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The importance of causal connections in the comprehension of spontaneous spoken discourse

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In this study, we investigated the psychological processes in spontaneous discourse comprehension through a network theory of discourse representation. Existing models of narrative comprehension describe the importance of causality processing for forming a representation of a text, but usually in the context of deliberately composed texts rather than in spontaneous, unplanned discourse. Our aim was to determine whether spontaneous discourse components with many causal connections are represented more strongly than components with few connections—similar to the findings in text comprehension literature—and whether any such effects depend on the medium in which the spontaneous discourse is presented (oral vs. written). Participants either listened to or read a transcription of a section of a radio transmission. They then recalled the spontaneous discourse material and answered comprehension questions. Results indicate that the processing of causal connections plays an important role in the comprehension of spontaneous spoken discourse, and do not indicate that their effects on recall are weaker in the comprehension of oral discourse than in the comprehension of written discourse.

La importancia de las conexiones causales en la comprensión de discurso oral espontáneo. En este estudio investigamos los procesos psicológicos en la comprensión de discurso oral espontáneo, a través de una teoría de redes causales. Los modelos actuales de comprensión de narrativas describen la importancia del procesamiento de las conexiones causales para construir una representación coherente, pero en el contexto de la comprensión de discurso creado por el experimentador, y no de discurso espontáneo. Nuestro propósito fue determinar si aquellos enunciados que poseen un mayor número de conexiones causales son más incorporados a la representación del discurso que aquellos enunciados con un menor número de conexiones causales —como ha sido hallado en investigaciones acerca de la comprensión de discurso escrito— y si estos efectos dependen del medio de presentación del discurso (oral versus escrito). Con este fin, se pidió a participantes que leyeran la transcripción o escucharan una sección de un programa radial. Luego se les pidió que escribieran todo lo que recordaban, y respondieran a algunas preguntas de comprensión. Los resultados indican que el procesamiento de las conexiones causales entre los enunciados juega un rol importante en la comprensión de discurso oral espontáneo, y no indican que sus efectos en el recuerdo sean menores en la comprensión de discurso oral que de discurso escrito.

Discourse is one of the behaviors that make us human (Graesser, Millis, & Zwaan, 1997). When people spontaneously communicate about events, they negotiate and renegotiate meaning (Dole, Duffy, Roehler, & Pearson, 1991; Stubbs, 1983). This interactive comprehension is indispensable for functioning in society (van den Broek & Kremer, 1999).

Discourse comprehension has been extensively investigated with respect to texts, and narrative texts in particular (e.g., Cain & Oakhill, 1999; Mandler & Johnson, 1977; van den Broek, 1989; van den Broek, 1990; van den Broek & Kremer, 1999; van den Broek & Trabasso, 1986; van Dijk & Kintsch, 1978). One of the most consistent findings is that comprehension of texts involves the reader's identification of meaningful relations —in particular local and global causal ones— between text elements and that these processes result in a coherent representation of the discourse in memory (Louwerse & Mitchell, 2003; van den Broek, 1990).

In comparison, little attention has been paid to the processing and representation of causality in spontaneous discourse comprehension. Research on spontaneous speech comprehension has focused on listeners' ability to predict, detect, and manage disfluencies (Brennan & Schober, 2001; Fox Tree, 1995; Lickley & Bard, 1998), the use of filled pauses (Brennan & Williams, 1995; Fox Tree, 2001; Fox Tree, 2002), of prosodic cues (Allbritton, McKoon, & Ratcliff, 1996; Schafer, Speer, Warren, & White, 2000; Kraljic & Brennan, 2005), listeners' participation roles (Clark & Schaefer, 1987; Schober & Clark, 1989), and so on. Yet, little is known about the cognitive processes involved in comprehending the causal relations between spoken sentences,

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and the contribution of these relations to the construction of an integrated representation in memory. In the present study we explore whether causality also plays a role in comprehension of spontaneous discourse.

