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# The Role of Causality in Information Acceptance in Narratives: An Example From Science Communication

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## Abstract

Narratives represent a powerful and ubiquitous form of communication that influence what individuals believe about the world. While the field of narrative persuasion investigates how narratives affect attitudes and behaviors, it rarely considers structural variables discussed in the field of discourse psychology. This study examines the utility of bridging these fields by testing the persuasive influence of novel science information relative to the internal causal structure of a narrative. Results suggest that information placed at causal locations of a narrative result in greater acceptance of information than the same information placed at noncausal locations within the same narrative. These findings suggest that the within-narrative variable of causality can influence the persuasive impact of information inserted into a narrative. In response, this study identifies a significant source of variance that has thus far been overlooked in studies of narrative persuasion.

## Keywords

narrative, persuasion, science communication, comprehension, causality

Narratives represent one area of communication that is claimed to exert a powerful influence on how individuals perceive and respond to the world (Bruner, 1986; Gerrig, 1993; Strange, 2002). Narratives have the ability to introduce novel information (Schank & Abelson, 1995; Schank & Berman, 2002), defamiliarize existing information (Oatley, 2002), and provide models for new behavior (Singhal & Rogers, 2002; Slater, 2002) often without the same level of cognitive resistance facing other types of persuasion (Green, 2006; Kreuter et al., 2007; Slater, 2002). Their influence is also enhanced by their ubiquity; narrative

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discourse exists and is studied across almost all domains of communication, including entertainment (Moyer-Guse, 2008), advertising (Chang, 2009), political communication (Bridgman & Barry, 2002), and science communication (McComas & Shanahan, 1999).

The field of narrative persuasion specifically investigates how information placed within narratives can alter perceptions of reality (Appel & Richter, 2007; Green, 2004; Green & Brock, 2000; Slater, 2002). Because traditional persuasion research has generally ignored narrative induced attitude change (Green & Brock, 2000), the effects of persuasion due to narratives have only recently been brought under empirical scrutiny (Kreiszurth, 1992, 2000). Nevertheless, studies of narrative persuasion have identified a range of variables that influence the persuasive impact of narrative discourse, often based on social cognitive theory (Bandura, 1986; Slater & Rouner, 2002), the transportation-imagery model (Brock, Strange, & Green, 2002; Green, 2004; Green & Brock, 2000), or as extensions from traditional persuasion literature (Prentice, Gerrig, & Bailis, 1997; Wheeler, Green, & Brock, 1999). However, one area that has garnered relatively less attention from narrative persuasion scholars is the field of discourse psychology. Discourse psychology investigates how internal components of a discourse, often focused on narrative discourse, can influence its comprehension (Trabasso & Suh, 1993; van den Broek & Gustafson, 1999; Zwaan, 1999). Discourse psychology, therefore, provides a rich history of defining and testing within-narrative constructs that could provide for a more detailed understanding of the effects of narrative persuasion.

One of these constructs that has yet to enter narrative persuasion literature regards the internal structure of a narrative. Where information is placed relative to the causal structure of a narrative has been shown to play an important role in narrative comprehension (Trabasso & Sperry, 1985), but its persuasive impact on narrative information is virtually unknown. Yet the existence of such an effect could have implications across much of narrative persuasion literature. Because an internal, causal structure is present in all narratives, it represents a potentially important source of variance that has thus far been overlooked. Accounting for this variance may serve to help explain inconsistent findings, strengthen predictive theories, and identify new questions of interest within narrative persuasion literature as well as other communication areas where narratives are present.

Therefore, the aim of this study is to incorporate the construct of an internal, causal structure of narrative from discourse psychology into an investigation of the impact of information acceptance within a narrative. Specifically, this study will manipulate the placement of information within a narrative relative to its causal structure and test the resulting levels of acceptance regarding the manipulated information.

### *Narrative Persuasion*

Studies of narrative persuasion investigate how information contained within narrative forms of discourse influence attitudes and behavior, often as compared to nonnarrative discourse. While the operationalization of narrative varies across studies (Winterbottom, Bekker, Conner, & Mooney, 2008), the methodology often includes measuring changes in belief, attitude, or behavioral intent after exposure to a related narrative.<sup>1</sup> A look at current

studies in narrative persuasion reveals the existence of two general categories of research based on different questions of interest.

