 experimental arguments are listed in Appendix.

4a. Claim: recycling should be federally mandated

4b. Reason: because recycling saves the environment

The relationship between the claim and the reason was signaled by the connector "because." The number of characters for the claim segments ranged from 26 to 90 with a mean of 59.04 ($SD = 17.5$) characters. The number of characters for the reason segments ranged from 37 to 98 with a mean of 63.79 ($SD = 17.7$) characters.

Each argument item included a single noun or adjective that was mentioned in both components of the argument. For example, both 4a and 4b mention "recycling." This word was later used as a cue in the cued recall task. Using a pronoun for the second mention of the target noun would have lead to a more felicitous reading, however, it was necessary to ensure that the noun was equally associated with both the claim and the reason.

A second reason was created for each argument to be used as an argument comprehension probe to ensure that participants in the argument evaluation condition encoded the argument and later evaluated it. For half of the items, this probe statement supported the presented claim. For the other half, it supported a counter-claim. For example, 4c supports the same side of the claim as the reason presented in the initial argument (4b).

4c. We are running out of available landfill space.

Design

Presentation order of the two argument components (i.e, claim and reason) was a within-subjects factor with two levels: claim-first order (e.g.,"Recycling should be federally mandated because recycling saves the environment.") and reason-first order (i.e.,"Because recycling saves the environment, recycling should be federally mandated."). To control for item differences, the items were randomly separated into two lists. In one list, half of the items were presented in claim-first order while the other half of the items were presented in reason-first order. In the second list, the matching items were presented in the opposite order. All participants received the arguments in a random order.

The between-subjects manipulation was a Comprehension Task (argument evaluation vs verbatim match). Participants reading the arguments under argument evaluation conditions made a judgment immediately after reading each argument as to whether a probe reason was consistent or inconsistent with that argument (see 4c above). Participants reading the arguments under verbatim match condition made a judgment immediately after reading each argument as to whether two words (e.g., "federally mandated" for arguments 4a and 4b above) appeared in any part of the previous argument. These probe words appeared in either the reason or claim segment of the argument but not both, and did not appear in any other argument, evaluation probe, nor as a cue in the recall task. This manipulation was made to test whether readers construct different types of representations of arguments under different task situations.

Procedure

Participants read a series of 2-phrase arguments such as those in 3a and 3b above presented on a computer using a non-cumulative, phrase-at-a-time moving window. When participants pressed the space bar, the current phrase was deleted and the next phrase was presented. They were instructed to read each argument at a normal rate of speed. After reading each argument, the participants in the argument evaluation condition were presented with a related reason (see 4c above) and pressed a key to indicate whether this reason supported the same side of the argument or an opposing side of the argument. Participants in the verbatim match condition were shown a pair of words and had to make a simple old/new decision. Errors in both conditions resulted in a short beep sound.

Participants were first given six complete practice trials and the opportunity to ask any questions about the task before proceeding. Once they were sure that they understood the task, they were given the experimental argument items. All items were presented in a different random order to each participant.

After completing the 6 practice trials and the 24 target arguments, participants were then given a surprise, cued-recall task. They were provided with a booklet that contained space for recalling each argument preceded by a target word that had been presented once in the claim and once in the reason (e.g., "recycling" cued Argument 3 above) but had not been presented in any of the other arguments or the argument evaluation probes. Participants were told to write anything they remembered, no matter how incomplete, without worrying about exact wording. They were given as much time as they needed to complete the cued-recall test.

Results

Six participants were dropped due to error rates exceeding 33% (average error rate = 46%) on the comprehension task (four and two participants were lost from the argument evaluation and verbatim match conditions respectively). The remaining participants performed well on their given task, answering 92% of the items correctly. Participants did perform significantly better on the verbatim match task ($M = 23.51$, $S = 0.83$) than on the argument evaluation task ($M = 20.81$, $S = 2.63$); $F(1, 72) = 36.89$, $p < .000$.

Reading time analysis

The principal question is whether there is a main effect of argument order. Because the manipulation was simply switching the order of presentation of the two clauses, all analyses were carried out on raw reading times. In the analyses reported below, F_1 refers to the participant analysis and F_2 refers to the item analysis. The reading time data were analyzed using an ANOVA

with Argument Order (claim-first vs reason-first order) as a within-subjects variable and Comprehension Task (argument evaluation vs verbatim match condition) as a between-subjects variable. As shown in Table 1, arguments were read faster when presented in a claim-first order. This main effect of Argument Order was the only significant result, $F_1(1,72) = 18.01$, $p < .001$; $F_2(1,46) = 22.37$, $p < .001$ with mean argument reading times longer when the arguments were presented in a reason-first order ($M = 10.82$ s) than when they were presented in claim-first order ($M = 9.75$). Neither the main effect of Comprehension Task nor the Argument Order × Task interaction were significant (F's < 1). Thus, arguments were read more quickly when they were presented in a claim-first order regardless of task.

A more detailed analysis of the reading times for each argument component is presented in Fig. 2. This analysis examines whether the effect of clause order was stronger for claims or for reasons. The mean reading time data for each argument component were analyzed using an ANOVA with Presentation Order (first vs second clause) and Argument Type (claim vs reason) as within-subjects factors and Comprehension Task (argument evaluation vs verbatim match condition) as a between-subjects factor. The time required to read reasons was more affected by changes in order (M difference = 2.51) than was the time required to read claims (M difference = 1.44). This Presentation Order × Argument Type interaction was significant and indicates that the argument components were not equally affected by ordering, $F_1(1,72) = 18.01$, $p < .001$; $F_2(1,46) = 22.37$, $p < .001$. Given the significant interaction, the significant main effects of Argument Type ($F_1(1,72) = 70.86$, $p < .000$; $F_2(1,46) = 8.94$, $p < .005$) and Presentation Order ($F_1(1,72) = 196.33$, $p < .000$; $F_2(1,46) = 142.50$, $p < .000$) are much less interesting.

