Analogical Inference in Automatic Interpretation

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Abstract

We present findings suggesting that analogical inference can play a role in the fundamental processes involved in automatic comprehension and interpretation. Participants were found to use information from a prior relationally similar example in understanding the content of a currently encoded example. Further, in doing so they were sensitive to structural mappings between the two instances, ruling out explanations based solely on more general kinds of activation and application. Reading speed measures were used to demonstrate that these inferences were taking place during encoding rather than at later retrieval. These findings support the integration of sophisticated processes such as analogical mapping in a wide range of cognitive functions.

Introduction

One of an individual's primary cognitive tasks is simply making sense of the things he or she encounters in the world. A person must quickly classify and assess objects and situations in order to know how to interact and what kinds of responses to expect, to know where to allot attention and what to safely disregard. So much information must be evaluated so rapidly that these processes are generally automatic and non-deliberative, apparently consistent with fairly low-level processing.

However, this assessment belies the complexity of the information these automatic interpretive processes can frequently produce. For many situations, accurate comprehension requires an understanding of the roles that each entity is playing, and how these various roles relate to one another, creating a larger coherent structure. This is particularly relevant since, in most real-world experiences, a great deal of information is left unstated or ambiguous, requiring a substantial amount of inference. This seems consistent with more sophisticated cognitive processes, such as analogical inference. In this paper, we present evidence that analogical inference plays a role in the automatic, non-deliberative processes of online interpretation and comprehension.

Analogical inference in comprehension

In analogical inference, a current representation is compared with that of some previously stored case, and a structural mapping between the two identifies common relational systems. These relational commonalities are then used to support the inference of additional information about the current case (Gentner, 1983; Holyoak & Thagard, 1989). Specifically, information occupying a particular structural position in one representation is carried over to a matching position in the other. The experiments presented here support the idea that this kind of process can be involved in the fast, automatic, non-deliberative processes used in real-time comprehension of experiences. In other words, people seem able to rapidly compare the structure of the current situation to some specific prior case, map together entities that are in similar roles, and automatically incorporate additional information from the prior case into their perceptions of the current one, perhaps without even realizing they are doing so.

This can be distinguished from prior work showing the influence of more general kinds of activation on interpretation (such as priming) where facilitation of an idea does not rely on structural commonalities. It is also distinct from the vast literature on analogical inference that takes place in directed, deliberate tasks.

Further, it represents a different sort of process than is observed in implicit structural processes such as the application of the structure in a learned artificial grammar (Reber, 1967; 1969). In these cases, structure seems to be playing a role in automatic interpretation, but only after extensive exposure to a large number of specific instances, presumably leading to a general, abstracted schema. The investigation of processes that are structural, non-deliberate, and based on a single prior instance therefore represents an intriguing and novel question.

General activation in comprehension

To date, investigation of the factors that are relevant in linking past episodes to current perception and interpretation has focused almost exclusively on simpler kinds of processes. For instance, a substantial amount of research has been done on priming effects in perceptual recognition, robustly demonstrating that prior exposure to a stimulus facilitates its future recognition, both in terms of speed and accuracy (Jacoby & Dallas, 1981; Tulving, Schacter, & Stark, 1982). McKoon & Ratcliff (1996) further showed that this priming may sometimes mislead individuals, biasing them toward responses that are consistent with what they have previously experienced even when these interpretations are incorrect. Similarly, studies of semantic priming have demonstrated that recognition of a

word can be facilitated by simply presentation of semantically related words (Meyer & Schvaneveldt, 1971). For instance, recognition of *doctor* is improved after exposure to *nurse*.

There is also some evidence that these kinds of effects can extend beyond speeded, local recognition and influence somewhat broader interpretational processes, though still in an unstructured way. For instance, Anderson, Reynolds, Schallert & Goetz (1977) designed ambiguous passages that could be comprehended in two entirely different ways. One of their passages, for example, could plausibly be interpreted as describing either an attempted jailbreak or a wrestling match (e.g., "The lock that held him was strong, but he thought that he could break it."). People's interpretations varied as a function of prior experience; further, the majority of participants reported never considering an alternative explanation from the first one they settled upon. This is consistent with automatic, non-deliberative processes. Ross and Bradshaw (1994) also used ambiguous passages, including a modified version of Anderson, et al's wrestling/jailbreak story, to demonstrate how simple association and general activation could influence interpretation. In their studies, the two relevant themes (wrestling and jailbreaks) had each been arbitrarily associated with some other topic (e.g., Shakespeare) in stories early in the set. Later, simply mentioning this neutral topic in the text of the ambiguous passage proved sufficient to lead participants strongly toward interpretation consistent with the associated theme. Again, however, this relied on a general increase in the accessibility of the concept, not on any structure-to-structure mapping.

