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RESEARCH

Analysis of Motions in Comic Book Cover Art: Using Pictorial Metaphors

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Motion can be depicted using literal pictorial devices (representing features present in the real world) and metaphorical pictorial devices (representing features that do not occur in the real world). How are literal and metaphorical pictorial devices used in comic book cover art? We analyzed the pictorial devices used to depict the motion *running* in 400 Silver Age (1956–1971) and Bronze Age (c. 1970–1985) superhero comic book covers (Frankenhoff & Thompson, 2012). Literal devices (such as arm and leg positions) were used additively; that is, artists preferred to use many literal devices. On the other hand, metaphorical devices (such as action lines) were not used additively; artists preferred to use only one metaphorical device. We propose the Literal Additive Metaphorical One-And-Done (LA-MOAD) theory to account for the use of literal and metaphorical devices in comic book cover art. The differential use of literal and metaphorical devices by comic book artists may be unique to comic book cover art, or it may reflect a basic function of our visual system.

Keywords: aesthetics; metaphorical pictures; motion perception; picture perception; psychology of art

Comic book covers often depict characters performing all sorts of motions, such as jumping, falling, swinging, flying, and running. This depiction of motion is possible even though pictures are a static medium (Carello, Rosenblum, & Grosofsky 1986; Cutting 2002; McCloud 1993; see **Figure 1**). How pictures in general can depict motion has been the subject of much research (e.g., Carello, et al. 1986; Cutting 2002; DeLoache, Pierroutsakos, Uttal, Rosengren, & Gottlieb 1998; Mori 1995; Shirai 2014; see Dobrez 2013 for a review). Here, we present a study of how a

Figure 1: Quicksilver is depicted as running using the literal pictorial devices of posture, orientation, and ground plane, and the metaphorical device of action lines. This is an example of a comic book artist using multiple literal pictorial devices with a single metaphorical device. Buscema, J (p), and Palmer, I (i). The Warlord and the Witch! *The Avengers* #75 Apr. 1970 Marvel Worldwide Inc. © Marvel Comics.

sample of Silver Age (1956–1971) and Bronze Age (c. 1970–1985) comic book artists depict motion (Frankenhoff & Thompson, 2012).

For our analysis of how artists depict motion in comic book covers, we examined specific features of a picture, called *pictorial devices* (Visual Arts: Glossary n.d.). We will focus on five specific pictorial devices that are often used when depicting motion: (1) posture (arm and leg positions), (2) orientation (body lean), (3) the ground plane, (4) action lines (lines that indicate past paths of motion), and (5) multiple images (images that indicate past states of motion) (Carello, et al. 1986, see **Figure 2**). Carello et al. (1986) showed that pictorial devices contain information that allows motion to be perceived in a static picture. We will investigate how comic book artists combine these pictorial devices to produce depictions of motion.

Literal vs. Metaphorical Pictorial Devices

Before beginning our analysis of how comic book cover artists in our sample combine pictorial devices to depict motion, we must distinguish between two categories of pictorial devices: literal and metaphorical. Literal pictorial devices represent features that are present in the real world (Kennedy, Green, & Vervaeke 1993: 244–250). For depictions of motion, literal devices represent things that actually occur when the motion is performed in the real world. For depictions of human motion, literal devices include posture (positioning of the arms and legs), orientation (slant of the body), and the ground plane (position of the body with respect to the ground; Carello et al. 1986, see **Figures 1** and **2**). In contrast, metaphorical pictorial devices represent features that are not present in the real world (Kennedy, et al. 1993: 244–250). For depictions of motion, metaphorical devices represent things that do not actually occur when the motion is performed in the real world. For depictions of human motion, metaphorical devices include action lines (lines extending perpendicular/parallel in the opposite direction of the motion, see **Figures 1** and **2**) and multiple images (extra images that indicate previous states of the motion, see **Figure 2**; Carello, et al. 1986).