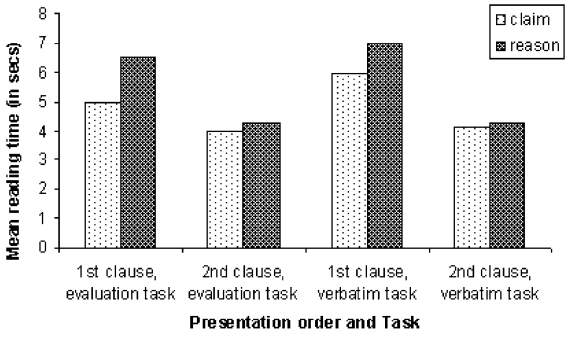

Fig. 2. Mean reading times for each component of the argument as a function of Presentation Order and Argument Type for each Comprehension Task in Experiment 1.

There was a significant Presentation Order × Task interaction: the position effect was more pronounced for the verbatim match task (M difference = 2.31) than for the argument evaluation task (M difference = 1.62) ($F_1(1,72) = 6.14$, $p < .05$; $F_2(1,46) = 4.67$, $p < .05$). However, the more important interaction, Task × Argument Type × Presentation Order, was not significant (F's < 1). Thus, regardless of reading goals, initial claims facilitated reading more than initial reasons.

Recall analysis

To examine the effect on participants' memory representations, the responses from the cued-recall test were segmented into the number of claims and reasons correctly recalled. The target claims and reasons were propositionalized and scoring required the participant to mention the predicate, subject argument, and object argument. To determine scoring reliability, two raters independently scored 50% of all recalls and achieved an interrater agreement of 91%.

Table 1
Mean reading times (in seconds) for the entire argument as a function of Argument Order and Task for all experiments (*SD* in parentheses)

Argument order	Experiment 1	
	Argument evaluation	Verbatim match
Claim-first	9.30 (3.2)	10.17 (3.1)
Reason-first	10.52 (3.5)	11.10 (3.4)
	Experiment 2	
	Connector present	Connector absent
Claim-first	8.10 (2.2)	8.19 (2.8)
Reason-first	8.66 (1.8)	9.03 (2.8)
	Experiment 3b	
	With should	Without should
Claim-first	8.68 (2.6)	9.92 (3.5)
Reason-first	10.59 (3.7)	10.14 (3.4)

On average, participants correctly recalled 39% ($SD = 16.4$) of the argument elements presented, or 19 of the 48 claims and reasons. As shown in Table 2, claims ($M = 5.74$) were recalled significantly better than reasons ($M = 3.68$), $F_1(1,78) = 174.60$, $p < .000$; $F_2(1,78) = 93.33$, $p < .000$. There was also a main effect of Presentation Order ($F_1(1,78) = 4.68$, $p < .05$; $F_2(1,78) = 10.76$, $p < .005$) with initial clause components ($M = 4.88$) better recalled than second clause components ($M = 4.55$).

The only significant interaction with Task was the Presentation Order × Task interaction for subjects only ($F_1(1,78) = 5.42$, $p < .05$) with the initial clause leading to better recall only for the evaluation task ($M = 5.3$ vs $M = 4.6$) and not for the verbatim task ($M = 4.5$ and $M = 4.5$). Critically, however, the Task × Argument Type interaction was not significant ($F_1(1,78) = .001$, $p = .97$; $F_2(1,40) = 3.10$, $p = .08$). For both tasks, there were an average of 2.0 more claims recalled than reasons.

To examine the order of recall, only those items for which the participants correctly recalled both elements from the same argument were considered. This occurred for only 24% of the items. For these items, accuracy was measured by the number of items mentioned in the presented order given that both elements were recalled. For example, a response that mentioned the claim followed by the reason would be accurate for arguments presented claim-first but inaccurate for those presented reason-first. An ANOVA was carried out with Argument Type (claim vs reason) × Recall Accuracy (accurate order vs inaccurate order) as within-subjects factors and Comprehension Task (evaluate argument vs verbatim match) as a between-subjects factor. As shown in Table 3, there was a main effect of Recall Accuracy ($F_1(1,78) = 65.74$, $p < .000$; $F_2(1,40) = 98.32$, $p < .000$): Participants recalled the arguments more often accurately in the order in which they were presented ($M = 2.19$) than in the reverse order ($M = 0.64$). More importantly, there was a significant Argument Type × Recall Accuracy interaction ($F_1(1,78) = 38.60$, $p < .000$; $F_2(1,40) = 34.18$, $p < .000$). Claim-first arguments were more often recalled in the presented order than in a reverse order (M difference = 2.46) compared to reason-first arguments (M difference = 0.65). Finally, the main effect of Comprehension Task was not significant nor were any of the associated interactions.