Schunn & Dunbar (1996) reported related results in the area of problem solving. In their study, participants were more easily able to make use of the idea of the mechanism of inhibition in solving a novel problem when they had recently encountered the concept in a problem from a different domain (biochemistry v. molecular genetics). Verbal protocols from participants were conspicuously lacking in references to the earlier task (which had been done on the previous day), leading the authors to suggest that the transfer and use were implicit and outside of conscious awareness. The authors interpreted these results as priming of the general idea of inhibition, and emphasized that the two problems did not share a larger global structure that would support analogical mapping. Rather, it seemed to be a more general application of a single, local relation.

In the examples so far, detailed structure mapping need not play a role. The influence of prior experience on current interpretation could be accounted for by broad activation of a relevant theme, or mapping of a simple local structure. Work on implicit learning (e.g., Reber, 1967; 1969), on the other hand, suggests that relational structure may be unconsciously encoded and applied to new situations, but only after extensive exposure and presumed abstraction. There is nothing here to suggest that individuals may make use of a single prior instance in the online comprehension of novel experiences.

Explicit analogy in interpretation

Some work has been done that is more closely related to our current focus, however. Blanchette and Dunbar (2002) examined analogy's role in on-line interpretation, using a false recognition paradigm to demonstrate representational change in an analogical target. In one of their studies, participants read a passage discussing the issue of marijuana legalization. Near the end of the passage, it was stated that the situation could be compared to alcohol prohibition, and the passage went on to describe some aspects of prohibition that could be considered analogous to the marijuana issue, although none of the potential inferences was stated explicitly. For instance, it was noted that the illegal production and distribution of alcohol during prohibition gave rise to elaborate and violent criminal organizations. Later, participants were more likely to believe that they had seen the implied facts actually stated about the target domain than were individuals in a control group that had not read the analogy paragraph—e.g., they falsely recognized sentences explicitly stating that drug laws gave rise to violent crime.

Importantly, this study demonstrates that analogical inference can be used in interpretation, actually altering participants' representations and beliefs about what they had seen. Unlike the present studies, however, the analogy had been explicitly identified, so participants were aware of the comparisons they were making and, at least to some extent, of the inferences they were drawing.

Text comprehension

As hinted above, research on text comprehension clearly bears on the question of automatic and nondeliberate inferencing. Although there is considerable variation in views concerning the degree and scope of inference-making during text comprehension (Kintsch, 1988; McKoon & Ratcliff, 1992; Glenberg et al., 1987; Graesser, Singer & Trabasso, 1994), even the most conservative estimates suggest that a fair number of automatic inferences are necessary to meaningfully process text. This motivates the use of narrative texts as a domain for examining the role of analogical processing in the generation of automatic inferences.

Although a considerable amount of research exists examining the incorporation of new information into existing knowledge structures (e.g., Kintsch's (1988) construction-integration model) as well as the role of available semantic associations in influencing inferences, the question remains open of whether and how structural information from a single, seemingly independent episode could bring about new automatic inferences.

Predictions

In the experiments described here, we examine whether analogical inference may be involved in the automatic, online interpretation of novel, ambiguous stimuli. If so, these inferences should not only reflect the general activation of previously seen concepts, but should also be

sensitive to commonalities in the roles that those concepts played in specific prior instances. Additionally, they should be incorporated into representations in a way that impacts individuals' actual beliefs about what they have seen.

Experiments

Participants read a series of narrative passages, designed such that some of the later stories were relationally similar to ones earlier in the set. Additionally, these later passages (the *target* passages) always left some relevant piece of information ambiguous or unstated. The question was whether participants would automatically use information from the earlier, analogous *source* passages to make inferences while comprehending the ambiguous targets.