Here we present a study that attempts to determine how the comic book cover artists in the sample use literal and metaphorical devices to depict motion. Specifically, we look at 400 superhero comic book covers from the Silver and Bronze

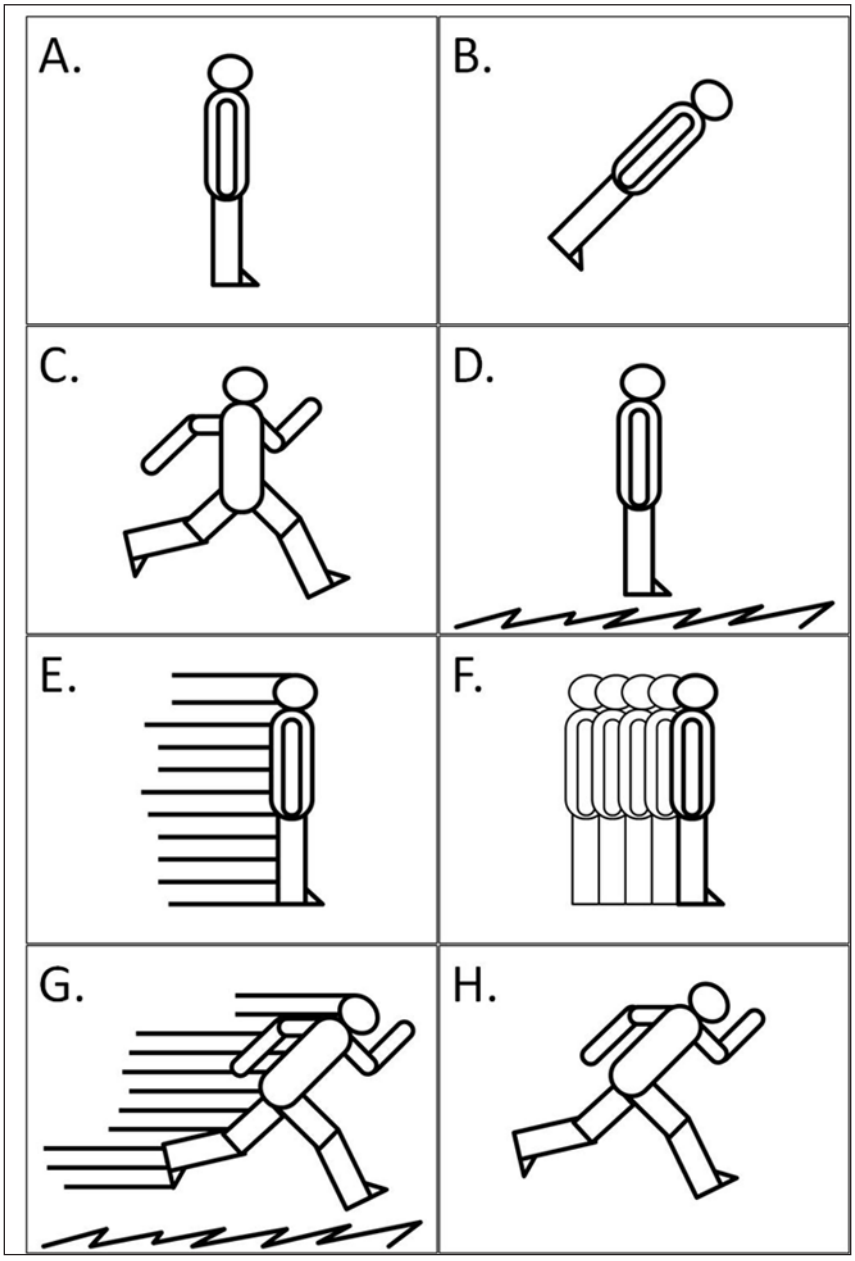

Figure 2: A schematic illustration of the five pictorial devices analyzed in this study and how they can depict running: (A) no devices, (B) orientation, (C) posture, (D) ground plane, (E) action lines, and (F) multiple images. Artists can use combinations of these devices to create effective depictions of running, for example: (G) orientation, posture, ground plane, with action lines, (H) orientation and posture (based on Carello, et al. 1986).

Ages and measure the frequency with which different combinations of literal and metaphorical pictorial devices are used by comic book cover artists to depict the motion *running*.

Methods

We selected 400 superhero comic book covers for analysis in our study (see **Table 1**). The following criteria were used in selecting the sample of comic book covers for analysis. Comic book covers from issues from the Silver and Bronze Ages were selected because: (1) by then, artists had enough time to experiment with and develop strategies for depicting motion in comics (as opposed to comic books from earlier time periods) and (2) many of the top comic book artists of all time worked during these two ages (see **Table 2**).