Discussion

Arguments were read faster when the claim preceded the reason. This effect appears to be due to faster processing when the claim was the initial clause than when the reason was the initial clause. Thus, the order in which argument information is presented has an immediate effect on the processing of that argument. This finding supports the hypothesis that the representation of argumentative texts is focused around a claim. The recall results highlight the importance of the claim in organizing the eventual representation of simple arguments. Claims were recalled better than reasons and this was true regardless of whether they were the initial argument element or not. Furthermore, arguments presented in a claim-first order were more accurately recalled in the presented order than were reason-first arguments. Thus, participants frequently recalled the

Table 2
Mean number of argument components recalled as a function of Presentation Order, Argument Type and Task. Note Experiments 1 and 2 had 12 items and Experiment 3b had 6

Argument order	Experiment 1			
	Argument evaluation		Verbatim match	
	Initial clause	Final clause	Initial clause	Final clause
Claim	6.34 (2.1)	5.54 (2.5)	5.44 (2.1)	5.64 (2.9)
Reason	4.17 (2.3)	3.59 (2.2)	3.56 (2.3)	3.41 (2.5)
	Experiment 2			
	Initial clause	Final clause		
Claim	6.29 (2.0)	5.89 (2.1)		
Reason	4.91 (2.3)	4.00 (2.1)		
	Experiment 3b			
	With should		Without should	
	Initial clause	Final clause	Initial clause	Final clause
Claim	4.12 (1.4)	3.79 (1.6)	3.47 (1.6)	3.53 (1.7)
Reason	2.79 (1.5)	3.53 (1.6)	3.30 (1.8)	2.91 (1.7)

Table 3
Mean recall accuracy of the order of argument component as a function of Argument Type and Recall Accuracy for all experiments (*SD* in parentheses)

Argument type	Experiment 1			
	Accurate order		Inaccurate order	
Claim-first recall	2.61 (2.0)		0.15 (.4)	
Reason-first recall	1.78 (1.7)		1.13 (1.6)	
	Experiment 2			
	Accurate order		Inaccurate order	
Claim-first recall	2.41 (1.78)		0.50 (1.19)	
Reason-first recall	2.32 (2.07)		0.98 (1.38)	
	Experiment 3b			
	With should		Without should	
	Accurate order	Inaccurate order	Accurate order	Inaccurate order
Claim-first recall	2.28 (1.7)	0.56 (1.2)	1.88 (1.5)	0.63 (0.9)
Reason-first recall	1.02 (1.3)	1.12 (1.3)	1.19 (1.3)	1.40 (1.2)

Note there were 12 items for Experiments 1 and 2 and six items for Experiment 3b.

reason-first arguments in a claim-first order. These results occurred for both a task that required deep analysis of the arguments (i.e., Argument Evaluation task) and a task that required a much more superficial analysis of the arguments (i.e., Verbatim Match task). This suggests that the construction of an argument representation does not differ depending on the reader's goal.

One limitation of this experiment is that the reason was always signaled by a connector (e.g., because), making it always syntactically subordinate. It is possible that these results may simply be due to initial subordinate clauses being processed more slowly than initial main clauses. An optimal solution to this confound would be to cross syntactic subordination with argument element by subordinating the claim as in 5a and 5b.

5a. Therefore recycling should be federally mandated, recycling saves the environment.

5b. Recycling saves the environment therefore recycling should be federally mandated.

This solution was rejected because of the awkwardness of the subordinated claim-first version (5a). It is interesting to note that a subordinating conjunction preceding an initial claim is awkward but one preceding an initial reason is not. This is consistent with the hypothesis that claims are helpful in organizing the processing of subsequent argument elements.

Instead, Experiment 2 tests whether the difference between argument presentation orders was the result of the reason being syntactically subordinated by manipulating the explicitness of the connection between the argument elements. Half of the participants received the arguments with the connector present (essentially a replication of Experiment 1) and the other half received the arguments without the connector. In this Connector Absent condition, the reader must semantically determine the relationship between the two syntactically equivalent argument elements. Thus, any facilitation in reading arguments presented in a claim-first order must be due to the semantic relationship between the claim and reason rather than to syntactic factors.

Experiment 2

Method

Participants

Fifty-six undergraduate psychology students at Northern Illinois University participated for course credit.

Design

The within-subjects variable was Argument Order (claim-first order vs reason-first order) and the between-subjects variable was Connector Explicitness (connector present vs connector absent). In this experiment, all participants read the arguments using the same task: argument evaluation.

Material

The stem items were the same as those from Experiment 1. The connector absent condition required an additional version of each argument to be constructed. This version did not contain a "because" to mark the relationship between the claim and reason. Instead the two argument components (i.e., claim and reason) were presented as two individual sentences as shown in 6a and 6b.

6a. Claim-first argument: Recycling should be federally mandated. Recycling saves the environment.
6b. Reason-first argument: Recycling saves the environment. Recycling should be federally mandated.

Procedure

As in Experiment 1, participants read the arguments phrase-at-a-time on a computer using a self-paced moving window. After reading each argument, the participants were given a related reason and made an argument consistency judgment. Feedback was given on incorrect trials. After reading the 24 arguments, participants were then given the same surprise cued recall task as was described in Experiment 1. Participants were given only 20 min to complete the cued recall test.

Results

Five participants' data were not included in the analysis due to error rates over 33%, average error rate = 41%. Three participants were lost from the connector present and two were lost from the connector absent condition. The remaining participants answered 87% of the items correctly and there was no accuracy difference between the connector present condition ($M = 21.33$, $S = 1.41$) and the connector absent condition ($M = 20.62$, $S = 2.06$).

