The Detection of Event Shifts in Sequential Art

Kris Gunawan[1], David E. Copeland[1], Paul J. Schroeder[2], & Nicole J. Bies-Hernandez[1]
University of Nevada, Las Vegas[1]
Air Force Research Laboratory[2]

PURPOSE

To examine the processing of event shifts in situation models through sequential art (i.e., illustrated narratives). This was accomplished by assessing judgments and response times for printed narratives (natural setting), electronic single-frame presentation, illustrations without text (images), and text without illustrations (scripts).

INTRODUCTION

Situation models – forming mental representations of the described state of affairs (Zwaan & Radvansky, 1998)

Event Indexing model – people monitor various event dimensions (e.g., space, time, entity) simultaneously in situation models to maintain the continuity of a story (Zwaan, Magliano, & Graesser, 1995)

Most studies have focused on written narratives, but recent work has examined other domains, such as film (Magliano, Miller, & Zwaan, 2001), videogames (Copeland, Magliano, & Radvansky, 2006), and children's storybooks (Magliano, Kopp, Radvansky, McNerny, Krawietz, & Tamplin, 2008).

Sequential art, another domain to explore, involves the integration of images and dialogues that can uniquely affect the construction of situation models.

Past studies have used judgments (e.g., Magliano, Miller, & Zwaan, 2001) or response times (Radvansky & Copeland, 2010) to detect event shifts.

HYPOTHESES

Judgments – Participants would detect event shifts for space, time, characters, and objects because they provide coherence (i.e., meaningful connections to a story).

Response Times – Participants would slow down to process event shifts for time, characters, and objects because updating is necessary to integrate new information with prior knowledge; however, participants are less likely to slow down for spatial shifts because location transitions tend to be a common experience.

Images Only or Dialogue Only – It was not clear whether effects would be observed for these "degraded" stimuli that may lack information that completes the narrative.

CODING OF EVENT SHIFTS

An a priori analysis was conducted to identify where event shifts occurred for each panel.

High inter-rater reliability – all Cronbach's alphas > .90

0 = no event/situational shift
1 = event/situational shift

Space
0 – same location as previous panel
1 – new location from previous panel

Time
0 – same timeframe as previous panel
1 – new timeframe from images (e.g., day/night, daydreaming, etc.) or textboxes

Character (Entity)
0 – same character as previous panel
1 – new character entering or old character re-entering

Object (Entity)
0 – same object as previous panel
1 – new object entering with a purpose

METHOD

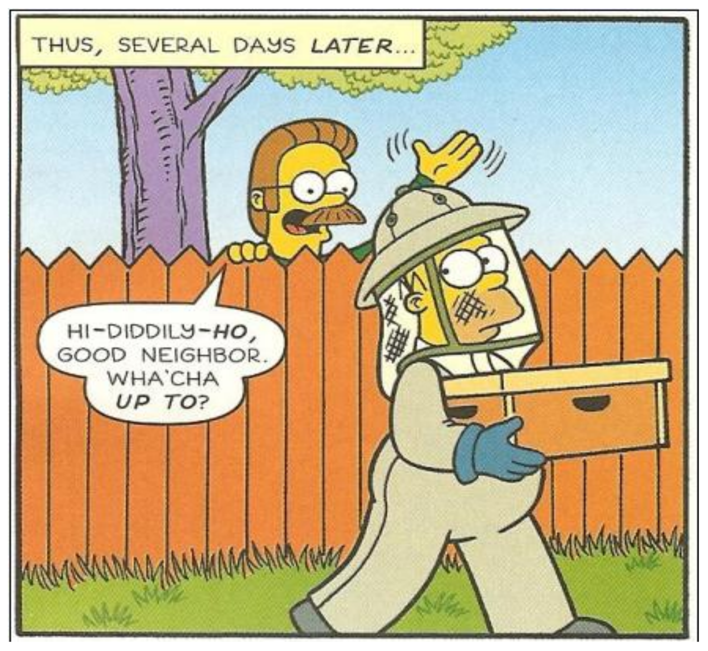
Materials

Two comic books:
Archie: A Typical Day (2009; Issue #597) – 128 panels
Simpsons Comics: Honey Nut Cheery D'ohs! (2009; Issue #154) – 147 panels

Panels = images and/or texts enclosed in a frame

Procedure

Experiment 1 (Combination of texts and images):
Participants were randomly assigned to one of three groups:
- Judgments (n = 20) – identified event shifts (paper copy of comic book)
- Judgments (n = 20) – identified event shifts (computer)
- Response Times (n = 20) – read for comprehension (computer)



