

## A Review of the Cognitive and Emotive Mechanisms Underpinning the Facilitatory Effects of Comic Features on Reading Comprehension

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### Abstract

Comics have gained popularity in both formal and informal education across cultures. While their attractive layout and artwork are thought to be salient features that engage readers, it is essential to identify and validate the possible benefits induced by comics. In this review, we describe the main features of comics and discuss psychological principles relevant to why readers may learn better with comics, as oppose to pure text. The major areas under review are threefold. First, comics' valence-rich content and engaging plots entice readers and motivate them to read the whole material. Second, conventions in comic design aid conveyance of intuitive ideas to readers and an understanding of the context. Third, the graphical presentation utilized within comics facilitates a chunked representation of information, either within a single mode or across visual and verbal modes, thus further optimizing use of readers' cognitive resources. We conclude this article with a discussion of the pedagogical value of comics and future research directions.

**Keywords:** Comics; Multimodal Texts; Reading Comprehension

### Introduction

Comics are a popular leisure reading material for many people. To a large extent, the context depicted by the pictorial presentation influences the reader's attitude and understanding of the text [1]. For instance, narration and fictional characters are instrumental to catching readers' attention. Moreover, good use of beautiful pictures and valence elements helps to engage readers and results in stress-free reading. While the overall facilitatory effects of comics have been noted and documented [2-4], the cognitive and emotive mechanisms that underpin the facilitatory effect of each comic feature are yet to be understood. Using contemporary psycho-educational models and research findings, this review aims to describe and explain the functions of the most common comic features.

Figure 1 is a comic strip incorporating multiple comic features. Before reading the following review, readers are recommended to pay attention to each feature and speculate on its function. You may have realized that the blend of visual and textual cues offers a unique sensory experience assisting readers' comprehension. This review will explore how comics facilitate reading and learning from both cognitive and emotive perspectives.

