

EFFECTS OF INTERPRETATION OF ENERGETIC AND EMOTIONAL COSTS OF DEPICTED ACTIONS IN PICTURE PERCEPTION

Proceedings of the International Association for Empirical Aesthetics, Volume XX, 2008 (in press).

SEELEY, William P.

Department of Philosophy, Bates College, USA

email: wseeley@Bates.edu

Psychological studies demonstrate a correlation between the *energetic cost* (e.g. fatigue and expected physical demands) of a task and the apparent *orientation* (slant) and *extent* (distance) in the environment. For instance, wearing a heavy backpack, walking on a treadmill, or throwing a heavy ball increases the apparent distance to a target (Proffitt 2006). These effects generalize to interactions with virtual environments, cases in which participants simply imagine performing an anticipated action (Stefanucci, 2005; Witt, in press), and to the *emotional costs* (e.g., fear and anxiety) of actions (Stefanucci, 2008). *Purposiveness* is a key variable in the production of these effects. Walking on a treadmill influences the apparent distance to a target if people anticipate walking to it. However, if participants view a target with the intention of tossing a beanbag to it after walking on a treadmill there is no measured modulation in apparent distance. Therefore, these effects are limited to energetic and emotional costs associated with actions participants intend to perform.

The results reported by Proffitt and his colleagues are compelling. However, one can question whether they are due to changes in the way participants perceived orientation and extent in their environment, or are instead artifacts of the way participants judged the difficulty of anticipated tasks. In order to evaluate these two possible explanations one needs a method to directly measure the spatial metric of perception. One means to do so is to ask participants to sketch/copy the rough spatial layout of what they perceive as accurately as possible. In this type of task participants continuously compare what they have drawn against what they perceive. Comparisons of the spatial extent of their drawings across different interpretations of energetic and emotional costs can, therefore, be interpreted as a record of change in perceived orientation & extent.

Philosophical theories of narrative understanding in picture perception suggest a novel way to implement this strategy. Theories of narrative understanding can be divided into two types. *Participant accounts* argue that viewers, spectators, and readers come to comprehend a narrative painting, film, drama, or work of fiction by imaginatively projecting themselves into the event depicted and adopting the perspectives, or simulating the beliefs and desires, of its characters from a first-person point of view (Goldman, 2006). *Observer accounts* argue that the spatial extent of pictures and films are radically (and noticeably) different from real life, that the temporal structure of films, dramas, and texts are radically (and noticeably) different from ordinary events, and that we fail to respond to pictures, films, dramas, and texts as we would if we were either actual characters or independent observers in the depicted event. They conclude that we come to understand the content of a narrative picture, film, drama, or work of fiction from a third-person point of view, or as a side-participant (Carroll, 1988/1991). A common theme in these types of theories is that spectators and readers are able to infer the content of narrative artworks using tacit folk psychological theories about the relationship between behavior and the beliefs and desires of others.

We hypothesized that if the participant account is valid, one should find similar effects associated with changes in the energetic & emotional costs of actions depicted in static images. We chose two paintings by Andrew Wyeth to test this hypothesis: *Christina's World* and *Winter, 1946*. Naïve viewers often report that Christina Olsen is a healthy individual *lying* in the field looking at the house in the distance. However, she suffered from an undiagnosed muscular disorder as a small child that had left her unable to walk. Wyeth reports that she is actually depicted in *Christina's World* crawling home from her vegetable garden. Wyeth's father and cousin were run over by a train just beyond the crest of the hill depicted in *Winter, 1946*. The painting depicts the neighbor's son running from the scene of the accident. We predicted that the introduction of this salient biographical information would alter the perceived energetic and emotional costs of the events depicted in the paintings and, as a result, modulate the apparent orientation and extent of the depicted landscapes.

Method

Participants. 87 participants were recruited from the general Franklin & Marshall College population (58 EN; & 29 EM; 29 males & 58 females; 78 undergraduates & 9 faculty) and compensated \$5 for their time.