Experiment 2 (Separation of texts and images):
Participants were randomly assigned to one of four groups:
- Images/Judgments (n = 20) – identified event shifts for images (computer)
- Script/Judgments (n = 20) – identified event shifts for dialogues (computer)
- Images/Response Times (n = 20) – viewed images (computer)
- Script/Response Times (n = 20) – read dialogues (computer)

Table 1

Experiment 1 - Beta Weights for Judgments and RTs for Texts and Images Combined

Event Dimensions	Paper Copy (Judgments)	Computer (Judgments)	Computer (RTs)
Space	0.086***	0.107***	-0.038**
Time	0.245***	0.187***	0.048**
Characters	0.176***	0.081**	0.062***
Objects	0.035**	-0.02	0.081***
Syllables	-----	-----	0.593***

Note. * $p < .05$, two-tailed. ** $p < .01$, two-tailed. *** $p < .001$, two-tailed.

Table 2

Experiment 2 - Beta Weights for Judgments and RTs for Texts and Images Separated

Event Dimensions	Images (Judgments)	Script (Judgments)	Images (RTs)	Script (RTs)
Space	0.110***	0.101***	-0.028	-0.028**
Time	0.182***	0.142***	0.127***	0.047***
Characters	0.127***	0.120***	0.074***	0.035*
Objects	0.054**	0.035*	0.176***	0.008
Syllables	-----	-----	-----	0.718***

Note. * $p < .05$, two-tailed. ** $p < .01$, two-tailed. *** $p < .001$, two-tailed.

ANALYSES

Linear Regression Models – The event dimensions (i.e., space, time, character, and objects) that were coded by the experimenters were forced entered as predictors. Judgments or response times were selected as the criterion. Beta weights for each participant were extracted from the model for the next analysis. Note that the two comic books were collapsed for the linear regressions.

One-sample *t*-tests – The beta weights for each event dimension were analyzed using one-sample *t*-tests. If the beta weights differed from the hypothesized value of zero, the shift for that event dimension can be reliably detected (Lorch & Myers, 1990).

DISCUSSION

People can detect shifts in space, time, characters, and objects when forming situation models for images, dialogues, and the combination – this finding supports the Event Indexing model.

Rapid spatial updating view – spatial shift detection is evident by judgments but can be processed very quickly (lack of RT effect) (Radvansky & Copeland, 2010)

Inconsistent detection of object shifts – may be due to differences in functionality of objects (Radvansky & Copeland, 2000)

Situation models can be constructed through inferences made from complex stimuli consisting of (1) images and text, (2) images without texts, or (3) through conversations among characters without images.

Unlike children's storybooks where text and illustrations convey the same information, sequential art involves a disconnect between images and texts to prevent redundancies; however, people are still capable of detecting the event shifts due to their own interpretation of the contexts.

REFERENCES

Copeland, D.E., Magliano, J., & Radvansky, G.A. (2006). Situation models in comprehension, memory, and augmented cognition. In M. Bernard, J. C. Forsythe, and T. Goldsmith (Eds.), *Cognitive systems: Human cognitive models in system design* (pp. 37-66). Mahwah, NJ: Erlbaum.

Lorch, R.F., & Myers, J.L. (1990). Regression analyses of repeated measures data in cognitive research. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *16*, 149-157.

Magliano, J.P., Kopp, K., Radvansky, G.A., McNerney, W., Krawietz, S., & Tamplin, A. (2008, November). Understanding situations in text and picture stories. Poster presented at the meeting of the Psychonomic Society, Chicago, IL.

Magliano, J.P., Miller, J., & Zwaan, R.A. (2001). Indexing space and time in film understanding. *Applied Cognitive Psychology*, *15*, 533-545.

Radvansky, G.A., & Copeland, D.E. (2000). Functionality and spatial relations in memory and language. *Memory & Cognition*, *28*, 987-992.

Radvansky, G.A., & Copeland, D.E. (2010). Reading times and the detection of event shift processing. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 36*, 210-216.

Zwaan, R.A., & Radvansky, G.A. (1998). Situation models in language comprehension and memory. *Psychological Bulletin, 123(2)*, 162-185.

Zwaan, R.A., Magliano, J.P., & Graesser, A.C. (1995). Dimensions of situation model construction in narrative comprehension. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 21*, 386-397.