Reading time analysis

The mean reading times for entire arguments are presented in Table 1. The data were analyzed using an ANOVA with Argument Order (claim-first vs reason-first order) as a within-subjects variable and Connection Explicitness (connector present vs connector absent) as a between-subjects variable. The main effect of Argument Order was significant $F_1(1,54) = 8.91$, $p < .005$; ($F_2(1,46) = 6.95$, $p < .01$). Mean argument reading times were longer when the arguments were presented in a reason-first order ($M = 8.86$) than when they were presented in claim-first order ($M = 8.15$). Neither the main effect of Connection Explicitness nor the Argument Order × Connection Explicitness interaction were significant, F's < 1. Just as in Experiment 1, arguments were read faster when the claim came first followed by the reason and this effect was not due to syntactically subordinating the reason.

To investigate the effect of order of presentation on the processing of each argument component (i.e., claim and reason), an ANOVA was carried out on mean reading time with Presentation Order (first vs second clause) and Argument Type (claim vs reason) as within-subjects factors and Connection Explicitness (connector present vs connector absent) as a between-subjects factor. As shown in Fig. 3, there was a main effect of Presentation Order with argument components in the second clause ($M = 3.58$) being read more quickly than those in the first clause ($M = 4.92$), ($F_1(1,54) = 56.18$, $p < .000$; $F_2(1,46) = 100.35$, $p < .000$). There was also a significant main effect of Argument Type for subjects $F_1(1,54) = 20.64$, $p < .000$ but not significant for items ($F_2(1,46) = 1.97$, $p = .17$). Claims were read faster ($M = 4.06$) than reasons ($M = 4.43$) though not for all items.

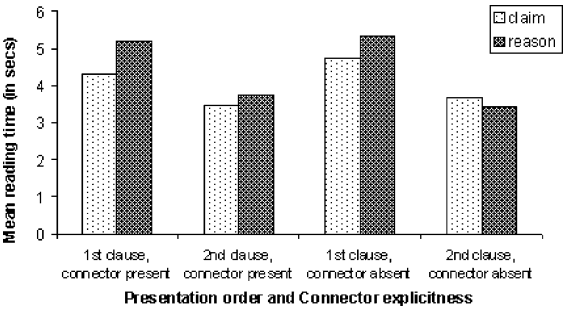

Fig. 3. Mean reading times for each component of the argument as a function of Presentation Order and Argument Type for each Comprehension Task in Experiment 2.

The more important result is the Presentation Order × Argument Type interaction which was significant ($F_1(1,54) = 8.91$, $p < .005$; $F_2(1,46) = 6.95$, $p < .01$). As shown in Fig. 3, reading times for reasons were more affected by changes in position (M difference = 1.69) than were reading times for claims (M difference = 0.99). While both claims and reasons were read slower in the initial clause, there was an advantage for reading claims occurring in the first position. Equally important, the Presentation Order × Argument Type interaction was not affected by Connection Explicitness (F's < 1). Reasons in the initial clause were read significantly slower whether they were syntactically subordinated or not.

There was also a significant Argument Type × Connection Explicitness interaction ($F_1(1,54) = 6.65$, $p = .05$) but not significant in the item analysis ($F_2(1,46) = 1.18$, $p = .28$). The claim-first advantage over reasons was larger for the connector present condition resulting in claims being read 582 ms faster than the reasons while the claims were only read 161 ms faster than reasons for the connector absent condition. This is a trivial effect most likely due to the additional word "because" in the reasons of the connector present condition.

Recall analysis

Participants correctly recalled 44% ($SD = 13.3$) of the total number of claims and reason elements (21 of the 48). As shown in Table 2, there was a main effect of Argument Type ($F_1(1,54) = 64.35$, $p < .000$; $F_2(1,46) = 27.82$, $p < .000$). Claims ($M = 6.09$) were

recalled better than reasons ($M = 4.46$). There was also a main effect of Presentation Order ($F_1(1,54) = 9.82$, $p < .005$; $F_2(1,46) = 9.68$, $p < .005$). Initial components ($M = 5.60$) were better recalled than second clause components ($M = 4.95$). No other effects were significant.

To examine the order of recall, only those items for which the participants correctly recalled both elements from the same argument (20%) were considered. In order to test whether these recalls were in the order presented or whether there was a preference for claim-first recalls regardless of presentation order, a mixed ANOVA was carried out with Argument Type (claim vs reason) × Recall Accuracy (accurate order vs inaccurate order) as within-subjects factors and Connection Explicitness (connector present vs connector absent) as a between-subjects factor. As shown in Table 3, there was a main effect of Recall Accuracy in that participants recalled the arguments more often in the order they were presented ($M = 2.37$) than in the opposite order ($M = 0.74$) ($F_1(1,54) = 30.14$, $p < .000$; $F_2(1,46) = 65.51$, $p < .000$). There was also a significant Argument Type × Recall Accuracy interaction ($F_1(1,54) = 4.03$, $p < .05$; but not significant for items $F_2(1,46) = 2.45$, $p = .12$). Claim-first arguments were more often recalled in the presented order than in a reverse order (M difference = 1.94) compared to reason-first arguments (M difference = 1.34). There were no effects of Connection Explicitness. Thus, regardless of whether reasons were preceded by a subordinating connector, reason-first arguments were more frequently recalled in an opposite order than were claim-first arguments.

Discussion

Experiment 2 again found that the processing of arguments was facilitated when argument information was presented in a claim-first order. This facilitation was revealed both during reading and in the subsequent recall. Arguments were read faster when claims preceded reasons and the extra processing time associated with reason-first arguments could be attributed to longer reading times on the reason. Claim-first arguments were recalled better than reason-first arguments and reason-first arguments were often transposed to a claim-first order when recalled. Most importantly, these results occurred whether the connector "because" was present or absent, indicating that the result is not due to syntactically subordinating the reason.