The first category seeks to measure the effectiveness of narrative persuasion by comparing narrative to nonnarrative discourse, often using statistical or didactic information as a comparison. These comparison studies often ask whether a single persuasive message is more effectively presented using narrative or nonnarrative discourse and are currently dominated by health and risk issues (Baesler & Burgoon, 1994; Braverman, 2008; Brosius & Bathelt, 1994; de Wit, Das, & Vet, 2008; Durkin & Wakefield, 2008; Mazor et al., 2007; Slater, Buller, Waters, Archibeque, & LeBlanc, 2003; Whittier, Kennedy, St. Lawrence, Seeley, & Beck, 2005; Wise, Han, Shaw, McTavish, & Gustafson, 2008). The second category seeks to explain differences in the effectiveness of narrative persuasion by comparing effects due to moderating variables, such as fictionality (Green, Garst, Brock, & Chung, 2006), perceived realism (Busselle & Greenberg, 2000; Wheeler et al., 1999), or transportation into a narrative world (Green & Brock, 2000; Green, Brock, & Kaufman, 2004). While some studies of the first category also examine moderating effects, the studies of this second category do so without a comparison to nonnarrative discourse and instead focus on a comparison between narratives exhibiting different moderating variables (Appel & Richter, 2007; Guttman, Gesser-Edelsburg, & Israelashvili, 2008; Marsh, Meade, & Roediger, 2003; Slater, Rouner, & Long, 2006).

Results from studies of narrative persuasion generally suggest that narratives can be an effective tool for altering attitudes and behavior because narratives provide an emotional experience that may result in involvement or identification with characters (Green et al., 2004; Moyer-Guse, 2008), they reduce the ability of the receiver to construct counterarguments (Busselle & Bilandzic, 2008; Green, 2006; Kreuter et al., 2007), and they facilitate easier integration into memory than argument-based information (Schank & Abelson, 1995; Schank & Berman, 2002). Other common claims include an increase in persuasion as the individual becomes more transported into the world of the narrative (Green, 2006; Green & Brock, 2000), a possible link between persuasion and perceived reality of the narrative (Busselle & Bilandzic, 2008; Busselle & Greenberg, 2000; Wheeler et al., 1999), and a decrease in persuasion if the persuasive intent of the narrative becomes salient (Slater & Rouner, 2002).

However, there are also inconsistent findings that suggest the influence of narrative discourse on persuasion is far from understood. Narratives often fail to persuade (Slater et al., 2003; Slater et al., 2006; Yoder, Hornik, & Chirwa, 1996) resulting in conflicting recommendations as to when narratives may be appropriate for communication campaign planners. Explanations for this lack of persuasive effect are often attributed to a vague lack of "quality" in the narrative used (Green & Brock, 2000; Kreuter et al., 2007; Moyer-Guse, 2008; Slater et al., 2006). A recent narrative persuasion meta-analysis focusing on the first category of studies found that narratives failed to affect individual decision making in about two thirds of the studies and the authors advise avoiding the use of narratives in ethical situations until more is known about how they actually influence beliefs (Winterbottom et al., 2008).

These inconsistencies have begun to attract the attention of researchers who ask for a more nuanced study of narrative effects (Davin, 2003) or claim that future research should examine what conditions and characteristics make narratives more persuasive (Kreuter et al., 2007). Models proposing additional variables that may influence narrative effects have recently been introduced, focusing on such areas of perceived reality (Busselle & Bilandzic, 2008), narrative quality (Kreuter et al., 2007), and overcoming resistance (Moyer-Guse, 2008).

However, there exists a wealth of cognitive and structural narrative variables in the field of discourse psychology that have rarely been incorporated into empirical studies of narrative persuasion. An examination and/or adoption of some of these constructs may lend assistance toward a finer-grained understanding of the persuasive impact of narratives.

### *Discourse Psychology*

The field of discourse psychology investigates how information becomes represented in the mind. Many studies from this field focus on narratives and the internal variables that influence their comprehension (Graesser, Olde, & Klettke, 2002; van den Broek & Gustafson, 1999; Zwaan, Langston, & Graesser, 1995). Important constructs in the comprehension of narratives include type of description (Morrow, Bower, & Greenspan, 1989), internal actions (Zwaan et al., 1995), character goals (Egidi & Gerrig, 2006), and number of connections to other statements (Trabasso & Sperry, 1985).

One construct that has received much attention is causality, defined as statements that are linked to each other by successive causes and consequences (Trabasso & Sperry, 1985). The investigation of causality has been shaped in large part by the causal network model (Trabasso & Sperry, 1985) that claims that causal relations represent the glue that hold narratives together (Magliano, 1999) and the model has, consequently, served as a basis for many of the later models of discourse psychology (Magliano, 1999; van den Broek & Gustafson, 1999).

Studies using the causal network model identify causal relations using the logical criterion of necessity (Mackie, 1980), which states that element "A" is considered causally related to element "B" if element "B" could not occur in the narrative without element "A." Originally using short narratives on the order of only a few hundred words, each clause of the narrative was used as the unit of analysis for this causal identification. More recently, larger narratives on the order of 10,000 words have been used with the unit of analysis for causal identification extended to that of events (Britt, Perfetti, Sandak, & Rouet, 1999). Regardless of the unit size, these causal relations can then be empirically compared to noncausal relations with regard to dependent variables of interest.