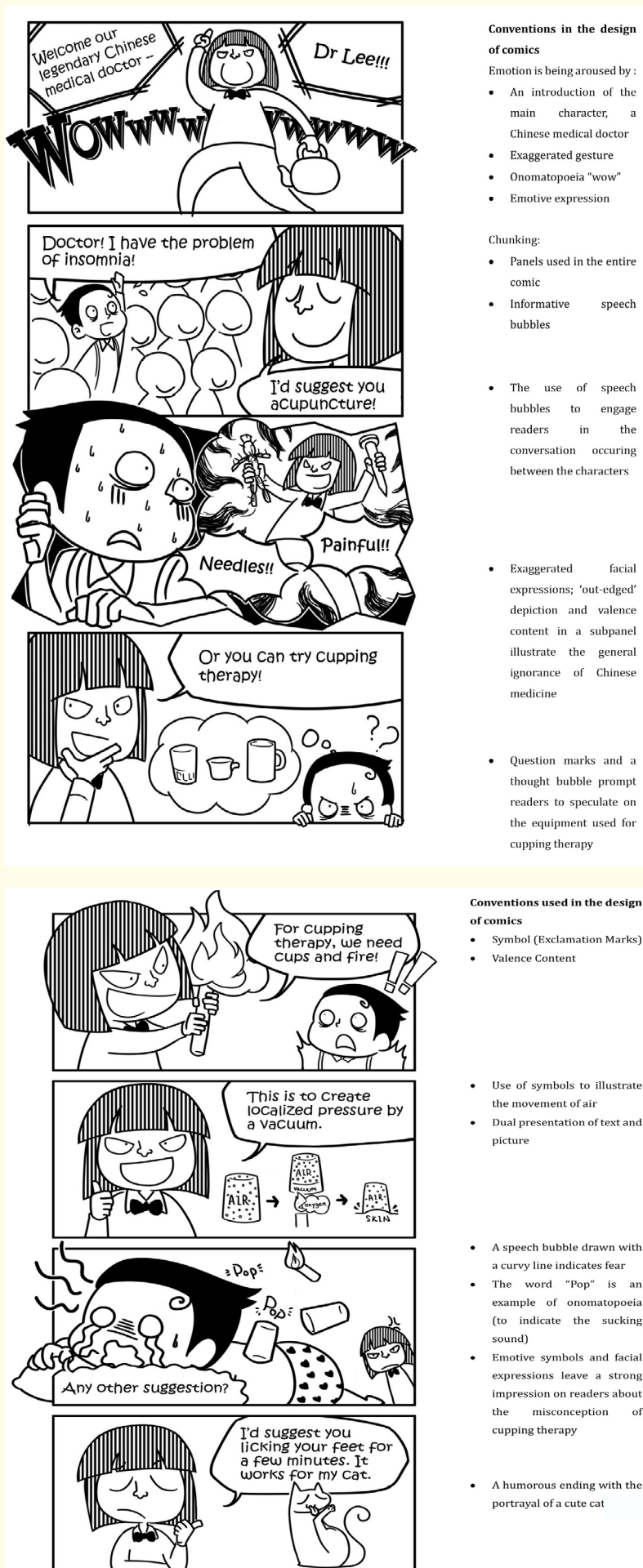


Figure 1: An Introduction to Cupping Therapy in Chinese Medicine.

### An emotionally engaged story plot and characters

Previous studies have shown that a more positive mood (e.g. happiness, interest, surprise, and enjoyment) promotes cognition. For instance, Isen [5] found that, after watching a funny topic-related video, participants exhibited stronger imaginations and were more likely to explore the topic further. Later studies also showed that people are more inclined to analyze and gauge an emotional event, in contrast to a neutral event [6]. These findings are consistent with Fredrickson's [7] argument suggesting a causal relation between positive emotions and a momentary thought-action repertoire. Accordingly, experiencing positive emotions prompts action that is spontaneous and unscripted. These individuals may discard daily routine and seek creative thoughts and novel actions. This proposition is well supported by research [8-12]. Therefore, comics that are rich in emotional content may induce a positive mood within readers and facilitate both their reading comprehension and knowledge acquisition.

There are a number of comic features that induce a positive mood, one of which is the use of humour. Humorous pictures make reading fun, motivate readers to complete the reading material and encourage them to be more open to new information. The main character acts as an anchor that guides readers through the content. With the use of differently shaped speech bubbles, the content and properties of dialogues (e.g. emotion and tone) can be clearly shown (see panels 1, 3 and 7 in figure 1). The emotional states of the main characters will leave a strong impression on readers. When readers' unspoken thoughts and personal views are projected from the main character, readers will feel as if they are part of the story.

Humorous storylines in comic scripts prompt readers to develop the mental plot of the story and anticipate what will come next. This type of storyline helps readers to organize events and information embedded in the comic, thus allowing them to comprehend the story with less effort. Furthermore, a tone is created that promotes readers' interest and involvement in the story. In other words, readers want to stay on the same page and reflect more deeply on the story, but at the same time, they want to skip forward to discover the story's ending [1]. Readers are mentally involved in the plot and believe they have a good control of the story. This sense of self-relevance motivates the readers to read further.

In order to arouse readers' emotions, comic artists apply several techniques. One technique commonly found in comics is onomatopoeia. The basic idea of this feature is to provide 'sound cues' through print. The 'sound' in comics is vividly represented by letters or words drawn in specific fonts and shapes to indicate loudness or tone. For example, the word- 'WOW' printed in a dynamic, capitalized font appears in the first panel within figure 1. The volume and quality of the speech sounds are expressed visually.

### Comic convention and information chunking

'Chunking' refers to the process of organizing and dividing information into multiple units [13]. Chunked information occupies less space in human memory than its raw format, thus expending fewer cognitive resources. This facilitates subsequent cognitive and linguistic processes (e.g. word recognition and inferencing) during reading comprehension. Research has provided wide support for the benefits of chunking in various cognitive functions, including complex problem solving, expert memory, and language acquisition [13-16]. In addition, Sweller, van Merriënboer and Paas [17] have also reported the benefit of chunking on reading comprehension.

As for comics, graphical information can also be chunked [18]. In one study, two groups of participants were asked to view geometry figures in either a traditional-element representation condition or a visual chunking representation condition. In the visual chunking representation condition, additional cues were provided to facilitate chunking. For example, a large triangle was divided into four small triangles using shading, rather than just using three lines. The results showed that participants performed better when a conjunction of multiple cues was provided, whereby chunked information was more readily available. An abundance of literature has shown that this type of visual chunking promotes efficient use of visual working memory [18-21]. For instance, Luck and Vogel [20] showed that participants retained more information for integrated object percepts when they stored them in visual working memory, instead of deploying separate memory systems.