Although causality has been found to be crucial in the comprehension of written discourse, it is possible that causality is not central to comprehension of spontaneous discourse. This is because there are substantial differences between texts and conversation. When speaking spontaneously, conversants manage discourse in response to the immediate situational demands (Ochs, 1979; Rico, Cohen, & Gil, 2006; Stubbs, 1983). This forces speakers to start talking even when they are not completely sure of what they want to say (Heeman & Allen, 1999). Therefore, it is common for them to hesitate, correct errors publicly, repeat words and abandon phrases (Brennan & Shober, 2001; Fox Tree, 1995; Fox Tree & Schrock, 1999; Ochs, 1979). As a result, the syntax of spontaneous discourse is significantly different from the syntax of most written language. Unplanned speech is frequently characterized by simple active sentences, juxtaposition of clauses with no explicit link at all, deletion of referents, etc. In consequence, the comprehension of spontaneous discourse requires the ability to maintain continuity in speech and comprehension, respond immediately to unexpected utterances, and make changes of topic and speaker in real time (Stubbs, 1983). As Hall (1993) suggests, there is considerable cognitive complexity in what seem to be simple oral practices.

Indeed, aspects that are unique to conversational communication play an important role in comprehension of conversation (Gimeno Collado, Anguera Argilada, Berzosa Sanz, & Ramírez Ramírez, 2006; Heeman & Allen, 1999). Typical conversational discourse markers (such as *well, I mean, oh*) help listeners follow speakers' train of thought, recover from a correction, and show the relation (of contrast, elaboration, etc) between two utterances (Fox Tree & Schrock, 1999; Schiffrin, 1987). Spontaneous speech is also enriched through information delivered non-verbally (Chafe, 1994). Spoken messages are delivered with intonation, pitch, loudness, voice quality and speech rate (Cameron, 2001), which signal implicit information (dialect, social status, emotional state, etc.) that contributes to the coherence of the verbal message (Gumperz, 1982).

In contrast with the evanescence, extemporaneity and immediacy of spoken discourse, written language is relatively permanent (can be preserved through time and space, and analyzed, manipulated, etc), usually planned, typically not situated (readers and writers are not usually co-present), and unable to rely on extra-linguistic context (Chafe, 1994). Because written language is relatively permanent, the comprehender can apply strategies such as skimming, omitting sections, reading in a different order than the text presented, and so on (Stubbs, 1980). These strategies are not possible with spoken discourse, given its rapid fading (Hocket, 1960). Given that written language is usually planned, it can be 'worked over', drafted and redrafted by several people (Chafe, 1994; Stubbs, 1980). This contrasts with the extemporaneity of spontaneous discourse, which requires listeners to process the speaker's statements in real time. Because written language cannot rely on extra-linguistic context, writers need to provide explicit contextual information. In contrast, spoken discourse can make use of prosody (pitches, prominence, pauses and changes in tempo and voice quality that enrich spoken expression) in order to provide this information (Chafe, 1994).

Given that conversational discourse and written discourse differ in significant respects, it is possible that factors that describe comprehension of texts —such as causality— may not play much of a role in comprehension of conversation. It is also possible, however, that despite these differences causality plays a crucial role in conversational comprehension as well. After all, both written and oral discourse require comprehenders to establish a coherent mental representation of the described events (Louwerse & Mitchell, 2003; van den Broek, 1990). Story grammars (Mandler & Johnson, 1977; Stein & Glenn, 1979), causal-chain theories (Black & Bower, 1980; Omanson, 1982), inferential taxonomies (Nicholas & Trabasso, 1981), the event indexing model (Zwaan & Radvansky, 1998; Zwaan, Radvansky, Hilliard, & Curiel, 1998), and network theories of discourse representation (Trabasso & Sperry, 1985; Trabasso & van den Broek, 1985) agree that the identification of causal relations is central to the construction of coherence in text comprehension. Insofar as coherence is also important for comprehension of conversational discourse, it is plausible that causal relations play a similar role in the construction of a coherent memory representation in spontaneous discourse comprehension.

In summary, there is ample evidence for the importance of processing causality during narrative comprehension, but arguments can be made both for and against the likelihood that causality also influences the comprehension of spontaneous discourse. The purpose of the present paper is to investigate the role of causal connectivity in the comprehension of spontaneous discourse, and to explore potentially unique aspects of spoken discourse. Specifically, the main questions are whether there are differences in the probability of recall of statements in conversational discourse as a function of their number of causal connections and of the medium in which they are presented (oral versus written).