Causality has been found to have a wide range of effects for narrative comprehension. Causal information has been found to be recalled more than noncausal information within the same narrative and also receive higher ratings of importance to the narrative (Bower & Morrow, 1990; Kintsch, 1998; Trabasso & Sperry, 1985), the causal structure of the narrative has been found to influence how spatial relations between narrative objects are processed (Sundermeier, van den Broek, & Zwaan, 2005), inferences that provide causal

explanations are generated more often than those used to predict future events or track spatial locations (Graesser et al., 2002; Graesser, Singer, & Trabasso, 1994; Kintsch, 1998), and sentences followed by a causal antecedent are retained more often than other types of sentences (Fletcher & Bloom, 1988; Fletcher, Hummel, & Marsolek, 1990; Kintsch, 1998). In addition, because causality has been found to also influence other discourse constructs, it is said to serve as a powerful predictor of comprehension (van den Broek, Lorch, & Thurlow, 1996).

Even though comprehension is closely related to persuasion, the structural influence of narrative causality upon narrative persuasion has yet to be explored. Moreover, because an internal, causal structure is intrinsic to all narratives, the existence of such an effect could have implications across much of narrative persuasion literature. Understanding the role of causality within narrative persuasion may help elucidate some of the inconsistent findings and provide some of the more nuanced effects as called for by narrative persuasion researchers.

### *Study Description*

This study investigates if the persuasive impact of narrative information is dependent upon its location relative to its causal structure. It will focus on the acceptance of novel information rather than attempting to alter a strongly held belief for two reasons. First, altering an existing belief includes many moderating variables (O'Keefe, 2002), and it is important to understand the pure effect of causality before introducing extraneous complexity. Second, previous research suggests that narratives may have a stronger effect on the acceptance of novel information over altering preexisting information (Prentice et al., 1997; Slater, 1990), and it is important to maximize the potential effect size for this exploratory study.

This study will use science communication as its context. Information acceptance is commonly a dependent variable of interest in science communication, especially in areas such as risk and health (Dillard, Plotnick, Godbold, Freimuth, & Edgar, 1996; Witte & Allen, 2000), so the questions of interest for this study align well with the public understanding of science. In addition, science communication research commonly uses amount of media coverage (Southwell & Torres, 2006) or simple presence of content (Dudo, Dahlstrom, & Brossard, 2007) as variables but often overlooks structural or presentational factors. Therefore, this study can also add to the smaller body of literature that looks at these factors with regard to science communication (Yaros, 2006).

The design of this study will be based on previous belief-based studies of narrative persuasion that insert assertions into a narrative and measure the perceived truth of the assertions after exposure (Appel & Richter, 2007; Marsh et al., 2003). In addition, this study will incorporate the manipulation of causality within the narrative.

Causality will be manipulated by the insertion of assertions at different locations within a single narrative based on causal structure of the narrative. Therefore, the factors used in this study will include assertion placement (a) at a causal location within the narrative, (b) at a noncausal location within the narrative, or (c) not inserted into the narrative to serve as a control.

To ensure the operationalization of causality used in this study is similar to that used in the model articles from discourse psychology, the measure of recall will be included as a manipulation check. Because causal information has been found to be recalled more often than noncausal information (Trabasso & Sperry, 1985), Hypotheses 1 and 2 translate this finding to include the concept of inserted assertions.

*Hypothesis 1:* Assertions placed in a narrative will be recalled more often than control assertions not included in the narrative.

*Hypothesis 2:* Assertions placed at causal locations within a narrative will be recalled more often than assertions placed at noncausal locations.

Because narrative persuasion often finds that information placed into a narrative receives greater information acceptance without controlling for placement of information (Appel, 2008; Appel & Richter, 2007; Green & Brock, 2000; Marsh et al., 2003), it is possible that these findings represent an average effect across possible causal locations. Therefore, the mere mention of information in a narrative may offer some level of perceived truthfulness over information not presented in the narrative. Therefore, Hypothesis 3 is proposed:

*Hypothesis 3:* Assertions placed into a narrative will be perceived as more truthful regarding the real world than control assertions not present in a narrative.

Regarding the primary questions of interest, the following two hypotheses address the untested assumption that different locations of causal placement within a narrative may result in different levels of perceived truthfulness. Because the participants will have little prior knowledge with which to judge the actual truthfulness of the assertions, differences in recall may receive a greater weight in the formation of truthfulness perceptions. Greater recall at causal locations may represent a greater integration of that information into memory, which may in turn subjectively lead to greater perceptions of perceived truthfulness at causal locations. This reasoning suggests a mediating effect of recall between causal location and perceived truthfulness of information. The fourth hypothesis extends the importance of causality from narrative comprehension to the realm of narrative persuasion and the fifth hypothesis tests the proposed mechanism of a mediating relationship of recall. Therefore, Hypotheses 4 and 5 are proposed:

*Hypothesis 4:* Assertions placed at causal locations in a narrative will be perceived as more truthful regarding the real world than assertions placed at noncausal locations.