The claim-first advantage found in Experiments 1 and 2 appears to be due mostly to the difference in reading time on the initial clause. Because this difference occurs even when the connector "because" is not present, one must conclude that readers are able (at some level) to distinguish between claims and reasons. To further test this supposition, the claims and connector-absent reasons from Experiment 2 were randomly assigned to two lists so that no matching claim and reason occurred in the same list. Twenty-five different participants from the same population were asked to read each sentence and rate on a 6-point scale whether the sentence was more like a claim (1) or a reason (6). Although these participants judged all items towards the claim end of the scale (suggesting that the default interpretation for isolated items is as claims), they gave a significantly lower rating to claims ($M = 2.07$, $S = 0.76$) than to reasons ($M = 3.12$, $S = 0.87$) ($F(1,23) = 35.18$, $p < .000$). Thus, the claims and reasons presented in Experiment 2 were, to some extent, distinguishable when the initial clause was read.

This raises the question of what type of semantic, syntactic and pragmatic cues are present to signal the reader that a claim has been encountered. One possible set of cues that a statement requires support is the presence of modals that indicate a value judgment (such as, "should," "ought," "must") or uncertainty (such as "probably," "could have," "possibly"). Indeed, an analysis of the 30 claims used in the two experiments (see Appendix) revealed that 70% were explicitly marked with "should." To further clarify this issue, we conducted a rating experiment (Experiment 3a) followed by a reading time experiment (Experiment 3b).

Experiment 3a

Experiment 3a examines whether the quality of a cue can influence claim identification. Twenty-four claims were selected and three versions of each were created by manipulating the type of marking used to signify the statement is a claim. Consider sentences 7a–c below:

7a. The national highway speed limit is 65 miles per hour.

7b. The national highway speed limit is probably 65 miles per hour.

7c. The national highway speed limit should be 65 miles per hour.

Sentence 7a is an unmarked assertion; sentence 7b includes an uncertainty marker (i.e., "probably"); sentence 7c includes a modal marker (i.e., "should"). Both uncertainty and the use of "should" communicate that the sentence is not certain and requires support. Thus, we would expect readers to rate these sentences as more claim-like than an unmarked sentence.

Method

Participants

Forty-eight undergraduate psychology students at Northern Illinois University participated for course credit.

Materials

Twenty-four claims were created based on the 30 arguments in Appendix. Three versions were made of each claim that had either no marker (e.g., 7a), an uncertainty marker (e.g., 7b), or a modal marker (e.g., 7c). The claims were randomly assigned to three lists so that each list had an equal number of each type of marker and only one version of each claim was in the list. Ten distractor items were also created. These sentences were designed to be good reasons in an effort to reduce any tendency on the part of the participants to respond "1" to all of the items. The distractors included such items that began with "because" as well as sentences that provided very specific, factual information, for example: "Because 4 out of 5 doctors prefer it." and "Columbus started his voyage in 1492 with three ships, the Nina, Pinta, and Santa Maria." For each list condition, the 34 items were collected into a two page booklet.

Design and procedure

The participants were randomly assigned to the three list conditions. They were given a booklet that provided instructions to rate each sentence on a 6-point scale as to whether the sentence was more like a claim (1) or more like support (6). The instructions included an example argument with its claim component and its reason component presented in the same manner as the target sentences. Participants were given as much time as necessary to complete the task.

Results and discussion

The mean ratings for each condition were: 4.19 ($SD = 1.14$) for distractors, 3.40 ($SD = 1.03$) for unmarked claims, 2.77 ($SD = 1.10$) for claims with an uncertainty marker, and 2.15 ($SD = 1.03$) for claims with a modal marker. An ANOVA on mean ratings with Type of Statement as a within-subjects variable revealed a significant main effect ($F_1(3, 141) = 36.14$, $p < .001$). A Bonferoni post hoc test (experiment-wise $\alpha = .05$) showed that each mean was significantly different from every other mean.

The significance and pattern of the means provide further confirmation that certain text markers enable claims to be identified in isolation. The modal auxiliary verb "should" served as the best cue, followed by qualifiers like "probably" that suggest uncertainty. Unmarked claims were rated at the midpoint between claims and reasons. The distractors, which were designed to be good reasons, were rated most reason-like. These results help to explain how readers identify claims and why we observed a reading time advantage for claims on the first clause of an argument.

If readers use modals to identify claims, then presenting the arguments without a modal should lead to an elimination of the claim-first advantage. Without the "should" marker, the phrase could not be unambiguously identified as a claim and as such the argument schema would not be activated. This hypothesis is tested in Experiment 3b by presenting complete arguments with and without modals to aid in claim identification. It is predicted that with the modal, there will be a claim-first advantage in both reading time and recall. Without the modal, however, the phrase will be interpreted as a fact followed by an explanation and therefore there will be no advantage for claim first statements.

Experiment 3b

Method

Participants

Forty-eight undergraduates at Northern Illinois University participated for course credit.

Material

The arguments from Experiment 1 were modified in several ways. First, each of the causal claims was either converted to a policy claim or replaced with a new item that was a policy claim. Second, an additional version of each claim was constructed by omitting the "should" marker. Third, the claims were flipped to make sure that when the "should" was omitted, it did not create an obviously false statement. Consider 8a which is an example of an argument with a claim marker present while 8b is an example of the same argument without a claim marker.

8a. Recycling should not be federally mandated because recycling requires as much fuel consumption as product manufacturing.