We propose that a central component of successful spontaneous discourse comprehension is the construction of a functional, coherent representation in memory, as it is for narratives. To construct such a representation, the comprehender seeks adequate causal explanation for every new statement, connecting it to the previous statements (van den Broek, 1990). Our prediction is that statements that have many causal connections to other statements in the same discourse will be recalled more often than statements with fewer connections, given that this has been found for narratives (Goldman & Varnhagen, 1986; Trabasso & Sperry, 1985; Trabasso & van den Broek, 1985; van den Broek, 1988). Conversely, we expect statements with fewer causal connections to be less often recalled than statements with more causal connections. Alternatively, given that there are differences between written narratives and spoken discourse, causality processing may not play as a central role in spontaneous discourse comprehension as it does in text comprehension. Spontaneous discourse comprehension may, for example, require that more cognitive resources are devoted to managing disfluencies or processing prosodic cues, which are tasks required for spoken discourse comprehension (Allbritton, McKoon, & Ratcliff, 1996; Brennan & Schober, 2001; Fox Tree, 1995; Lickley & Bard, 1998; Snedeker & Trueswell, 2003; Schafer, Speer, Warren, & White, 2000; Kraljic & Brennan, 2005).

We consider these possibilities with conversational discourse that is presented in either oral or written form. If causality is found to play only a minor role in the comprehension of conversational discourse, this could be due to either differences between

conversation and narrative discourse —the issue of primary interest— or due simply to differences in medium - given that narratives usually are presented in textual form whereas conversation usually is oral. By considering conversation in both oral and written format we can distinguish between these two possibilities.

Method

Participants

Seventy-two undergraduate students at the University of Minnesota participated in the study. The sample was drawn from introductory psychology and social psychology courses. Participants received extra credit for their participation.

Materials

Materials consisted of a 7-minute excerpt of a radio transmission in WCCO radio (The Don Shelby Show, 2002), which began with the introduction of the topic of 'political correctness' (an excerpt of the transcription of this radio transmission can be found in the Appendix). The radio announcers begin discussing this topic, and move on to related sub-topics.

Procedure

Each participant was randomly assigned to one of two conditions: listening or reading. Participants were tested in groups of four or less. The instructions were given once for all participants in the group. Test sessions, including instructions, averaged 45 minutes in length. All subjects completed the task within one hour.

Participants in the listening condition were asked to listen to the 7-minute radio transmission. After they had listened to the materials, they were asked to write down everything they remembered from it, and to answer nine comprehension questions (see table 1). Some of the questions asked subjects to give reasons for the announcers' statements, some required them to answer if the announcers had said particular things, and some asked them why they would agree or disagree with the announcers' affirmations.

Participants in the reading condition were asked to read the transcription of the 7-minute radio transmission. After they had finished reading, they were asked to write down everything they remembered from it, and to answer to the comprehension questions.

Table 1
Comprehension questions about the materials

1. What do you think they mçean by 'subtle racism'?
2. Why does one radio announcer say that people from Thailand might be offended?
3. Why does one radio announcer say that Asians are not considered to be an underclass?
4. What do you think is the announcers' attitude towards the topic of racism?
5. Do you agree with what they say? Why? Why not?
6. What do they mean by human decency?
7. Do they talk about comedians?
8. Do they say it is wrong to be politically correct?
9. Why does one radio announcer say 'This is his own minority group' when the other goes back to the topic of comedians?

Scoring

The transcript of the radio transmission was parsed into statements in the announcers' speech. Following Trabasso & Sperry (1985), a statement was defined as a unit that contains sufficient state or action information to be identified as a cause or a consequence of another statement. That is, statements describe persons or objects that undergo state changes as a result of actions or processes enacted by persons or physical mechanisms. To judge whether two statements were causally connected, the criterion of necessity in the circumstances was used (Mackie, 1980). This criterion is tested through the counterfactual argument 'If not A, then not B'. That is, if an event described in statement A had not happened, then an event described in statement B would not have happened. If this is true, then it is concluded that event A is a cause of, or a condition for, B. In addition to this, a cause needs to be temporally prior to the consequence, and active when the consequence occurs. For example, in table 2 Statement 3 provides a cause for Statement 6. That is, if '*Johnny Carson had not kept referring to Wayne Newton's lack of masculinity*' (Statement 3), '*Wayne Newton would not have gone in and bodily threatened him'* (Statement 6). Thus, a causal connection is established between these two statements. The two authors derived the causal network for this radio transmission together, and the result was compared to that by a third judge. They agreed on 87% of the relations ($\kappa = .85$, $p < .001$). Differences were resolved through discussion. Their judgments were compared against the causal analysis derived by a fourth judge, agreeing on 91% of the relations ($\kappa = .90$, $p < .001$). Figure 1 provides an excerpt of the causal network, with each circle representing a statement, and each arc representing a causal relation between two statements. Participants' recall protocols were also parsed into statements. A statement was credited as recalled if the participant recalled all or part of it verbatim or if the gist was accurately reproduced (see van den Broek, Lorch, Linderholm, & Gustafson, 2001).