*Hypothesis 5:* Recall will serve as a significant mediator between causal location and perceived truthfulness.

Finally, one of the most discussed moderators of narrative persuasion is transportation, which represents the degree to which an individual becomes mentally involved in the narrative world (Green & Brock, 2000). While greater transportation is often found to

correlate with greater levels of narrative persuasion, its relationship to the difference between causal locations within the narrative remains untested. Likewise, transportation has yet to be tested as a significant moderator for recall. Therefore, the potential moderating effect of transportation will be formulated using research questions.

*Research Question 1:* Does transportation serve as a significant moderator of the differences between casual placement and recall?

*Research Question 2:* Does transportation serve as a significant moderator of the differences between casual placement and perceived truthfulness?

## Method

### Subjects

Fifty-six undergraduate students from a large midwestern university served as participants for this study.<sup>2</sup> Participants were offered extra credit as compensation. The mean age was 19.53 ( $SD = 0.72$ ) and 56% of the participants were female. The study was conducted over 2 weeks in November of 2007.

### Experimental Design and Procedure

This study manipulated information placement using a 3-factor within-subjects design. Assertions were placed in three locations with regard to a stimulus narrative: causal, non-causal, and not present in the narrative to serve as a control. Participants were informed that they would be involved in a study addressing how information is presented in the media. They were initially contacted by e-mail providing a web link to an online experiment accessible from any computer with Internet access. Participants were randomly assigned by an HTML algorithm to read one of three stimulus narratives. They were then presented with a set of questions measuring individual differences and standard demographics. Participants were finally presented with a set of questions designed to measure their levels of recall and perceived truthfulness regarding assertions from the narrative. The individual differences and demographic questions did not refer to assertions from the narrative and were therefore placed before the recall questions to serve as mental distraction to lessen the effect of recency on the recall measure. Other studies have successfully used a distraction task as short as 1 minute to reduce recency effects (Britt et al., 1999), and the successful completion of the individual differences and demographic questions used in this study exceeded this time period. Finally, participants were thanked for their participation and debriefed about the actual truth or falsity of the assertions from the narrative stimulus.

### Stimulus

The stimulus consisted of a narrative text into which assertions could be inserted. The creation of this narrative had to meet three requirements. First, the structure of the narrative

needed to contain multiple slots, each which could be filled with assertions without disrupting the logic of the narrative world. These slots needed to exist both at causal and noncausal locations to allow for the manipulation of information placement. Second, in an attempt to isolate the pure effect of causal placement, the topic of the stimulus needed to avoid controversial material that could activate competing psychological processes. Third, the topic of the narrative needed to conceal the persuasive attempt because narrative persuasion has been found to be significantly impaired if the persuasive intent becomes salient (Slater & Rouner, 2002). Therefore, the topic of the narrative needed to be based on something other than the topic of the assertions.

Taking these requirements into account, the topic chosen for the narrative was that of a group of inexperienced pirates searching for treasure. They carried with them a notebook full of facts that could be consulted when faced with barriers to their quest. The fantasy setting was selected to more easily avoid current controversies and hide the persuasive intent, while the inclusion of the notebook allowed for assertions to be inserted according to the logic of the narrative. Slots at causal locations were created at areas that influenced later events in the narrative while noncausal slots were created at areas of description or conversation that had no later effect on later narrative events. Correlation analysis between type of slot and page number was used to ensure that the distribution of causal and noncausal slots did not cluster within the narrative with regard to each other. Once the narrative had been created, specific assertions were created to fit within the logic of the narrative world. Like the topic of the narrative, the assertions also needed to be devoid of controversial overtones to avoid activating competing psychological processes. Therefore, all assertions used were based on neutral descriptions of the natural world, such as "Wild pansies rotate throughout the day to always face the sun" or "Jellyfish avoid the fast moving currents of the shallows."

The final narrative contained six slots each for causal assertions, noncausal assertions, and assertions not presented in the narrative resulting in 18 final assertions, as listed in the appendix.

## Measures

*Independent variable.* Causal placement was manipulated by inserting the assertions at three different locations with regard to the narrative: causal, noncausal, and not presented in the narrative. To control for primary and recency effects, three versions of the stimulus narrative were created to allow each assertion to rotate among all possible locations. For example, the assertion, "Wild pansies rotate throughout the day to always face the sun," was inserted in a causal location for stimulus version one, a noncausal location for stimulus version two and was not present in the narrative for stimulus version three. In this way, all 18 assertions were utilized for each version of the stimulus narrative but were not confounded with any specific location in the narrative. This rotation also had the benefit of canceling out any intrinsic differences of memorability or perceived truthfulness between the assertions. The final narratives versions consisted of lengths of 3758, 3763, and 3769 words.