The specific titles were chosen based on the popularity of their characters in the Silver and Bronze Ages, as well as their current familiarity to both comic book readers and the general public (all five titles have been recently adapted into major motion pictures that each grossed between $370,000,000–$1,519,000,000 worldwide, Box Office Mojo, n.d.).

Finally, the 100 consecutive issues for each title were chosen so that: (1) a variety of artists would be sampled and (2) the issues began as early as possible in the Silver Age. For example, the 100 issue run of *The Amazing Spider-Man* began with issue #39 rather than issue #1 due to Steve Ditko being the only cover artist for issues #1–38.

Finally, we selected 100 covers of *The Mighty Thor* to develop and refine the criteria used to determine (1) if running was depicted on the cover and (2) what

Title	Volume	Issue	Dates
The Amazing Spider-Man	1	#39–138	Aug. 1966 to Sept. 1974
The Avengers	1	#25–124	Feb. 1966 to June 1974
Captain America	1	#100–199	Apr. 1968 to July 1976
The Invincible Iron Man	1	#1–100	May 1968 to July 1977
The Mighty Thor	1	#126–225	Mar. 1966 to July 1974

Table 1: Comic Book Covers Selected for Analysis.

Name	# of Covers
Neal Adams	4
Bob Brown	1
Rich Buckler	13
John Buscema	41
Sal Buscema	33
Gene Colan	14
Johnny Craig	4
Ed Harrigan	1
Don Heck	14
Gil Kane	57
Jack Kirby	27
John Romita Sr.	107
Craig Russell	1
Marie Severin	17
Chic Stone	1
Jim Starlin	6
Jim Steranko	3
George Tuska	45
Herb Trimpe	4
Ron Wilson	6
Barry Windsor-Smith	1
Total	400

Table 2: Comic Book Cover Artists in the Analysis.

pictorial devices were used. The 400 covers from *The Amazing Spider-Man, The Avengers, Captain America,* and *The Invincible Iron Man* were then analyzed using these criteria.

There are 21 unique artists whose work is included in the analysis, including established names such as Jack Kirby, Neal Adams, Gil Kane, Barry Windsor-Smith, John Romita Sr., Jim Steranko, and John Buscema. **Table 2** lists all the included authors as well as the number of their covers that were analyzed for the study.

1 Results

1.1 Pictorial Device Combinations

In order to analyze how the comic book cover artists used pictorial devices to depict running in the covers studied, the five pictorial devices were organized into two separate categories: literal devices (posture, orientation, and ground plane) and metaphorical devices (action lines and multiple images). Then, for each possible combination of literal and metaphorical pictorial devices (see **Table 3**) the frequency that they were used to depict running was recorded.

Across the 400 covers, there were 75 total depictions of running. **Figure 3** shows the frequency with which each combination of pictorial devices was used in these 75 depictions.

# of Literal	# of Metaphorical	Designation	Example
1	0	L	Posture
2	0	LL	Posture with Orientation
3	0	LLL	Posture with Orientation and Ground Plane
0	1	M	Action Lines
0	2	MM	Action Lines with Multiple Images
1	1	LM	Posture with Action Lines
1	2	LMM	Posture with Action Lines and Multiple Images
2	1	LLM	Posture with Orientation and Action Lines
2	2	LLMM	Posture with Orientation, Action Lines and Multiple Images
3	1	LLLM	Posture with Orientation and Ground Plane, and Action Lines
3	2	LLLMM	Posture with Orientation and Ground Plane, and Action Lines and Multiples

Table 3: Possible Combinations and Designations of Pictorial Devices.