Table 2
Excerpt of the transcript of the radio transmission

1. I was surprised as watching something about Wayne Newton.
2. Well, he got all hot and bothered…
3. Because Johnny Carson keeps referring to his lack of masculinity.
4. If you remember Wayne Newton… he's had a voice coach bring his voice down.
5. Because he had that high pitch voice.
6. So he went in and bodily threatened Johnny Carson…

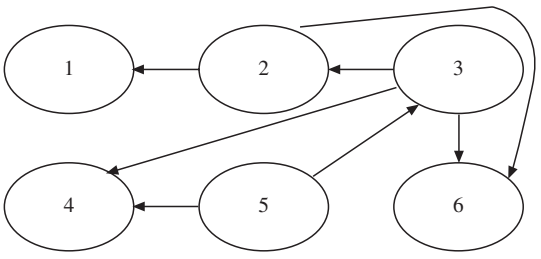

Figure 1. *Excerpt of Causal Network for the Radio Transmission in table 1*

Results

Free recall data

A 2 × 3 mixed factors analysis of variance ANOVA was conducted to determine the effect of causal connectivity on probability of recall as well as any effects of medium. Medium had two levels, (oral and written), and causal connectivity had three levels (low (statements with 0-1-2 connections, n= 34), medium (statements with 3 & 4 connections, n= 24), and high, (statements with 5 or more connections, n= 24)). Medium was a between-subjects variable, and causal connectivity was a within-subjects variable. The results of this analysis indicated a main effect of the number of causal connections a statement had on its probability of being recalled, $F(1,162)= 22.488$, $p<.001$. Medium did not significantly predict probability of recall, $F(1,162)= 1.297$, $p= .257$. The interaction between number of causal connections of a statement and the medium of presentation did not reach significance, $F(1,162)= .483$, $p= .618$. Planned comparisons were used to test whether statements with more causal connections were recalled more often than those with fewer connections. Statements with low causal connectivity were less often recalled ($M= 3.618$, $SD= 5.123$) than those with medium connectivity ($M= 8.177$, $SD= 9.017$), $t(115)= 3.457$, $p= .001$, and those with high connectivity ($M= 12.833$, $SD= 7.971$), $t(115)= 7.577$, $p<.001$. Statements with medium connectivity were less often recalled than those with high connectivity, $t(95)= 2.680$, $p<.009$. Thus, the number of causal connections a statement has exercises a powerful effect on its probability of recall, regardless of the medium in which it is presented (see figure 2).

Question answer data

A 2 × 3 mixed factors ANOVA was conducted to determine the effect of causal connectivity on the probability of inclusion of a statement in answers to questions about the materials, and to determine if such an effect depended on medium (oral versus written discourse). The results of this analysis revealed a main effect of number of causal connections a statement had on its probability of being included in answers about the materials, $F(1,162)= 16.955$, $p<.001$. Medium (oral versus written) was not a significant predictor of probability of inclusion as answer, $F(1,162)= 1.332$, $p= .25$. The interaction between number of causal connections of a statement and the medium of presentation did not reach significance, $F(1,162)= .314$, $p= .731$. Planned comparisons were used to test whether those statements with more causal connections would be more often included in answers. Statements with low causal connectivity were less often included as answers ($M= .235$, $SD= .569$) than those medium connectivity ($M= 1.802$, $SD= .366$), $t(115)= 3.47$, $p= .001$, and those with high connectivity ($M= 4.479$, $SD= 6.082$), $t(115)= 5.728$, $p<.001$. Statements with medium connectivity were less often included in answers than those with high connectivity, $t(95)= 2.611$, $p= .010$. Thus, the number of causal connections a statement has exercises a powerful effect on its probability of being included in answers to questions about the materials, regardless of the medium in which it is presented (see figure 3).