Participants in both the Energetic Cost and the Emotional Cost Groups were divided into 30 Second, 1-Minute, 3-Minute, and 1-Minute-Reverse groups. Participants in the Target Groups were asked to draw the paintings twice, in a *naïve condition* prior to being presented with information about the painting, and then again in an *educated condition* after reading a 1-page description of biographical information salient to the event depicted. The Control Groups for each timing drew the paintings twice without reading the salient information about the depicted events. Participants in the Reverse Group were asked to read the salient biographical information prior to their first target drawing (*Drawing 1r*). They were then asked to read a second passage designed to lessen their interpretation of the energetic or emotional costs of the event depicted (*Drawing 2r*).

Materials. We chose paintings similar in luminance profile and hue. Images were projected onto a screen using a ceiling mounted VGA projector and presented 25" x 40" on a black field. Participants sat 7 feet away from the screen at a large utility table. The center of the image was located approximately 18" above participants' line of sight. Participants made several drawings on 24" x 36" sheets of rough newsprint using soft (8b) drawing pencils. The projected size of images was scaled to roughly match the visual size of the newsprint sheet.

Procedures. Participants were instructed to copy the spatial arrangement of the key features in the scene depicted as accurately as possible, but not to worry about how realistically their copies matched the original paintings. They were encouraged to use abstractions to facilitate their drawings (e.g. rectangles for buildings and stick figures for people). All participants were given a set of practice drawings to familiarize themselves with the nature and timing of the task. A written survey was administered after each drawing to screen participants for drawing skill, general knowledge of art history, familiarity with the paintings, familiarity with Wyeth's work, familiarity with biographical knowledge salient to the events depicted in the paintings, and to evaluate interpretation of energetic/emotional costs of the depicted actions.

The *extent* of *Christina's World* was defined as the area of the triangle formed by the head of the figure, the front corner of the house, and the point where a vertical line bisecting the head of the figure intersected with the horizon. The *extent* of the *Winter, 1946* was defined as the area of the triangle formed by the head of the figure, the peak of the hill, and the point where the fence meets the horizon. We threw out drawings in which any of these features were omitted. There were 78 remaining pairs of drawings following this procedure (50 EN; 28 EM).

Results & Discussion

Energetic Costs. We predicted that participants would expand the extent of the landscape in the educated condition relative to the naive condition and that participants in the 1 Minute-Reverse group would truncate the landscape in Drawing 2r relative to Drawing 1r. Participants in the Energetic Cost group expanded the extent of the landscape. The mean difference in extent for targets and controls in this group was significant, $t(44) = 2.83$, $p < 0.05$ (one tailed). Participants in the 1 Minute-Reverse Group truncated the landscape in Drawing 2r relative to Drawing 1r as expected. Differences in the mean difference in extent in drawings from the 1 Minute-Reverse Group and the 1 Minute Energetic Cost Group were significant, $t(08) = -2.64$, $p < 0.01$ (one tailed). We found no significant perspectival effects associated with the expansion of the extent of the depicted landscape. However, participants tended to draw a more pronounced crown to the hill in the educated condition. We interpreted this as an increase in the depicted slope of the hill. Thus these results demonstrate an effect of the energetic costs of depicted actions in picture perception.

The 30 Second group was the only energetic cost group for which the mean differences between Target and Control Groups was insignificant. This result is consistent with Cohen (2005) who reports that performance falls off sharply in simple copying tasks at timings shorter than 1 minute for participants without drawing training. We initially hypothesized that participants in the 3 minute group would have ample time to analyze the depicted landscape in the painting and correct drawing distortions. We predicted, as a result, that participants in the 1 minute group would expand the extent of the depicted landscape more than participants in the 3 Minute Group. This was the case (Table 2). However, differences in the mean change in extent between the 1 and 3 Minute Groups was not significant, $t(18) = 1.13$, $p > 0.05$.