There were two versions of each source passage (given between-subjects) that varied in some key details—the same details which could be used to guide inferences in the comprehension of the targets. For example, one source passage described a herpetologist exploring the jungles of Peru, who came across a lizard with some unusual physical characteristics. In one version of the story, the scientist is thrilled to realize that he has discovered a new species; in the other, he is upset by what he recognizes as a physical mutation caused by pollution from a nearby refinery. Aside from these key statements, the passages are identical. Later in the series, participants read an analogous scenario about a marine biologist who finds a sea turtle, again with unusual physical characteristics. This target passage leaves the cause of these characteristics unstated, however, simply stating that the researcher recognized the significance of what she had found, and carefully reported her discovery to the scientific community. Our primary focus, then, was to examine how participants resolved the ambiguities in each of the target passages, and how these comprehension-related inferences varied as a function of which versions of the source passages had been read.

In previously completed research (Day & Gentner, in preparation) we discovered a strong tendency for participants to interpret this kind of ambiguous passage in a manner consistent with the information presented in the earlier source analog. While consistent with our claim of automatic analogical inference, this result on its own cannot distinguish between inferences based on structural mapping and those resulting from a more general kind of conceptual activation. For instance, a participant who has recently encountered the notion of discovering a new species may have a generally increased fluency and availability for this idea, increasing its influence on comprehension whenever any ambiguity is encountered. In this situation, no mapping between representations would be required. Our first experiment was designed to distinguish between these two possible factors.

Experiment 1

In our first study, we sought to rule out an explanation for automatic inference based solely on the prior activation of a general concept, and to demonstrate an influence of matching representational structure. We therefore included *both* of the key concepts in each version of the source passages, but varied the role that each piece of information played in the larger representation. For example, in the source story involving the herpetologist, one version described the lizard as a new species, but also revealed the fact that the scientist had earned his reputation through examining the effects of pollution on reptile growth and development; the other version reversed the roles of these facts—the lizard is described as being deformed by pollution, while the scientist's reputation was based on the discovery of new species.

Note that if simple conceptual activation due to exposure were the sole factor in the source passages' influence, there should be no difference between the two conditions—all participants have seen both key concepts. If mapped structure between the source and target were also playing a part, however, then there should be an advantage for target interpretations that are based on the source concept that played a structurally matching role to the ambiguous portion of the target.

After reading the passages, participants were given several questions about their content, including some critical items used to determine how they had interpreted each of the target stories.

Participants

The participants were 20 undergraduate students at Northwestern University, who participated in the study for class credit.

Materials and Procedure

The materials consisted of a set of narrative passages and a set of questions about their content. The story set included nine passages—two source-target pairs and five filler stories—presented in the following order: filler, Source 1, Source 2, two fillers, Target 1, filler, Target 2, filler. The average story length was 182 words (*sd* = 84). Above each story was a brief (2-3 word) title, describing some salient feature of the passage, such as setting (e.g., "The Bank," "High School").

There were two versions of each source passage, varying the role of two relevant pieces of information. The target passages left this information unstated or ambiguous, and were designed to be equally comprehensible with either of the possible interpretations inferable from the source. Which version of the source was read was varied between participants, and all individuals were randomly assigned to one of the two groups (10 per group). All participants read the same filler and target passages. Participants were given the story set along with the following instructions: "Please read each of the following passages quickly but thoroughly. Later, you will be asked to answer a few questions about them."

The participants were allowed to read the nine stories at their own pace, usually requiring about five minutes for the set. Once finished, they performed an unrelated filler task

that took approximately twenty minutes to complete, and then answered a set of questions about the stories. The questions were given with the following instructions: "Please circle *Yes* or *No* to indicate whether each of the following facts was stated in the passages you read earlier. To assist you, the title of the relevant story is given in italics before each fact."

The test set contained 18 items, two per passage. For each of the source and filler stories, there was one fact that had actually been presented in the passage and one fact that had not, making the correct responses "yes" and "no" equally represented. For the target passages, there was also one new statement consistent with each of the possible inferences given by the sources and inconsistent with the other, although neither fact had been explicitly stated in the passage. For instance, there was one item that was consistent with the interpretation that the marine biologist had discovered a new species of sea turtle and one that was consistent with her discovery of a turtle that had been deformed due to pollution.