*Dependent variables.* Recall for each assertion was measured by a cued-recall task after a set of distraction measures to limit the effect of recency. Participants were given the topic of each assertion as a cue and prompted to recall the full assertion in an open-ended text field. For example, the previous assertion, "Wild pansies rotate throughout the day to always face the sun," was cued with the phrase, "Wild pansies . . ." Responses were coded as either correct or incorrect based on similarity to the assertion from the narrative. One coder rated all responses for each of the 18 assertions and a second coder rated 20% of the responses for each assertion to serve as a reliability check. All measures of Cohen's Kappa between the two coders were found to be above 0.84. The individual Kappa scores for each assertion can be seen in the appendix. After ensuring reliability, the first coder's scores were used to calculate all recall variables.

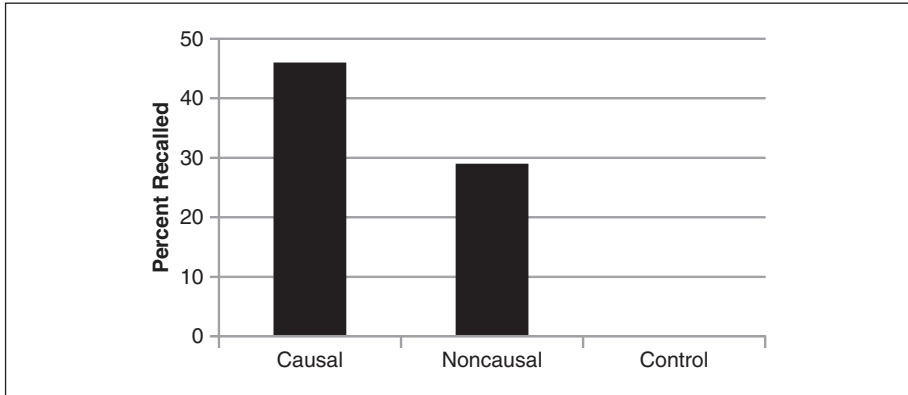
Three recall variables were created for each participant: recall of causal assertions ( $M = 0.46$ ,  $SD = 0.32$ ), recall of noncausal assertions ( $M = 0.29$ ,  $SD = 0.22$ ), and recall of assertions not present ( $M < 0.01$ ,  $SD = 0.04$ ). All variables were averages of the recall measures of the 6 assertions representing each causal location in the version of the narrative stimulus to which the participant was exposed. Because the coding values were either 0 or 1, a participant's average recall measure also represented the percentage of correctly recalled assertions. Measures of omnibus recall were not significantly different between versions of the stimulus narrative,  $F(2, 53) = 0.70$ ,  $p = .50$ ,  $\eta_p^2 = 0.03$ .

It is important to note that the control situation asked participants to recall information that they had not seen. While this created a useful baseline for the measure of recall, it also resulted in significantly less variance for the control level than the other levels of information placement. In order to correct for this violation of the assumption of homogeneity of variance, all measures of recall were transformed using an arcsin transformation in order to stabilize the variances among them (Laubscher, 1961). While these transformed measures were used in all analyses regarding recall, the untransformed means are reported because of their more meaningful nature and ease in interpretation.

Before the described measure of cued recall, participants were also asked to recall as many assertions as possible from the narrative in a completely open-ended format. However, many subjects rushed through this question resulting in obviously truncated or non-relevant responses and this measure of recall was, therefore, dropped from further analysis.

Perceived truthfulness was measured by asking participants to rate the likelihood of each assertion being true in the real world on a 7-point scale with possible responses ranging from "absolutely false," "probably false," "possibly false," "don't know," "possibly true," "probably true" to "absolutely true." Responses were coded so larger numbers represented greater levels of perceived truthfulness.

Three perceived truthfulness variables were created for each participant: perceived truthfulness of causal assertions ( $M = 5.26$ ,  $SD = 1.12$ ), perceived truthfulness of noncausal assertions ( $M = 4.93$ ,  $SD = 0.97$ ), and perceived truthfulness of assertions not present ( $M = 4.53$ ,  $SD = 0.83$ ). All variables were averages of the perceived truthfulness measures of the 6 assertions representing each causal location in the version of the narrative stimulus to which the participant was exposed. Measures of omnibus perceived truthfulness were not significantly different between versions of the stimulus narrative,  $F(2, 49) = 1.63$ ,  $p = .21$ ,  $\eta_p^2 = 0.06$ .