Emotional Costs. Results from the emotional cost group did not support our hypothesis (Table 1). There are three possible explanations for these results. First, the drawings suggest that participants found it difficult to draw *Winter, 1946*. Second, the boy in the *Winter, 1946* is both running towards, and looking at, the viewer. In contrast, the viewer is situated behind the figure in *Christina's World*. It may, as result, be harder to adopt the perspective of the figure in *Winter, 1946*. Finally, emotional cost effects in perception are associated with purposiveness (e.g., anxiety about descending steep slopes). Although the emotional

cost story we read to participants depicts the figure in the painting as anxiously fleeing, the target of his anxiety is not descending the slope, but rather a past event that transpired beyond the crest of the hill.

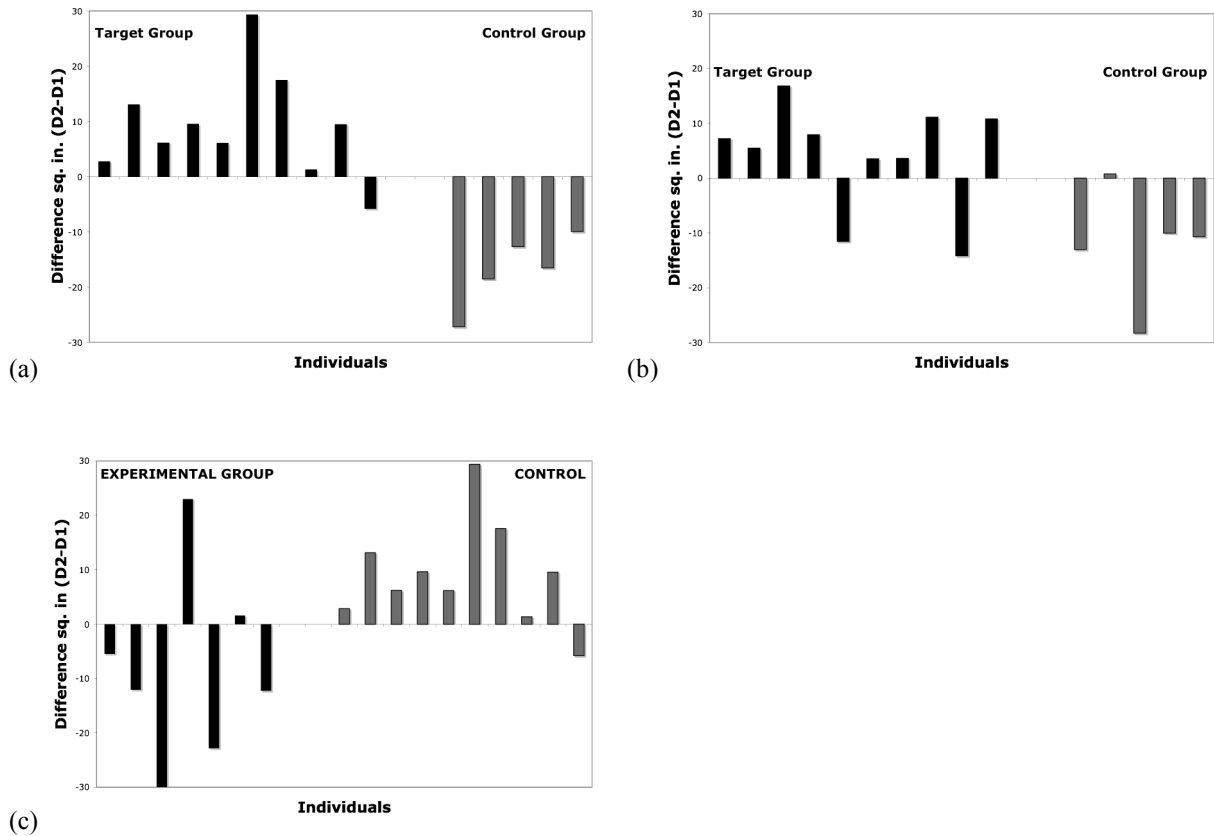


Figure 1. Mean change in extent (in^2) for individuals in the (a) 1-minute, (b) 3-minute, and (c) 1-minute Reverse Energetic Costs Groups.