If participants failed to make any inferences about the ambiguous portion of the target passages, or if they engaged in a deliberate inference process (which would require awareness of the ambiguity) they should respond "no" to both of these critical items, since both statements were actually new. If participants' interpretations were influenced solely by a general activation of the relevant concepts in the source passages, then they should sometimes answer "yes" to the critical items, but there should be no systematic differences in the pattern of responses between the two conditions—both source concepts would have been activated for all participants. However, if they are also sensitive to the *role* that the relevant concept played in the source passage and how that role maps onto the structure of the target, then they should be more likely to interpret the ambiguous portion of the target in a manner consistent with the concept in the structurally matching part of the source.

Results and Discussion

The results were consistent with our claim of structurally consistent inferences. For each participant, the proportion of "yes" responses was calculated separately for items consistent with structurally corresponding and structurally non-corresponding source information—that is, whether the key concept in the source was in the same or a different structural position as the ambiguous portion of the target. A one-way ANOVA was performed using these proportions as a within-participants factor. The results showed that participants were significantly more likely to respond that a fact had been stated in the target when that fact was consistent with information playing a corresponding role in the source (F (1, 19) = 13.11, $p < .01$). On average, participants responded affirmatively to structurally corresponding items 58% of the time and non-corresponding items only 23% of the time.

Prior work has demonstrated that an individual's comprehension of ambiguous information may be influenced by the general activation of a potentially relevant concept. The current results support the additional idea that individuals may automatically use a single prior instance as a source for inference based on structural commonalities. The results are consistent with the proposal that the representations of the two passages are aligned and inferences are made based on structural commonalities found during the mapping process. Even though all participants had seen the same two relevant concepts, either of which could be used to support target comprehension, they were far more likely to make use of a source element when it corresponded structurally to the ambiguous part of the target story. Further, the fact that they indicated that the information was actually stated in the target story supports the idea that these inferences did not involve active deliberation, but rather were automatically incorporated into their representations as they were being created.

Experiment 2

The results of Experiment 1 lend support to our suggestion of analogical inference in automatic interpretation. The patterns of inference are consistent with the claim that individuals are making use of prior analogous instances during the actual interpretation of a new episode. However, it would be desirable to have a more subtle measure of online inferences. Additionally, although the method used in Experiment 1—asking which facts had been stated in the target passages—provides a strong measure of participants' current representations of the stories, it leaves itself vulnerable to some concerns. For instance, participants could have inadvertently been remembering the source story itself rather than the target. Although steps were taken to make this less likely—giving story titles with each test item, changing salient details such as character gender between source-target pairs—this remains a concern. Due to similarity between the source and target scenarios, participants also could have conflated the two stories, reconstructing a memory that included details from both passages.

In order to address issues such as these, as well as to more directly examine participants' online processes, we adopted a computer-based reading speed measure. The passages from Experiment 1 were modified by adding a sentence to each target that would be consistent with one of the possible interpretations and inconsistent with the other. If the source passage were influencing the target during online comprehension rather than retrieval, we would expect confusion (and therefore slower reading times) when a sentence in the target was inconsistent with the interpretation suggested by the corresponding concept in the source.

Participants

The participants were 20 undergraduate students at Northwestern University, who participated in the study for pay or for class credit.

Materials and Procedure

The materials consisted of modified versions of the set of narrative passages used in Experiment 1. Since reading speed served as the dependent measure, there were no additional test items. The relevant passages were altered in two ways. First, the two versions of the source passages each contained only one of the key concepts that could be used in interpreting the target. The alternate concept, which had been located in a non-corresponding section of the source in Experiment 1, was deleted for this study. Additionally, a sentence was added to each of the target passages that was consistent with one of the possible interpretations and inconsistent with the other. All participants read the same target passages, but whether the additional sentence was consistent or inconsistent with source-based inferences depended upon which version of the source passage had been read.