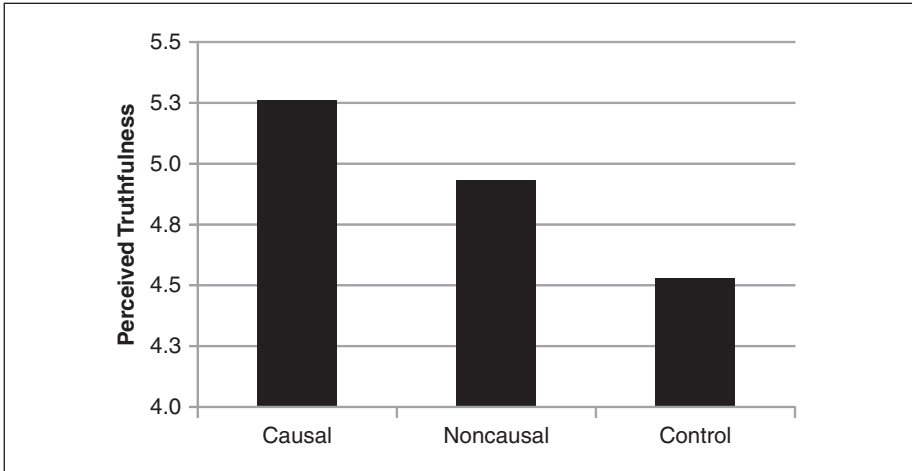
**Figure 1.** Effect of causal placement upon recall of information.

Care was taken to ensure that there was no confusion of the participant as to the fictional nature of the narrative. The fantasy setting of the narrative itself helps to suggest fiction, but the narrative was also always referred to as a “fictional short story” and its fictional nature was highlighted once again before exposure to questions of perceived truthfulness.

*Moderators.* Transportation was measured with the standard 12-item scale (Green & Brock, 2000;  $M = 4.37$ ,  $SD = 0.76$ ,  $\alpha = 0.76$ ). Political ideology ( $M = 3.55$ ,  $SD = 1.46$ ) and religiosity ( $M = 3.98$ ,  $SD = 1.98$ ) were also measured using single items on a 7-point scale where larger numbers represented more conservative views and a greater importance of religion, respectively. However, neither of these variables had significant effects on any of the questions of interest and will, therefore, not be included in the following analyses.

## Results

The first hypothesis predicted that assertions placed into the narrative would be recalled more often than the control assertions not present in narrative and the second hypothesis predicted that assertions placed at causal locations would be recalled more often than assertions placed at noncausal locations. A significant within-subjects omnibus test of recall of assertions between the three within-subject levels of placement,  $F(2, 110) = 94.32$ ,  $p < .01$ ,  $\eta_p^2 = 0.63$  justifies the investigation of individual contrasts at an alpha of .05 without fear of Type I error inflation. As shown in Figure 1, the mean of the recall of assertions at causal locations ( $M = 0.46$ ,  $SD = 0.32$ ) was significantly higher than the assertions at noncausal locations  $M = 0.29$ ,  $SD = 0.22$ ;  $F(1, 55) = 31.90$ ,  $p < .01$ ,  $\eta_p^2 = 0.37$  and both causal and noncausal assertions were recalled significantly more than the control assertions that were not present in the narrative,  $M < 0.01$ ,  $SD = 0.04$ ;  $F(1, 55) = 123.02$ ,  $p < .01$ ,  $\eta_p^2 = 0.69$ ;  $F(1, 55) = 92.45$ ,  $p < .01$ ,  $\eta_p^2 = 0.62$ . Therefore, both Hypotheses 1 and 2 were supported.



**Figure 2.** Effect of causal placement upon perceived truthfulness of information.

The third hypothesis predicted that assertions placed into the narrative would be perceived as more truthful than the control assertions not present in narrative and the fourth hypothesis predicted that assertions placed at causal locations would be perceived as more truthful than assertions placed at noncausal locations. Again, a significant omnibus test of perceived truthfulness of assertions between the three within-subject levels of placement,  $F(2, 102) = 10.37, p < .01, \eta_p^2 = 0.17$ , justifies the investigation of individual contrasts at an alpha of .05 without fear of Type I error inflation. As shown in Figure 2, the mean of the perceived truthfulness of assertions at causal locations ( $M = 5.26, SD = 1.12$ ) was significantly higher than the assertions at noncausal locations ( $M = 4.93, SD = 0.97; F(1, 51) = 4.88, p = .03, \eta_p^2 = 0.09$ ), and both causal and noncausal assertions were significantly perceived as more truthful than the control assertions not present in the narrative  $M = 4.53, SD = 0.83; F(1, 51) = 15.69, p < .01, \eta_p^2 = 0.24; F(1, 51) = 7.15, p = .01, \eta_p^2 = 0.12$ . Therefore, Hypotheses 3 and 4 were also supported.

The fifth hypothesis predicted that recall would serve as a significant mediator between causal placement and perceived truthfulness. Two conditions need to be met for significant within-subject mediation (Judd, Kenny, & McClelland, 2001). First, there must be a significant treatment effect in the same direction for both variables of interest. The previous hypotheses show this requirement has been met. The second requirement is that the proposed mediator be predictive of the proposed mediated outcome variable. As suggested by Judd et al. (2001), a pair of regression difference contrasts was created to test this second requirement. The first contrast compared the control group against the combined treatment groups, while the second contrast compared one treatment against the other. Recall was not predictive of perceived truthfulness for either respective contrast  $t(48) = 1.64, p = .10; t(49) = 1.42, p = .16$ . Therefore no significant mediation effects were found and Hypothesis 5 was not supported.