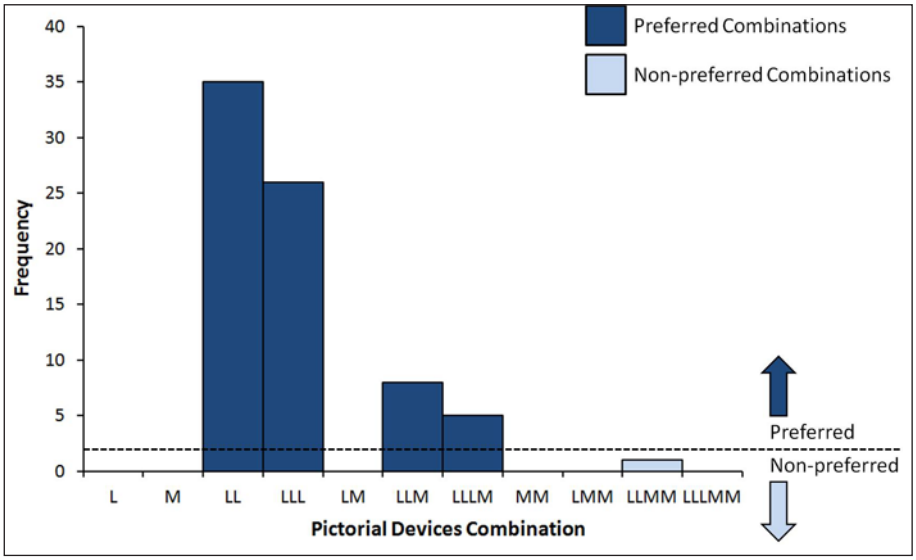

Figure 3: Frequency with which comic book artists used each combination of pictorial devices to depict running in the 400 analyzed comic book covers. The dotted line indicates the cutoff frequency as determined by the cumulative Poisson distribution. Combinations of pictorial devices that were used at a frequency above this line were preferred by artists. Combinations whose frequency is below this line were non-preferred.

1.2 Poisson Analysis Rationale

Named after French mathematician, geometer, and physicist Siméon Denis Poisson, the Poisson distribution expresses the probability of a given number of events occurring in a fixed interval of time and/or space if these events occur with a known average rate and independently of the time since the last event (Haight 1967). Here we use the Poisson distribution to analyze the frequency with which the different pictorial combinations were used in the 75 depictions. Because there were 75 depictions of running in the 400 comic book covers, and there are 11 possible combinations of pictorial devices (see **Table 3**), the average expected frequency for any pictorial device combination is 6.8. In other words, if the selection of pictorial devices by the comic book artists was random, then each combination should have been used approximately 6–7 times (out of the 75 depictions of running). For our analysis, a pictorial device combination was considered *preferred* by artists if it was used at (i.e., not significantly different from) or above (i.e., significantly greater than) the average

amount (6–7 times). On the other hand, a pictorial device combination was considered to be *non-preferred* if it was used below (i.e., significantly less than) the average amount.

In order to determine if a combination of pictorial devices was preferred or non-preferred, a cumulative Poisson distribution was used. An $\alpha < 0.05$ was used for this analysis. Using the cumulative Poisson distribution, a cutoff frequency was identified that divided the frequencies into preferred and non-preferred ranges (see **Figure 3**). The frequency region for preferred combinations was 3 and above. That is, if a pictorial device combination was used 3 or more times in the 75 depictions of running, then that combination was preferred by the artists. Conversely, the frequency region for non-preferred combinations was 2 and below. That is, if a pictorial device combination was used 2 or fewer times in the 75 depictions of running, then that combination was not preferred by the artists (see **Figure 3**).

1.3 Poisson Analysis Results

The Poisson analysis revealed the following (see **Figure 3**). First, single devices (both literal and metaphorical) were not preferred by comic book artists. Additionally, non-preferred combinations of pictorial devices also included: (1) a single literal device with a single metaphorical device, (2) multiple metaphorical devices, (3) a single literal device with multiple metaphorical devices, and (4) multiple literal devices with multiple metaphorical devices. Conversely, preferred combinations of pictorial devices included: (1) multiple literal devices (see **Figure 3** and **4**) and (2) multiple literal devices with a single metaphorical device (see **Figures 1** and **3**).

2 Discussion

2.1 Summary

The pictorial device combinations preferred by comic book cover artists were: (1) multiple literal devices and (2) multiple literal devices with a single metaphorical device. This suggests that multiple literal devices contain enough information to effectively depict the motion of running. Comic book artists use multiple literal devices because the contribution of each literal device seems to have an accumulative effect on the depiction of running. Further, comic book

Figure 4: Captain America is depicted as running using the literal pictorial devices posture, orientation, and ground plane. This is an example of a comic book artist using multiple literal pictorial devices without a metaphorical device. Buscema, S (p), and Giacoia,F (i). The Falcon Fights Alone. *Captain America and the Falcon* #75 Oct. 1972 Marvel Worldwide Inc. © Marvel Comics.

artists also often add a single metaphorical device to multiple literal devices. This suggests that a single metaphorical device also adds to the information provided by literal devices.