Discussion

This study examined the role of causality in the comprehension of spontaneous spoken discourse. Given what had been found for narratives (Goldman & Varnhagen, 1986; Trabasso & Sperry, 1985; Trabasso & van den Broek, 1985; van den Broek, 1988), one possibility was that statements that had many causal connections to other statements in the same discourse would be recalled more often than statements with fewer connections. An alternative possibility was that, given the considerable differences between narratives and conversations, the causality effects typically observed for narrative comprehension would not be seen in the comprehension of conversation.

The results showed a clear effect of causality in the comprehension of conversation. The more causally connected statements were better recalled and more often included in answers to questions about spontaneous discourse materials than were the less causally connected statements. Moreover, there was no evidence that the effects of causality differed between the written and oral formats. That is, there was not a significant difference in the role of causal connectivity according to medium of presentation, and the interaction between medium and connectivity did not approach statistical significance.

Thus, comprehenders seem to rely on processing how speakers' statements are causally interconnected to derive a coherent representation of discourse in memory. Those statements that have more causal connections seem to make a greater contribution to this representation and to be more easily accessed when comprehenders are required to retrieve or answer questions about what a speaker said. These results indicate that the network theory of discourse representation, developed in the context of comprehension of narrative texts, is a useful approach for thinking about how people process spontaneous discourse.

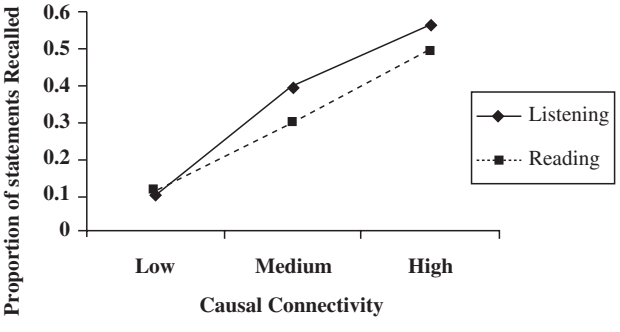

Figure 2. *Proportion of statements recalled as a function of number of causal connections and medium*

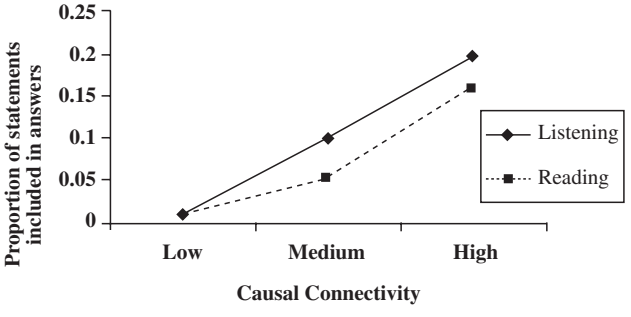

Figure 3. *Proportion of statements included in answers to questions about the materials as a function of number of causal connections of the statement and medium*

The fact that there was no indication that the effects of causal connectivity differed according to medium suggests that we cannot propose at this point that participants formed different memory representations of the materials in terms of causal connectivity according to their presentation format. Yet, exactly to what extent the processes during the comprehension of spoken discourse are the same is an important topic for further investigation. That is, given that we measured recall and not the moment-by-moment processing of spoken discourse, we cannot establish that the processes through which participants arrived at this representation are the same. On the one hand it is possible that the on-line processes are similar; on the other hand, it is possible that although the end-product —the resulting mental representation that this study focused on— is remarkably similar, the processes by which these representations are reached are —at least partly— distinct. This latter possibility may occur, for example, as a result of a unique interplay between causality processing and the processing of properties unique to conversation, such as speech repairs, prosodic cues, and other tasks that are required with spoken discourse, which were not captured through the offline task. Detailed investigations about such potential processing similarities and differences will be required, and should also be extended to other types of spontaneous discourse materials (such as interviews, other radio transmissions, etc) to determine if our results would generalize beyond the particular radio conversation we studied -and, consequently, if the network theory of discourse representation applies to a wide range of communicative situations. To summarize, although we cannot make conclusions about processing differences between spoken and written discourse at this point, we can propose that causal network analyses can yield valuable information about the comprehension of spontaneous spoken discourse, given that they can help researchers to capture differences in the recall of spoken statements according to their causal connectivity.