The first and second research questions addressed the moderating effects of transportation on the previous relationships. Because transportation is a continuous variable, difference scores were calculated for both recall and perceived truthfulness and transportation was tested for significance as a covariate regarding the difference in difference scores. In response to Research Questions 1 and 2, transportation did not significantly moderate the differences of recall  $F(2, 50) = 2.00, p = .15, \eta_p^2 = 0.07$  or perceived truthfulness  $F(2, 46) = 0.44, p = .65, \eta_p^2 = 0.02$ .

## Discussion

The purpose of this study was to test the utility of incorporating the construct of a causal narrative structure from discourse psychology into a narrative persuasion framework. Specifically, this study manipulated the placement of novel science assertions relative to the causal structure of a narrative and tested the resulting levels of acceptance regarding the manipulated assertions.

Results indicate that assertions placed at causal locations of the narrative were perceived as more truthful in the real world than the same assertions placed at noncausal locations within the same narrative. In addition, both causal and noncausal assertions were perceived as more truthful in the real world than the control assertions that were not present in the narrative. This suggests that the mere inclusion into a narrative does provide an increase in the perceived truthfulness of information; a result that agrees with many previous narrative persuasion studies. However, the difference in persuasive impact between causal location of assertions within a single narrative suggests that the internal causal structure of the narrative discussed in discourse psychology represents an important and ubiquitous source of overlooked variance that may help to elucidate the complex effects of narrative persuasion.

The measure of recall was included in this study for two purposes. First, recall served as a check on the operationalization of causality and because results matched findings from discourse psychology, specifically that assertions placed at causal locations were recalled significantly more often than assertions placed at noncausal locations, the operationalization of causality in this study seems appropriately similar to that used in previous studies.

The second purpose for including recall was to permit the test of a proposed mechanism predicting recall to mediate the effect of causal placement on perceived truthfulness. While the tests of mediation did approach marginal significance, this mediating relationship was not supported by this data. Therefore, the mechanisms linking causal placement with perceptions of truthfulness remain in question. It may be possible that narrative audiences hold a presumption that professional fiction writers would not base the key junctions of their narrative on inaccurate information, if not demanded by the plot. However, this mechanism would seem to require more cognitive resources than are normally thought available to participants deeply engaged in narrative discourse.

Another possible mechanism relates to the transportation-imagery model (Green & Brock, 2000) where stronger mental imagery is related to greater changes in attitude. It may be that narrative audiences must visualize causal events for successful comprehension,

whereas the nonessential, noncausal events may be visualized less frequently. This greater pool of stored causal images may lend greater credibility to their perceived truthfulness. However, this mechanism would presume a strong transportation moderation effect where stronger imagery due to differences in transportation would lead to greater differences in perceived truthfulness, which was not found with this data.

Overall, transportation was not found to have any moderating effect with the causal placement on either recall or perceived truthfulness. It is possible that because only one narrative was used, there might not have been a large enough difference in levels of transportation across the sample to detect an effect. However, the spread of transportation values from this study were not overly clustered and were comparable to distributions of other studies, so a lack of variation may not be the cause. Regardless of the role of transportation, future studies should continue to examine the underlying mechanism linking causal location and perceptions of truthfulness.

While the assertions used in this study tested for the existence of a causal placement effect, they represented novel information that did not have to compete with preexisting belief structures. The next empirical step would be to move beyond testing for the existence of a causal placement effect to testing the strength of such an effect by using highly politicized or controversial assertions that may contradict existing belief structures. This extension would likely intersect with persuasion literature on attitude and belief change and potentially include additional moderators not relevant to the acceptance of novel information. For instance, assertions that contradict preexisting beliefs may increase scrutiny of the narrative, leading to source credibility effect as suggested by the Elaboration Likelihood Model (Cacioppo & Petty, 1984). High levels of enjoyment regarding such a narrative could also result in strong levels of cognitive dissonance (Festinger, 1957), the reduction of which could serve to either reduce enjoyment of the narrative, reduce strength of previous belief, or reduce the importance with which the previous belief was held (Simon, Greenberg, & Brehm, 1995). Returning to the variable of transportation, a moderating effect may materialize regarding contradicting preexisting beliefs because transportation is said to inhibit the counterarguing that it would be more pronounced with these assertions (Green, 2006).