8a. Recycling has not been federally mandated because recycling requires as much fuel consumption as product manufacturing.

Design and procedure

In this experiment, both Argument Order (claim-first order vs reason-first order) and Claim Marker (with should vs without should) were manipulated within-subjects. The procedure was the same as Experiment 2.

Results

The five participants whose error rates exceeding 33% (average error rate = 56%) were dropped from the analysis. The remaining participants answered an average of 87% of the items correctly.

Reading time analysis

The mean reading times for the complete argument are presented in Table 1. A within-subjects ANOVA was carried out with Argument Order (claim-first vs reason-

first order) × Claim Marker (with should vs without should). The main effect of Argument Order was significant ($F_1(1,42) = 14.21$, $p < .001$; $F_2(1,23) = 5.67$, $p < .05$). Mean argument reading times were longer when the arguments were presented in a reason-first order ($M = 10.36$) than when they were presented in claim-first order ($M = 9.30$). More importantly there is a significant interaction of Argument Order × Claim Marker $F_1(1,42) = 8.91$, $p < .005$; ($F_2(1,23) = 6.15$, $p < .05$). Marked arguments were read faster in the Claim-first order (M difference = 1.90), but unmarked arguments were not read faster (M difference = 0.22).

A further ANOVA was carried out on mean reading time with three within-subject factors: Presentation Order (first vs second clause), Argument Type (claim vs reason), Claim Marker (with should vs without should). As shown in Fig. 4, there was a main effect of Presentation Order with argument components in the second clause ($M = 4.07$) being read more quickly than those in the first clause ($M = 5.76$), ($F_1(1,42) = 84.11$, $p < .000$; $F_2(1,23) = 40.37$, $p < .000$). There was also a significant main effect of Argument Type $F_1(1,42) = 38.46$, $p < .000$; ($F_2(1,23) = 6.57$, $p = .05$) with claims being read faster ($M = 4.52$) than reasons ($M = 5.31$). The Presentation Order × Argument Type interaction was significant ($F_1(1,42) = 14.22$, $p < .001$; $F_2(1,23) = 5.67$, $p < .05$). Initial claims were read 1.16 s faster than final claims, while initial reasons were read 2.22 s faster than final reasons. There was also a significant Argument Type × Claim Marker interaction for subjects, $F_1(1,42) = 38.46$, $p < .000$, but not for items $F_1(1,42) = 38.46$, $p < .000$. The difference in reading time for claims and reasons was greater for marked arguments ($M = 1.15$) than for unmarked arguments ($M = 0.42$). However, these effects are all qualified by a significant Presentation Order × Argument Type × Claim Marker interaction, ($F_1(1,42) = 8.91$, $p < .005$; $F_2(1,23) = 6.15$, $p < .05$), which is shown in Fig. 4. Claims were read more quickly than reasons but only for marked claims in the initial position (M difference = 2.20). With unmarked claims this advantage is eliminated in the first position (M difference = 0.53). There was no effect in the final position for either marked (M difference = 0.20) or unmarked claims (M difference = 0.31). Thus, only when the claim is marked and therefore easily identifiable is there a claim-first advantage.

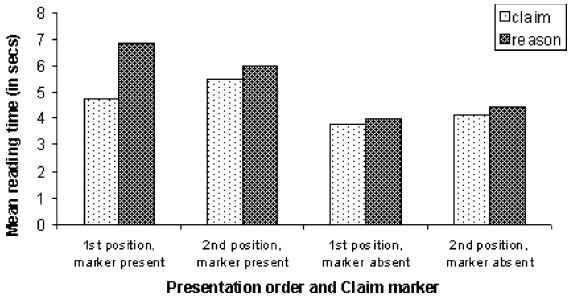

Fig. 4. Mean reading times for each component of the argument as a function of Presentation Order and Argument Type for each Comprehension Task in Experiment 3b.

Recall analysis

In this experiment, participants only had 6 items per condition and therefore the absolute number of elements recalled can not be directly compared to Experiments 1 and 2. Participants correctly recalled 56% ($SD = 9.1$) of the total number of claim and reason elements (26.7 of the 48). As shown in Table 2, there was a main effect of Argument Type ($F_1(1,42) = 22.68$, $p < .000$; $F_2(1,23) = 13.81$, $p < .001$). Claims ($M = 3.73$) were recalled better than reasons ($M = 3.13$). There was also a main effect of Presentation Order ($F_1(1,42) = 7.47$, $p < .005$; $F_2(1,23) = 9.02$, $p < .01$). Initial components ($M = 3.56$) were better recalled than second clause components ($M = 3.30$). Finally, there was a significant interaction of Argument Type × Presentation Order × Claim Marker ($F_1(1,42) = 5.87$, $p < .05$; $F_2(1,23) = 8.70$, $p < .01$). Only initial claims marked with ''should' were recalled better than reasons, $t(42) = 6.66$, $p < .001$.

Participants correctly recalled both elements from the same argument 41% (9.7 of 24 arguments). A within-subjects ANOVA carried out on these complete recalls with Argument Type (claim vs reason) × Recall Accuracy (accurate order vs inaccurate order) × Claim Marker (with should vs without should). As shown in Table 3, there was a main effect of Recall Accuracy in that participants recalled the arguments more often in the order in which they were presented ($M = 1.59$) than in the opposite order ($M = 0.92$) ($F_1(1,42) = 9.83$, $p < .01$; $F_2(1,23) = 27.18$, $p < .000$). There was also a significant Argument Type × Recall Accuracy interaction ($F_1(1,42) = 33.56$, $p < .01$; $F_2(1,23) = 35.22$, $p < .01$). Claim-first arguments were more often recalled in the presented order than in a reverse order (M difference = 1.49) compared to reason-first arguments (M difference = −0.15). There was also a significant interaction of Argument Type × Claim Marker interaction ($F_1(1,42) = 4.37$, $p < .05$; $F_2(1,23) = 5.10$, $p < .05$). In these complete arguments, claims were recalled better than reasons with marked arguments (M difference = 0.35) but not for unmarked arguments (M difference = −0.03).