For instance, one of the source passages described a wealthy widow who had died under suspicious circumstances. In one version, her niece, who lived in another city, dutifully flew to her aunt's home upon the announcement of her death. In the other version, the niece had been in the same city as her aunt but mysteriously left town when the death was announced. The target passage, which closely parallels the source, simply stated that a nephew, George, bought a ticket and flew to Rio de Janeiro upon the announcement of his wealthy uncle's death. This leaves unstated whether it is a flight to or from his uncle's home, or neither. Later in the passage, the following sentence was added: "*George's absence from the service was conspicuous, especially since he had been seen around his uncle's estate prior to his death, and the police soon found out about his flight to Rio.*" If the reader has interpreted the nephew's trip as fleeing the scene of a crime, this sentence is easy to understand. If the trip is understood as the nephew coming to the uncle's funeral, however, the sentence becomes not only unexpected, but somewhat incomprehensible. Reading times for this sentence therefore provide a way of potentially examining which relevant inferences are being made online. The source passages were varied between participants such that each individual read one target that was consistent and one that was inconsistent with inferences from the sources that had been read. Each target passage was read an equal number of times as consistent and inconsistent with the source information.

Participants read the passages from the terminal of a desktop computer. The stories were presented one sentence at a time, with participants pressing the space bar to proceed to the next sentence. Reading times for each sentence were recorded, measured from the time a sentence appeared on the screen until the space bar was pressed. The title for each story remained at the top of the screen while each sentence was read, and at the end of each story the screen cleared and did not proceed to the next passage until the space bar was pressed again. Reading times for the critical sentences, which could be either consistent or inconsistent with source-based inferences, served as the dependent measure for this experiment

Results and Discussion

The results from Experiment 2 indicate that participants were making source-based inferences during the reading of the target passages. A one-way ANOVA using source-consistency as a between-items factor revealed a significant difference in reading times ($F (1, 19) = 6.81$, $p < .05$). The average reading time for a relevant sentence when it was consistent with a potential inference from the source was 6.40 seconds, compared with a reading time of 8.88 seconds for the same sentence when it was inconsistent with the inference. This disparity, almost 2.5 seconds, represents a sizeable difference. Perhaps a more telling measure is a simple count—for 16 of the 20 participants, reading times were longer for whichever sentence was inconsistent with potential source inferences compared with the sentence that was consistent. It is important to note that these reading times reflect the result of inferences made *earlier in the target passage*. The test sentences themselves are not directly involved in the relevant, structurally based inferences from the source passage. Rather, they provide a means of examining whether such inferences have already been made in the earlier, ambiguous portion of the target.

These results demonstrate that the contents and structure of the source passage are influencing the comprehension of the target as it is being read. Identical sentences took significantly longer to read when they conflicted with inferences suggested by an earlier analogous story. This is evidence that the effects observed in Experiments 1 are influenced by online interpretive processes.

General discussion

Taken together, the results of these experiments strongly support the idea that structural information from a single analogous instantiation can influence the understood structure of a new instance, while it is being experienced. In Experiment 1, participants interpreted new narrative passages in a way that indicated they were using an earlier passage as a source for inference, interpreting the same target passage in different ways depending on which source had been read. Further, they were quite sensitive to the role that the relevant information played in the source story, showing a strong preference for inferences based on concepts in a matching structural position. Experiment 2 ruled out explanations for this result based solely on simple memory effects, showing instead that these inferences were actually being made during reading. In combination with the results of the first experiment, this suggests that the mapping of prior structure was occurring at the level of interpretation of the materials. Inferences were taking place during the encoding of the target passages that influenced participants' beliefs about what had been presented in those stories.

These results are consistent with the use of structure-mapping in the fundamental process of assigning meaning

to the things we encounter. They support the idea that the developing representations of events, as those events are being experienced, may be aligned with existing mental representations of specific prior episodes in a way that identifies common structure and allows for the potential importation of structurally matching information. It should be noted that the story pairs used in this research were quite similar overall. Prior research established that surface similarity is an important determinant of analogical retrieval from long-term memory (Gentner et al., 1993; Holyoak & Koh, 1987). Thus one question for future research is whether this kind of structural priming process occurs between materials with less surface similarity.

Prior research has established ways in which analogical inference may be involved in a number of higher cognitive functions, such as learning (e.g., Gentner & Medina, 1998; Loewenstein, Thompson, & Gentner, 1999), problem solving (e.g., Gick & Holyoak, 1983), and decision making (Medin, Goldstone, & Markman, 1995). The current findings support its potential role in seemingly more basic and automatic processes, such as comprehension. This work, combined with research exploring the relationship between analogy and other fundamental processes such as judgments of perceptual similarity (Gentner & Markman, 1997; Goldstone, Medin & Gentner, 1991) bolsters the view that structure-mapping mechanisms of alignment and inference may be recruited to play a role in processes at all levels of cognition. Further research will help to clarify the extent of this role, and how these mechanisms interact with other mental processes to support cognition.