### Multi-modal chunking in comics

Comics present graphical and textual information together seamlessly. A multi-modal print, presenting both graphical and textual information simultaneously, is suggested to be processed by distinct coding systems [23]. These two systems are interconnected but require different modes of resources [2,24]. As such, readers are able to hold both elements simultaneously in working memory and have spare cognitive resources for additional cognitive processing [25]. Aligning with this proposition, the dual presentation of graphic and linguistic information in comics is suggested to require both nonverbal and verbal resources [26]. This maximizes the resources available for reading comprehension. Mayer [25] further suggests that, when elements are closely presented, referential links can be easily formed. Referential links further help readers to use their cognitive resources efficiently by chunking scattered information. The formation of these links can be achieved easily by the seamless presentation of both verbal and graphical information. Thus, the presentation of dual codes in comics maximizes the potentially usable resources and supports more efficient usage of cognitive resources, which in turn enhances reading comprehension.

Apart from forming chunks within texts or pictures, chunks can also be formed between texts and pictures. When verbal and nonverbal information is chunked and linked with other chunks in close proximity, readers do not need to gaze back and forth from one cue to another [27]. As a result, comics provide an efficient medium for reading comprehension and learning.

Before readers' attentions are caught by the beautiful pictorial details of a comic strip, the first notable pictorial information presented is its panel configuration. To date, two main styles of panel configuration are adopted by comic artists. First, tidy and orderly rectangular frames are typically used to deliver static messages with less emotional weighting. Second, broken frames with heavy weighted characters or 'out-edged' depiction are commonly used to create a sense of excitement and surprise (see panel 3 in figure 1). Additionally, portraying the scenes through different angles using cinematic techniques such as camera pans, zooming, and lens distortion, further capture readers' attention [28].

### The use of comics in pedagogical settings and future research directions

The first and foremost advantage of adopting comics as an instructional medium is their dual representation of information, through constellations of pictures and texts. An increasing number of scholars and educators have reached consensus on the strengths of comic literacy in the recent decade, noting improved motivation; enhanced reading performance and a spur of critical thinking [29-31]. Aligning with all the cognitive gains mentioned above, the advocacy of comics as a beneficial alternative pedagogical tool is optimistic.

It is noteworthy that the use of comics should be implemented wisely and cautiously. Empirical research supporting the adoption of comic materials as a learning tool may be confounded by individual differences in English abilities [2]. Additional empirical support is thus necessary to generalize this claim.

Comics scaffold text reading through their unique features. The dual-representation of graphics and texts facilitates readers' efficient use of cognitive resources. Nevertheless, caution should be employed when designing comic materials. For example, when humorous elements outweigh the main content, readers may find the comic distracting and unhelpful to comprehension [32]. Still, a humorous comic may inspire advanced learners to approach topics in an innovative way. Thus, similar to other mediums of instruction, using the right techniques to create the right balance of humour and content is essential. The investigation of the suitability of the design and techniques for different levels of readers should form an important focus for upcoming research.

As far as the potential beneficial effects of reading comics on learning are concerned, an exploration of this application may also focus on how readers interpret information differently with the help of comic illustrations. An unexplored area would be whether comics are equally beneficial when learning abstract and less abstract materials and concepts. Intuitively, the benefit of comics is greatest when learning materials that can be visualized easily. However, it is important to remember that comics allow for a diverse way of presenting

information, with meaningful rules and conventions in comic design [33]. Fonts, frames, and the illocutionary representation of speech bubbles depict multiple layers of meaning, which may facilitate the narration of philosophical arguments, political and morality issues that are complex, implicit and abstract in nature.

### Conclusion

The cognitive and emotional impact of comic features on reading comprehension has been discussed. The dual representation of graphics and texts inherent in comic design are shown to increase the efficiency of readers' cognitive resources usage, as well as being a stimulating and engaging learning tool. Whilst greater empirical support is required to fully justify the use of comics within an educational setting, current research points towards the advantageous role of multi-modal materials, as oppose to pure text, within reading comprehension tasks. Consistent with the cognitive gains mentioned previously, the use of comics as a beneficial alternative pedagogical tool appears promising.

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### Conflict of Interest

The authors declare that they have no conflict of interest.

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