Discussion

Experiment 3b shows that when claims are marked with a modal that clearly identifies it as a claim, arguments are read more quickly and recalled better in a claim-first order. When the modal is omitted, the claim-

first advantage is eliminated. Thus, the preference for reading claims first only occurs when there is an unambiguous claim identification process.

General discussion

The experiments presented here show that order effects occur in reading argumentative texts. Not only does there appear to be a processing advantage for reading arguments in a claim-first order, but the representation that is constructed also appears to conform to a structure that is organized around a claim. These effects are similar to those observed for other text genre. As noted in the introduction, the representation of narratives appears to be organized around causal-temporal relationships and the representation of procedural texts appears to be organized around goals and actions. In the case of arguments, the claim appears to be the central component to which other elements (or at least reasons) are associated. Support for the special status of the claim comes from four findings: claim-first arguments were read more quickly than reason-first arguments, initial claims were read faster than initial reasons, claims were recalled better than reasons, and claims were often recalled first even when presented second. Experiments 3a and 3b showed that it was the presence of a modal in the claim that enabled readers to identify it as such and thus incur the processing advantage. In the next section a simple framework for argument processing is offered as a starting point to account for the results of these experiments.

A framework for argument processing

Like narrative and expository texts, the processing of argumentative texts appears to be driven by genre-specific organizing structures. The central component of the proposed argument schema is the claim. Because processing of the reason as well as other argument elements depends upon establishing the claim, the claim assumes the focal position in the structure. The other argument components are related to the claim through a set of required (e.g., reason) and optional (e.g, warrant, backing, rebuttal, and qualifier) slots or connectors. These slots are inter-linked through labeled relationships among the argument elements, such as *supports*, *restricts*, *permits*, and *refutes*.

Argument processing is initiated by the parsing of a clause or sentence. If any semantic, syntactic and pragmatic cues are present to signal that a claim has been encountered, then an argument schema is activated. As the results of the ratings tasks presented at the end of Experiment 2 and the results of Experiments 3a and 3b show, explicit marking of claims by modals and qualifiers affects how "claim-like" a statement is perceived to be. In addition to modals and qualifiers and explicit connectors (such as "therefore"), other features may aid the reader in identifying claims. One such feature is the consistency of the statement with the reader's beliefs. For example, the statement "The solution to our future energy demands is the construction of cold fusion plants" contains no explicit cues that it is a value judgment or in any way uncertain, but one's common knowledge (if available) should raise a red flag that cold fusion is not currently a viable technology and thus this statement requires support. Another way that claims might be identified is through familiarity and explicit knowledge that the statement is controversial, even if it is not inconsistent with the reader's beliefs. Thus a statement like, "The death penalty is not a deterrent to crime," even if already accepted by the reader would probably be recognized as controversial and thus create an expectation that supporting statements are likely to follow. Finally, a fourth way that claims can be identified is when they are followed by an explicit reason. This is most likely the case for claims that contain no explicit markers and are not perceived as inconsistent or controversial. There are occasions, usually historical or rhetorical in nature, when one reads arguments that support claims everyone already believes.

Once a claim is detected, a memory search is initiated to activate prior knowledge (Lesgold, Roth, & Curtis, 1979; McKoon & Ratcliff, 1980; Myers & O'Brien, 1998) and associated attitudes (Voss, Fincher-Kiefer, Wiley, & Silfies, 1993). The subsequent attachment of other argument elements is then a matter of identifying the element type and attaching it to the available slot. Although the current experiments do not address the triggering and identification of other elements, it is assumed that prospective argument slots are identified based on semantic, syntactic and pragmatic cues. As each element is attached, the argument may be reevaluated to ascertain truth value and detect inconsistencies. It is unclear to what extent arguments are automatically evaluated during reading, though people do seem adept at detecting *non sequiturs* and at least some logical inferences appear to be made automatically (Lea, 1995; Noordman et al., 1992).

Now consider the case of the reason-first sentences in Experiments 1 and 2. One would not expect a reason to immediately trigger an argument schema due to either the inherent ambiguity of connectors such as "because" or to the relative acceptability and certainty of statements that are typically offered as reasons. One does not usually provide reasons that are controversial because the reason is supposed to form the basis for the acceptance of the claim. Thus, the reason clause must be held in an unattached form in memory (i.e., buffered) awaiting a future statement that will indicate its relationship to a macro-organizer (e.g., argument). Presumably, this indeterminacy and buffering incur a

processing cost during the reading of the unattached ambiguous element. Once the claim is read, the argument schema is opened, the claim is assigned and only then is the initial reason attached.

It is left to future research to more fully elaborate and test this framework but it is constrained enough to create several testable predictions and stimulate research on a neglected genre. What factors trigger an argument schema? How are more complex arguments represented? How are arguments processed in extended discourse and how are narrative, explanatory, and argumentative structures coordinated during reading? How is argument processing affected by differences in reading and reasoning ability? How and when do individuals acquire an argument schema?