Acknowledgements

References

Anderson, R.C., Reynolds, R.E., Schallert, D.L., & Goetz, E.T. (1977). Frameworks for comprehending discourse. *American Educational Research Journal, 14,* 367–381.

Blanchette, I., & Dunbar, K. (2002). Representational change and analogy: How analogical inferences alter representations. *Journal of Experimental Psychology: Learning, Memory & Cognition, 28*(4), 672–685.

Gentner, D. (1983). Structure-mapping: A theoretical framework for analogy. *Cognitive Science, 7,* 155–170.

Gentner, D., & Medina, J. (1998). Similarity and the development of rules. *Cognition, 65,* 263–297.

Gentner, D., & Markman, A.B. (1997). Structure mapping in analogy and similarity. *American Psychology, 52*(1), 45–56.

Gentner, D., & Medina, J. (1998). Similarity and the development of rules. *Cognition, 65,* 263-297.

Gick, M. L., and K. J. Holyoak. (1983). Schema induction and analogical transfer. *Cognitive Psychology, 15,* 1-38.

Glenberg, A. M., Meyer, M., & Lindem, K. (1987). Mental models contribute to foreground during text comprehension. *Journal of Memory and Language, 26*(1), 69-83.

Goldstone, R. L., Medin, D. L., & Gentner, D. (1991). Relational similarity and the non-independence of features in similarity judgments. *Cognitive Psychology, 23,* 222-264.

Graesser, A., Singer, M., & Trabasso, T. (1994). Constructing inferences during narrative text comprehension. *Psychological Review, 101*(3), 371-395.

Holyoak, K. J., & Koh, K. (1987). Surface and structural similarity in analogical transfer. *Memory & Cognition, 15,* 332-340.

Holyoak, K.J., & Thagard, P.R. (1989). Analogical mapping by constraint satisfaction. *Cognitive Science, 13,* 295–355.

Jacoby, L., & Dallas, M. (1981). On the relationship between autobiographical memory and perceptual learning. *Journal of Experimental Psychology: General, 110,* 306–340.

Loewenstein, J., Thompson, L., & Gentner, D. (1999). Analogical encoding facilitates knowledge transfer in negotiation. *Psychonomic Bulletin & Review, 6*(4), 586–597.

Medin, D.L., Goldstone, R.L., & Markman, A.B. (1995). Comparison and choice: Relations between similarity processes and decision processes. *Psychonomic Bulletin and Review, 2,* 1–19.

Medin, D.L., & Ross, B.H. (1989). The specific character of abstract thought: categorization, problem solving, and induction. In R. J. Sternberg (Ed.), *Advances in the psychology of human intelligence.* Mahwah, NJ: Lawrence Erlbaum Associates.

Meyer, D.E., & Schvaneveldt, R.W. (1971). Facilitation in recognizing pairs of words: Evidence of a dependence upon retrieval operations. *Journal of Experimental Psychology, 90,* 227–234.

Ratcliff, R., & McKoon, G. (1996). Bias effects in implicit memory tasks.. *Journal of Experimental Psychology: General, 125,* 403–421.

Reber, A. S. (1967). Implicit learning of artificial grammars. *Journal of Verbal Learning and Verbal Behavior, 6,* 855-863.

Reber, A. S. (1969). Transfer of syntactic structure in synthetic languages. *Journal of Experimental Psychology, 81,* 115-119.

Ross, B.H., & Bradshaw, G.L. (1994). Encoding effects of remindings. *Memory and Cognition, 22,* 591–605.

Schunn, C., & Dunbar, K. (1996). Priming, analogy, and awareness in complex reasoning. *Memory & Cognition, 24*(3), 271–284.

Tulving, E., Schacter, D., & Stark, H. (1982). Priming effects in word fragment completion are independent of recognition memory. *Journal of Experimental Psychology: Learning, Memory & Cognition, 8,* 336–342.