Table 1. Mean Change in Extent (in^2) between Drawing 1 Drawing 2

Group	Targets	Controls	T-stat	P-value
<i>Energetic Costs (all)</i>	5.001	-3.628	$t(44) = 2.83$	$p < 0.05$
30 seconds	1.455	8.284	$t(14) = -1.25$	$p > 0.01$
1 Minute	7.453	-16.944	$t(14) = 4.74$	$p < 0.01$
3 Minutes	4.079	-12.235	$t(13) = 2.99$	$p < 0.01$
1 Minute-Reverse	-9.472	7.453	$t(08) = -2.64$	$p < 0.01$
<i>Emotional Costs (all)</i>	1.946	0.748	$t(26) = 0.22$	$p > 0.05$
30 Seconds	-0.992	-7.694	$t(13) = 0.85$	$p > 0.05$
1 Minute	5.619	0.748	$t(11) = 0.63$	$p > 0.05$

Table 2. Mean Extent (in^2) of Energetic Cost Drawings & Christina's World

Group	1 Min	3 Min	Christina's World
<i>Naïve</i>	41.42	36.24	40.22
<i>Educated</i>	50.41	40.32	

General Discussion

We predicted that the spatial extent of participants' copies in the Target Groups would differ in the naïve and educated conditions indicating that the introduction of salient biographical information caused participants to interpret the energetic or emotional costs of the depicted actions differently and that this novel interpretation would cause them to perceive the distance between key landmarks as longer. Our results generally support these predictions for changes in the energetic costs of depicted actions. Thus, our results provide support for both the participant account of narrative understanding and a perceptual interpretation of the influence of energetic costs on the spatial metric of perception.

Proffitt and his colleagues argue that modulations of the spatial metric of perception attributable to the energetic costs of actions are effects of motor simulations involved in tacit motor planning (Witt, in press). We interpret our results to demonstrate that participants simulate Christina Olsen's perspective and so anticipate crawling home across the field depicted in the painting. However we have no direct means in this study to verify whether participants are actually simulating the perspective of depicted characters. Electromyography suggests an indirect means to measure whether our inference is valid. Motor simulation is associated with the activation of premotor cortex. Activation of premotor areas in motor simulation produces low level myographic signals in target muscles. Electromyography is, therefore, an indirect means to measure premotor activation correlated with motor simulation, and could potentially be used to evaluate whether participants adopt the perspectives of characters in the perception of actions depicted in static images.

References

- Carroll, N. (1988/1991). Simulation, emotions, and morality. In N. Carroll (Ed.) *Beyond Aesthetics* (pp. 306-316). New York: Cambridge University Press.
- Cohen, D.J. (2005). Look little, look often: the influence of gaze frequency on drawing accuracy. *Perception & Psychophysics*, 67(6), 997-1009.
- Goldman, A. (2006). Imagination and simulation in audience responses to fiction. In S. Nichols (Ed.), *The Architecture of the Imagination*. New York: Oxford University Press.
- Proffitt, D. (2006). Embodied perception and the economy of action. *Perspectives in Psychological Science*, 1, 110-122.
- Witt, J.K., & Proffitt, D. R. (in press). Action-specific Influences on Distance Perception: A Role for Motor Simulation. *Journal of Experimental Psychology: Human Perception and Performance*.
- Stefanucci, J.K., Proffitt, D.R., Clore, G.L., Parekh, N. (2008). Skating down a steeper slope: fear influences the perception of geographical slant" *Perception*, 37(2), 321 – 323.
- Stefanucci, J.K. Proffitt, D. R., Banton, T., & Epstein, W. (2005). Distances appear different on hills. *Perception & Psychophysics*, 67(6), 1052-1060.