Surprisingly, none of the pictorial device combinations that contained *multiple* metaphorical devices were preferred. That is, comic book cover artists rarely used both action lines and multiple images together. This suggests that, while a single metaphorical device adds information (as suggested by the preferred use of multiple literal devices with a single metaphorical device), adding additional metaphorical devices does not contribute any additional information and does not increase the effectiveness of the depiction.

Finally, and not surprisingly, the results revealed that the comic book cover artists studied do not prefer using single pictorial devices. Single pictorial devices may not contain enough information on their own to effectively depict the motion of running.

2.2 Literal Additive Metaphorical One-And-Done (LA-MOAD) Theory

The results suggest that literal pictorial devices on the covers operate additively, with more devices increasing the effectiveness of a depiction of running. A single metaphorical device will also add to the information in the depiction. However, metaphorical devices interact with each other in a non-additive, 'one-and-done' manner. That is, after one metaphorical device adds its information to the depiction, any additional metaphorical devices do not contribute additional information (i.e., the accumulation of information from metaphorical devices is 'done'). In other words, one metaphorical device increases the effectiveness of a depiction, but any additional metaphorical devices do not. These different ways that comic book artists use literal and metaphoric devices suggest that these two categories of devices are processed by viewers in fundamentally different ways. We will call this newly proposed theory of the differential processing of literal vs. metaphorical devices the Literal Additive Metaphorical One-And-Done (LA-MOAD) theory.

We propose that the LA-MOAD theory can be thought of as a formal statement of what comic book artists have discovered through experience. After years of

experimenting with countless depictions of motion, successful comic book artists may have uncovered artistic strategies for the effective depiction of motion. The success of these artists indicates that these artistic strategies are, indeed, effective. Their effectiveness, in turn, suggests that these strategies may parallel how our visual system processes information in a comic book picture. That is, our suggested visual system operates in a manner where the information provided by literal devices is processed additively. The information from metaphorical devices, however, is not processed additively. In other words, while a single metaphorical device provides information to the visual system, additional metaphorical devices do not. This would suggest a fundamental difference in the way that our visual system processes literal and metaphorical devices. As such, the LA-MOAD theory is also a theory of how our visual system processes literal and metaphorical devices to comprehend comic book pictures.

2.3 Exceptions

One could argue that even though multiple metaphorical devices are not used often, they are used sometimes (albeit very sparingly, see **Figure 3**). This may indicate that using multiple metaphorical devices can be effective, but that they are only used for depictions of extreme motion. For example, multiple metaphorical devices have been used to depict motions that occur at enormous speed (see **Figure 5**). This may be due to how metaphorical devices are processed. It may be the case that multiple metaphorical devices do not make a motion more recognizable, but do contribute to perceived characteristics of the motion (e.g., super speed). However, this may also be due to conventions used in depiction. For example, influential comic book artist Carmine Infantino published a famous guide for drawing the Flash (Infantino, 1963). In it, he used the metaphorical devices of action lines and multiple images to depict the Flash running at extremely high speeds. Any aspiring comic book artist following this instruction might likewise use these metaphoric devices together to depict high speed running. This would be the case even if the artistic strategy is not particularly effective (e.g., it is simply an art style). Further research is needed to investigate these two possibilities.

Figure 5: Quicksilver is depicted as running using the literal pictorial devices of posture, and orientation, and the metaphorical devices of action lines and multiple images. This is a rare example of a comic book artist using multiple literal pictorial devices with multiple metaphorical devices. The use of multiple metaphorical devices might be limited to depictions of extreme motion (e.g., super speed). Romita, J (p, i). The Speedster and the Spider. *The Amazing Spider-Man* #71 Apr. 1969 Marvel Worldwide Inc. Cover. ©Marvel Comics.

Competing Interests

The authors declare that they have no competing interests.

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