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Authors

Cohn, Neil
Wagner, David
Foulsham, Tom
et al.

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The cognition of comics: What “comics” can tell us about the mind

Neil Cohn (neilcohn@visuallanguagelab.com)

Center for Research in Language, University of California, San Diego

David Wagner (david.wagner@uis.no)

Department of Cultural Studies and Languages, University of Stavanger-Norway

Tom Foulsham (foulsham@essex.ac.uk)

Department of Psychology, University of Essex

John E. Drury (john.drury@stonybrook.edu)

Department of Linguistics, Stony Brook University

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Introduction

Drawing is a fundamental aspect of human communicative expression, and sequential images have been used to convey information since at least cave paintings. However, only until recently has increased research turned towards studying the cognition of visual narratives—especially those found in comics. The most examined question about visual narratives has asked: How do readers make meaning out of a sequence of images? Such an inquiry must balance the understanding of meaning within and across individual images, the generation of inferences from such content, and the engagement of such phenomena within the physical layouts of a page, possibly in multimodal interactions.

Recent research has posited that sequential images use a “grammar” that organizes categorical roles into hierarchic constituents. However, rather than a grammar of “syntax” like in sentences, sequential images employ a “narrative grammar” at a discourse level (Cohn, 2013b) to order “panels”—the encapsulated image units of a visual narrative. Such structures are separate from, yet interface with, the rules organizing the composition and navigation of images arranged in a page’s layout (Cohn, 2013a). Ongoing research has demonstrated that, like the relationship between syntax and semantics, this narrative grammar is separate from meaning (Cohn, 2012; Cohn, Paczynski, Jackendoff, Holcomb, & Kuperberg, 2012), and is organized using a constituent structure (Cohn, 2012; Gernsbacher, 1985). In addition, manipulation of these structures yields the same brain responses as comparable paradigms from sentence processing (Cohn, 2012; Cohn et al., 2012).

This initial research has raised several questions: 1) How do readers negotiate the interaction of text, images, and page layouts in their comprehension of both sequential images and individual panels? 2) What aspects of individual images might influence the comprehension of sequential images? 3) How does the comprehension of visual narratives overlap with the cognition of other domains? The presentations in this symposium will report on ongoing collaborative

research addressing these questions, along with illustrating the potential that visual narratives hold for the cognitive sciences more generally.

Tracking the eyes across text-image relationships in comic pages

While eye-tracking has been a popular method for studying the comprehension of both text and visual scenes, surprisingly few studies have used this technique for studying visual narratives with any theoretically guided significance. Eye-tracking seems especially useful as a technique to study the complex interaction between text and image, and the complex layouts used in whole comic pages. In this talk, David Wagner describes the results of an experiment examining the eye-movements of readers as they progressed through 20 pages of Jeff Smith's *Bone*. These findings show that readers engage comic pages in systematic ways. These include the dedicated navigation through a page’s layout, the engagement of content within and between panels, and the allocation of time to text and image depending on which carries more semantic weight. Overall, the results of this experiment demonstrate that readers are consistent in their engagement with comic pages across multiple levels of structure. Such results allow us to form insights on the structure and comprehension of visual narratives as well as the ways in which readers engage with graphic media beyond isolated text.

Prediction and interpretation in comic reading

Beyond the understanding of whole pages, eye-movements can inform us about the structure of attentional processing in sequential image comprehension more specifically. In this talk, Tom Foulsham describes two experiments which begin to investigate how attention is allocated in the reading of wordless visual narratives. In the first experiment, participants’ eye movements changed systematically based on manipulations to the order in which panels appeared. Participants fixated on features important to the meaning of the panel relative to their context within the broader

narrative, demonstrating that attention was allocated top-down. Viewing was less stereotyped and more idiosyncratic when panels were presented out of sequence, consistent with findings that scrambled orders of sequential images significantly impair comprehension (Cohn et al., 2012; Gernsbacher, Varner, & Faust, 1990). In the second experiment, panel-by-panel viewing was compared with the viewing of comic strips presented in full all at once. In the whole-strip viewing, participants showed reading-like behavior, making regressive eye movements to re-appraise parts which were difficult to understand. Such findings provide insights on the specific manipulations to visual narratives that challenge readers in their online comprehension. Together, these experiments show that participants allocate their attention skillfully when reading comics, making such visual narratives an ideal test-bed for studying top-down attention, prediction, and interpretation.

Language, music, math, and visual narrative

An important question to ask about the comprehension of visual narratives is to what degree their comprehension overlaps with other domains. Such questions tap into fundamental debates about the independence and generality of cognitive functions, which are particularly suited to investigations using event-related potentials (ERPs), a measure of the electrical activity of the brain particularly popular in studying sentence processing. Early research on sentence processing formulated two qualitatively distinct response patterns: (i) N400 effects linked to “semantic” processing, and (ii) left anterior negativities (LANs) and posterior positive deflections (P600s), linked to “syntactic” processing. This was attractive to (psycho)linguists as it held out the promise that ERP research could be relevant to adjudicating theoretical disputes about how to best situate analyses of various different language-specific phenomena.

In this talk, John Drury will argue that we need to reconsider this language-centric alignment, since none of these effects (N400, LAN, P600) can be uniquely aligned with the syntax/semantics distinction, let alone language. Rather, alternative conceptions of these effects conceives of (i) N400s as access/retrieval of information from long-term memory, (ii) LANs as the temporary maintenance of information currently being processed (working memory storage), and (iii) P600s as operations acting on the information buffered in the storage components (integration/composition). Thus far, similar types of ERP responses have been demonstrated across cognitive domains, including language, music, math, and visual narrative. However, it has been unclear whether (or to what extent) these superficially similar effects across domains point to shared/overlapping domain-general neural mechanisms, or whether functionally similar mechanisms are nonetheless independent (domain-specific). This presentation will highlight results from ERP experiments using interference paradigms examining interactions between language/music and music/visual narrative which

start to tease apart such neurocognitive distinctions. Finally, the prospects of pursuing this kind of cross-domain, comparative cognitive neuroscience will be evaluated, including broader implications for various kinds of translational/applied research.

Visual narrative and cognitive science

While sequential image comprehension has received the most focus in research, drawn visual narratives offer a wealth of potential research questions across many domains of cognitive science. For example, research related to perception can ask whether cartoony images are processed differently than more realistic images, and how can simple variables in lines lead to drastic changes in meaning? Related to attention: Panels seem to frame aspects of visual scenes similarly to the “attentional spotlight”—are panels simply simulations of human attention? And if so, can we find evidence of cross-cultural differences in attention (e.g., Nisbett, 2003) reflected in different cultures’ comics? Related to event structure: How can the visual representations of complex actions inform our understanding of event structure and comprehension? Related to multimodality: What can the tight and complicated interactions between text and images offer our understanding of multimodal interactions?

While the existing work on such issues will briefly be addressed, this final presentation by Neil Cohn primarily focuses on these and other questions that remain underexplored by the cognitive sciences. First, this framing aims to illustrate the complexity and multi-layered structure found in visual narratives that have typically been considered with little seriousness. Second, it offers a challenge and an invitation to the rest of the cognitive science community to engage with visual narratives to address questions that relate directly to their own research interests.

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