One limitation with this study is that the assertions used in the stimulus narrative were not uniformly true or false. This raises a potential concern, as it is possible that a portion of the measured effect may be due to prior knowledge regarding the truth status of specific assertions. The rotation of each assertion through all three locations in the different versions of the narratives should have spread this effect of background knowledge across all conditions, but future experiments should address this concern by either creating assertions of uniform truth or falsity, experimentally manipulating the truth of assertions or measuring the background knowledge of the participants before exposure to the assertions. In addition the sample population used in this study consisted of college students, which may be more open to the believability of novel information than more experienced adults, resulting in a more pronounced effect than may exist in the larger public.

Nevertheless, this study attempted to investigate the effect of causal placement of information within a narrative on persuasion and found significant differences. These results

suggest two important consequences. First, the persuasive impact of information can be influenced by its causal location within a narrative. This represents a source of variance that has been overlooked and researchers should begin to reexamine previous findings of narrative persuasion while controlling for causal location to potentially clarify previous results. For instance, some of the noted inconsistencies within health narrative research may potentially be due to the information of interest being inserted across a range of causal and noncausal locations, leading to the wide deviations in the measured effect. Experimental studies may actually be more vulnerable to unmeasured causal location confounds due to design artifacts. Because manipulating noncausal information between experimental treatments requires fewer changes to the overall stimulus narrative, it is likely more prevalent than the more extensive manipulation of causal information. Therefore, findings in general may be primarily based on noncausal measurements that could underestimate the effect size of narrative influence in the larger population.

Likewise, the existence of a causal location effect on the persuasive impact of narrative information could provide communication practitioners with practical recommendations on how to increase the acceptance of their narrative campaign messages. For instance, designers of education-entertainment media may achieve greater success regarding their target information if it is delegated to causal locations within their message. Similarly, product placement and related advertising practices may benefit from locating their products at causal versus noncausal locations in an associated narrative.

However, it is important to emphasize that the impact of this causal location effect on narrative research is difficult to predict due to the inability of this data to explain the underlying psychological mechanisms involved. It remains unknown whether the influence of causality represents a significant addition to the literature or a manifestation of some existing mechanism. Likewise, the reach of the theoretical distinction between causal and noncausal locations has no clear bounds. Narrative discourse stretches across communication boundaries and a meaningful causal location effect could reasonably follow. However, the concept of causality extends outside of narrative discourse and the validity of a causal location effect in nonnarrative communication has yet to be investigated. Both of these caveats should be addressed by future research.

The second consequence of this study is to support the integration of cognitive and structural narrative variables discussed in discourse psychology into the investigation of narrative persuasion effects. This study adopted the construct of causality and found significant effects, but there exists many more variables in discourse psychology that have yet to be tested with regard to narrative persuasion. Therefore, future research should also identify other within-narrative variables from discourse psychology that meaningfully relate to narrative persuasion with the goal of constructing a more complete model of the persuasive impact of narratives.

Narratives remain an influential, yet complex mode of communication that individuals use to learn about and respond to the world. Expanding our understanding of the effects of internal variables of narrative may help to better understand its persuasive nuances.

## Appendix

### Assertions and Their Intercoder Reliabilities

	Kappas
1. Wild pansies rotate throughout the day to constantly face the sun	1.00
2. Berry bushes are thickest on the windward side	0.89
3. Mushrooms prefer to grow on the side of fallen logs protected from moving air	0.85
4. Sails tilted upward when not in use will reflect sunlight, even on a cloudy day	0.94
5. Sailing into the waves on a choppy sea will leave a visible trail of foam	0.96
6. Leaving dirty laundry on the deck will attract flocks of seagulls	0.96
7. The trunk of the mango trees is almost always crooked because of how it grows	0.85
8. The scaly bark of banana trees almost looks like checkerboard from afar	0.89
9. Coconut trees have evenly spaced rings along the entire length of their trunks	0.94
10. Long strands of brown seaweed will rarely break, even in a hurricane	0.94
11. Vines thicker than a man's wrist can support even the heaviest monkey	0.90
12. Three strips of bark braided together are over 50 times stronger than a single strip	0.92
13. Dolphins prefer to eat fish in deeper waters	1.00
14. Jellyfish avoid the fast moving currents of the shallows	0.96
15. Pelicans nest near reefs to provide ample food for their chicks	0.87
16. The hair on a man's arm will rise just before lightning strikes.	0.91
17. Bubbles rush to the surface as water spirals into a whirlpool	0.89
18. Tornados on the sea create a sharp whistle as moving air and water mix	0.89

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## Notes

1. An additional narrative methodology mirrors that of cultivation theory (Gerbner, 1987) and focuses on the effects of the amount of narrative consumption over larger time frames (Appel, 2008; Bilandzic & Busselle, 2008; Brodie et al., 2001; Busselle, 2001; McComas & Shanahan, 1999). However, this methodology is outside the scope of the current argument.
2. The original sample size was 61, but 5 participants were dropped for either not completing the study or misinterpreting what was asked of them in the cued-recall questions.

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