Although it has been argued that readers construct a schema-like representation while reading, the ultimate nature of the representation is likely to be something conducive to logical inference, be that propositional (Braine & O'Brien, 1998) or some form of mental model (Schaeken, De Vooght, Vandierendonck, & d'Ydewalle, 2000). A complete model of argument comprehension will need to account for both reasoning and text processing constraints. These results also point out the importance of differences in text genre for text processing theories. It is unlikely that a simple mechanism based only on causal-temporal connections would be able to account for processing of all non-narrative texts. While some non-narrative texts, such as expository ones, clearly make use of causal-temporal connections, persuasive texts use logical connections to build a different type of representation. A complete theory of reading will need to specify what these logical connections are and under what circumstances they are used.

Appendix

1C. Marijuana should be legalized
1R. Because marijuana is no more harmful than alcohol which is legal
1P. Marijuana is the US's number one cash crop which would translate into huge tax revenues
2C. Women should not be allowed entrance into all military schools
2R. Because a mixed gender environment will destroy the important bonding that must take place in military schools
2P. Military schools provide important intangible benefits to their graduates that other schools do not
3C. All research on animals should be stopped immediately
3R. Because animals experience pain and suffering as a result of this research
3P. Major advances in medicine have been achieved through basic research with animals
4C. Hunting animals for sport is morally wrong
4R. Because all animals have a right to life
4P. Sport hunters hunt for pleasure not for need of food
5C. People should be allowed to have only two biological children
5R. Because overpopulation is threatening our way of life in America
5P. Restricting the number of births is against many people's religious beliefs
6C. The legal age for drinking alcohol should be 18 for all states
6R. Because a person can vote at age 18
6P. Males can be drafted to serve in the military as young as 18 years old
7C. The death penalty is not a deterrent to crime
7R. Because most crime is committed spontaneously
7P. People will not commit murder if know they will be put to death
8C. Grade school teachers should promote all students to the next grade even those who fail
8R. Because failing students who are passed along do better in later life than those who are held back
8P. Promoting everyone will reward students for being lazy
9C. The state should not require centralized emissions testing for automobiles
9R. Because centralized emissions testing would be too inconvenient for drivers
9P. Centralized testing would insure better compliance with clean air laws
10C. The highway speed limit should remain 55 miles per hour
10R. Because studies show that 55 miles per hour is the safest driving speed
10P. Driving 55 mph is good for the environment
11C. Schools should be allowed to use physical punishment with children who seriously misbehave
11R. Because physical punishment is the only way to maintain order in the classroom
11P. Schools who punish children have higher test scores
12C. Universities should be allowed to randomly test athletes for steroids
12R. Because steroids have serious, even life-threatening, side-effects
12P. Sporting contests are assumed to be based on one's ability and training
13C. Physician-assisted suicide should not be permitted for terminally ill patients
13R. Because overburdened caretakers will apply pressure for the patient to commit suicide
13P. People have a right to die with dignity

Appendix (*continued*)

14C. TV advertisements for condoms should be shown during prime time
14R. Because condoms can prevent AIDS and unwanted pregnancy
14P. Condom advertisements encourage sexual behavior
15C. Reading causes poor vision
15R. Because the eye muscles responsible for vision deteriorate with overuse
15P. Most professors wear glasses
16C. Lack of sunlight in the winter causes depression in some people
16R. Because chemicals in the brain that are important for happiness are triggered by sunlight
16P. People in tropical areas are less depressed than people in colder climates
17C. Pittsburgh should legalize riverboat gambling
17R. Because gambling will increase city revenues
17P. Gambling leads to increased crime and alcoholism
18C. Recycling should be federally mandated
18R. Because recycling saves the environment
18P. We are running out of available landfill space
19C. Uniforms should be required in all public schools
19R. Because uniforms will create a sense of equality among all students
19P. Students get into serious fights over the clothes they wear to school
20C. Curfews should not be placed on teens
20R. Because teens have a right to freedom
20P. Curfews make a community safer
21C. Schools should teach the history of women
21R. Because women helped shape the course of US history
21P. Students will change negative stereotypes about women
22C. Drivers who are charged with drunk driving should have their licenses taken away
22R. Because drunk drivers are often repeat offenders
22P. People should be allowed to make occasional mistakes in their lives
23C. Oil drilling in the Alaskan wildlife preserve should be allowed
23R. Because the US needs the oil
23P. Americans would need to rely on volatile Middle East countries for oil
24C. Watching violent television programs causes people to commit aggressive offences
24R. Because viewers become less sensitive to violent acts
24P. People sometimes copy violent acts that they first viewed on TV
25C. Taking vitamin C daily helps to prevent colds
25R. Because vitamin C keeps the immune system strong
25P. Many people taking Vitamin C still get sick
26C. Parents' level of education determines their child's level of education
26R. Because parents will encourage their child to succeed in school to their same level
26P. Children whose parents are highly educated usually go to college
27C. Defective genes cause some people to become obese
27R. Because obesity frequently occurs among members of the same biological family
27P. Members of the same family share similar eating and exercise habits
28C. The government should ban sexually explicit music lyrics
28R. Because sexually explicit music increases sexual promiscuity
28P. Censorship violates the first amendment right of free speech
29C. Children should be returned to their natural parents whenever possible
29R. Because natural parents' rights outweigh adoptive parents' rights
29P. Disrupting the strong bond may be very detrimental to the child's emotional health
30C. Inhaling cigarette smoke causes lung cancer
30R. Because there is a higher incidence of lung cancer among smokers than nonsmokers
30P. Nonsmokers still get lung cancer

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