The current study focused on comprehension of conversation by a non-participating listener. It would be interesting to explore the unique processing by participants in a conversation themselves. Although one would expect that the establishment of a coherent representation is important for conversants as well, what constitutes coherence in the eyes of a participant may differ in systematic ways from the coherence in the eyes of an observer. Furthermore, the participatory role by the conversant —for example, the fact that language is produced as well as comprehended, the resulting demands on attentional and processing capacity, the fact that the participants may have particular goals— may uniquely affect to what extent and in what form coherent representation is established.

In conclusion, the current results show that the tools and insights from the extensive research literature on comprehension of narrative texts can be brought to bear on the study of comprehension of conversations. In particular they reveal the importance of causal coherence for comprehension of such discourse. By using these tools and insights both commonalities and possible systematic differences between different types of discourse can be identified.

References

Allbritton, D.W., McKoon, G., & Ratcliff, R. (1996). Reliability of prosodic cues for resolving syntactic ambiguity. *Journal of Experimental Psychology: Learning, Memory and Cognition, 22*, 714-735.

Black, J.B., & Bower, G.H. (1980). Story understanding as problem solving. *Poetics, 9,* 223-250.

Brennan, S., & Schober, M. (2001) How listeners compensate for disfluencies in spontaneous speech. *Journal of Memory and Language, 44,* 274-296.

Brennan, S.E., & Williams, M. (1995). The feeling of another's knowing: Prosody and filled pauses as cues to listeners about the metacognitive states of speakers. *Journal of Memory and Language*, *34*, 383-398.

Cain, K., & Oakhill, J.V. (1999). Inference making ability and its relation to comprehension failure in young children. *Reading and Writing: An Interdisciplinary Journal, 11*, 489-503.

Cameron, D. (2001). *Working with Spoken Discourse.* Thousand Oaks, CA: Sage Publications.

Chafe, W. (1994). *Discourse, Consciousness and Time.* Chicago: University of Chicago Press.

Clark, H.H., & Schaefer, E.F. (1987). Concealing one's meaning from overhearers. *Journal of memory and Language, 26*, 209-225.

Dole, J., Duffy, G., Roehler, L., & Pearson, P. (1991). Moving from the old to the new: Research on reading comprehension instruction. *Review of Educational Research, 61*(2), 239-264.

Fox Tree, J.E. (1995). The effects of false starts and repetitions on the processing of subsequent words in spontaneous speech. *Journal of Memory and Language, 34,* 709-738.

Fox Tree, J.E. (2001). Listeners' uses of um and uh in speech comprehension. *Memory and Cognition, 29*, 320-326.

Fox Tree, J.E. (2002). Interpretations of pauses and ums at turn exchanges. *Discourse Processes, 34*, 37-55.

Fox Tree, J.E., & Schrock, J.C. (1999). Discourse markers in spontaneous speech: Oh what a difference oh makes. *Journal of Memory and Language, 40,* 280-295.

Gimeno Collado, A., Anguera Argilada, M.T., Berzosa Sanz, A., & Ramírez Ramírez, L. (2006). Detección de patrones interactivos en la comunicación de familias con hijos adolescentes. *Psicothema*, *18*(4), 785-790.

Graesser, A., Millis, K., & Zwaan (1997). Discourse comprehension. *Annual Review of Psychology, 48,* 163-189.

Goldman, S.R., & Varnhagen, C.K. (1986). Memory for embedded and sequential story structures. *Journal of Memory and Language, 25*, 401-418.

Gumperz, J.J. (1982). *Discourse strategies.* Cambridge: Cambridge University Press.

Hall, J. (1993). The role of oral practices in the accomplishment of our everyday lives: The sociocultural dimension of interaction with implications for the learning of another language. *Applied Linguistics, 14,* 145-166.

Heeman, P., & Allen, J. (1999). Speech repairs, intonational phrases and discourse markers: Modeling speakers utterances in spoken dialogue. *Computational Linguistics, 25,* 1-45.

Hocket, C.F. (1960). The origin of speech. *Scientific American, 203,* 89-96.

Kraljic, T., & Brennan, S. (2005). Prosodic disambiguation of syntactic structure: For the speaker or for the addressee? *Cognitive Psychology, 50,* 194-231.

Lickley, R., & Bard, E. (1998). When can listeners detect disfluency in spontaneous speech? *Language and Speech, 41,* 203-226.

Louwerse, M., & Mitchell, H. (2003). Toward a taxonomy of a set of discourse markers in dialog: A theoretical and computational linguistic account. *Discourse Processes, 35,* 199-239.

Mandler, J.M., & Johnson, N.S. (1977). Remembrance of things parsed: Story structure and recall. *Cognitive Psychology*, *9*, 111-151.

Nicholas, D.W., & Trabasso, T. (1981). Toward a taxonomy of inferences. In F. Wilkening & J. Becker (Eds.): *Information integration by children* (pp. 243-265). Hillsdale, NJ: Lawrence Erlbaum Associates.

Ochs, E. (1979). Planned and unplanned discourse. In T. Givon (Ed.): *Discourse and syntax.* Syntax and Semantics Series, vol. 12, 52-80. New York: Academic Press.

Omanson, R.C. (1982). The relation between centrality and story category variation. *Journal of Verbal Learning and Verbal Behavior, 21,* 326-337.

Rico, R., Cohen, S., & Gil, F. (2006). Efectos de la interdependencia de tarea y la sincronía en las tecnologías de comunicación sobre el rendimiento de los equipos virtuales de trabajo. *Psicothema, 18*(4), 743-749.

Schafer, A.J., Speer, S., Warren, P., & White, S.D.(2000). Intonational disambiguation in sentence production and comprehension. *Journal of Psycholinguistic Research, 29*, 169-182.

Schiffrin, D. (1987). *Discourse Markers*. Cambridge University Press.

Schober, M.F., & Clark, H.H. (1989). Understanding by addressees and overhearers. *Cognitive Psychology, 21*, 211-232.

Stein, N.L., & Glenn, C.G. (1979). An analysis of story comprehension in elementary school children. In R.O. Freedle (Ed.): *New directions in discourse processing: Vol. 2. Advances in discourse processes* (pp. 53-120). Norwood, NJ: Ablex.

Stubbs, M. (1980). *Language and Literacy.* London: Routledge & Kegan Paul.

Stubbs, M. (1983). *Discourse Analysis*. Chicago: University of Chicago Press.

Tannen, D. (1989). *Talking voices: Repetition, Dialogue and Imagery in Conversational Discourse.* Cambridge: Cambridge University Press.

Trabasso, T., & Sperry, L.L. (1985). Causal relatedness and importance of story events. *Journal of Memory and Language, 24,* 595-611.

Trabasso, T., & van den Broek, P. (1985). Causal thinking and the representation of narrative events. *Journal of Memory and Language, 24,* 612-630.

van den Broek, P. (1988). The effects of causal relations and hierarchical position on the importance of story statements. *Journal of Memory and Language, 27,* 1-22.

van den Broek, P. (1989). Causal reasoning and inference making in judging the importance of story statements. *Child Development, 60,* 286-297.

van den Broek, P. (1990). The causal inference maker: Towards a process of inference generation in text comprehension. In D.A. Balota, G.B. Flores d'Arcais & K. Rayner: *Comprehension processes in reading* (pp. 423-445). Hillsdale, NY: Erlbaum.

van den Broek, & Kremer (1999). The mind in action: What it means to comprehend during reading. In B. Taylor, M. Graves, & P. van den Broek (Eds.): *Reading for meaning* (pp. 1-31). NY: Teacher's College Press.

van den Broek, P., Lorch, R., Linderholm, T., & Gustafson, M. (2001). The effects of readers' goals on inference generation and memory for texts. *Memory & Cognition, 29,* 1081-1087.

van den Broek, P., & Trabasso, T. (1986). Causal network versus goal hierarchies in summarizing text. *Discourse Processes, 9,* 1-15.

van Dijk, T.A., & Kintsch, W. (1978). *Cognitive Psychology and discourse: Recalling and* summarizing stories. *In Dressler,* ed., 61-80.

Zwaan, R.A., & Radvansky, G.A. (1998). Situation models in language comprehension and memory. *Psychological Bulletin, 123,* 162-185.

Zwaan, R.A., Radvansky, G.A, Hilliard, A.E., & Curiel, J.M. (1998). Constructing multidimensional situation models during reading. *Scientific Studies of Reading, 2*(3), 199-220.