

UC Merced

Proceedings of the Annual Meeting of the Cognitive Science Society

Title

Toward a Resolution of the Debate on the Cognitive Penetrability of Perception

Permalink

<https://escholarship.org/uc/item/79v1v958>

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 40(0)

Author

Lupyan, Gary

Publication Date

2018

Toward a Resolution of the Debate on the Cognitive Penetrability of Perception

Gary Lupyan (lupyan@wisc.edu)

Department of Psychology, 1202 W. Johnson Street
Madison, WI 53706 USA

Keywords: top-down effects, cognitive penetrability, perception

What determines the contents of our perception? A century and a half of psychophysics research has focused on the process by which objectively measurable stimuli are represented by the brain. This paradigm has focused on discovering lawful relationships by which we form veridical representations of the external world and has classically viewed perception as a one-way mapping from the world to the mind. At the same time, perception researchers have long understood that perceptual systems have been honed by evolution to transform energy (electromagnetic waves, mechanical vibrations, aromatic molecules) into forms useful for guiding our actions (Marr, 1982). To be maximally useful, the same input should be represented differently depending on current task demands. This idea conflicts with the traditional emphasis on veridicality (e.g., Hoffman, Singh, & Prakash, 2015; cf. Lupyan, 2015b). If true, then rather than focusing on the world as a determinant of what we perceive, the best approach for understanding the contents of our perception may be to emphasize the needs, goals, and expectations of the organism as they *relate* to the world (a line of thinking diversely represented in e.g., Clark, 1997; Gibson, 1979; Noe, 2004).

It is this tension that underlies the debate on the *Cognitive Penetrability of Perception* (Fodor, 1984; Churchland, 1988; Pylyshyn, 1999). Are the contents of our perception determined strictly by physical inputs (no cognitive penetrability of perception), or are they jointly determined by physical inputs and our cognitive states (perception is cognitively penetrable).

Many may have thought that this debate has been settled by modern cognitive (neuro)science. As it turned out, the debate just took a hiatus and is now rekindled and going strong (e.g., Deroy, 2013; Firestone & Scholl, 2014, 2016; Goldstone, de Leeuw, & Landy, 2015; Lupyan, 2015a, 2017a; Lyons, 2011; Ogilvie & Carruthers, 2015; Raftopoulos, 2005; Teufel & Nanay, 2016).

I will argue that despite the continuing terminological and methodological disagreements, we have sufficient empirical evidence to resolve the debate in favor of cognitive penetrability.

The first half of the talk will outline a theoretical argument that what we know about the function of perception and its neural implementation *necessitates* perception to be

cognitively penetrable (at least in organisms with mammalian behavioral repertoires). The second half will provide examples of demonstrable effects of cognitive states affecting what we perceive. For example, verbal cues can make otherwise invisible percepts, visible (Lupyan & Spivey, 2010a; Lupyan & Ward, 2013), and participants' knowledge that pumpkins are orange but that cars come in a variety of colors causes people to experience more vivid color afterimages of pumpkins than of pumpkin-colored cars (Lupyan, 2015c).

I will end by issuing several challenges to remaining skeptics of the idea that what we know routinely influences what we perceive.

References

- Boutonnet, B., & Lupyan, G. (2015). Words jump-start vision: a label advantage in object recognition. *The Journal of Neuroscience*, 32(25), 9329–9335. <https://doi.org/10.1523/JNEUROSCI.5111-14.2015>
- Churchland, P. M. (1988). Perceptual Plasticity and Theoretical Neutrality: A Reply to Jerry Fodor. *Philosophy of Science*, 55(June), 167–87.
- Clark, A. (1997). *Being There: Putting brain, body, and world together again*. Cambridge, MA: MIT Press.
- Deroy, O. (2013). Object-sensitivity versus cognitive penetrability of perception. *Philosophical Studies*, 162(1), 87–107. <https://doi.org/10.1007/s11098-012-9989-1>
- Firestone, C., & Scholl, B. J. (2014). “Top-down” effects where none should be found: The El Greco fallacy in perception research. *Psychological Science*, 25(1), 38–46.
- Firestone, C., & Scholl, B. J. (2016). Cognition does not affect perception: Evaluating the evidence for “top-down” effects. *The Behavioral and Brain Sciences*, 39, 1–77. <https://doi.org/10.1017/S0140525X15000965>
- Fodor, J. A. (1984). Observation Reconsidered. *Philosophy of Science*, 51(March), 23–43.
- Gibson, J. . (1979). *The Ecological Approach to Visual Perception*. Boston: Houghton Mifflin.
- Goldstone, R. L., de Leeuw, J. R., & Landy, D. H. (2015). Fitting perception in and to cognition. *Cognition*, 135, 24–29. <https://doi.org/10.1016/j.cognition.2014.11.027>
- Hoffman, D. D., Singh, M., & Prakash, C. (2015). The Interface Theory of Perception. *Psychonomic Bulletin & Review*, 22(6), 1480–1506. <https://doi.org/10.3758/s13423-015-0890-8>

- Lupyan, G. (2008). The conceptual grouping effect: Categories matter (and named categories matter more). *Cognition*, 108(2), 566–577.
- Lupyan, G. (2015a). Cognitive Penetrability of Perception in the Age of Prediction: Predictive Systems are Penetrable Systems. *Review of Philosophy and Psychology*, 6(4), 547–569. <https://doi.org/10.1007/s13164-015-0253-4>
- Lupyan, G. (2015b). #interfacetheory: True enough - Psychonomic Society. Retrieved February 12, 2017, from <https://www.psychonomic.org/news/297866/interfacetheory-True-enough.htm>
- Lupyan, G. (2015c). Object knowledge changes visual appearance: Semantic effects on color afterimages. *Acta Psychologica*, 161, 117–130.
- Lupyan, G. (2017a). Changing what you see by changing what you know: the role of attention. *Frontiers in Psychology*, 8(1055). <https://doi.org/10.3389/fpsyg.2017.00553>
- Lupyan, G. (2017b). How reliable is perception? *Philosophical Topics*, 45(1), 81–105.
- Lupyan, G. (2017c). Objective Effects of Knowledge on Visual Perception. *Journal of Experimental Psychology: Human Perception and Performance*, 43(4), 794–806. <http://dx.doi.org/10.1037/xhp0000343>
- Lupyan, G., & Spivey, M. J. (2010a). Making the Invisible Visible: Verbal but Not Visual Cues Enhance Visual Detection. *PLoS ONE*, 5(7), e11452. <https://doi.org/10.1371/journal.pone.0011452>
- Lupyan, G., & Spivey, M. J. (2010b). Redundant spoken labels facilitate perception of multiple items. *Attention, Perception, & Psychophysics*, 72(8), 2236–2253. <https://doi.org/10.3758/APP.72.8.2236>
- Lupyan, G., Thompson-Schill, S. L., & Swingle, D. (2010). Conceptual penetration of visual processing. *Psychological Science*, 21(5), 682–691.
- Lupyan, G., & Ward, E. J. (2013). Language can boost otherwise unseen objects into visual awareness. *Proceedings of the National Academy of Sciences*, 110(35), 14196–14201. <https://doi.org/10.1073/pnas.1303312110>
- Lyons, J. (2011). Circularity, Reliability, and the Cognitive Penetrability of Perception. *Philosophical Issues*, 21(1), 289–311. <https://doi.org/10.1111/j.1533-6077.2011.00205.x>
- Marr, D. (1982). *Vision: A computational approach*. San Francisco: Freeman & Co.
- Noe, A. (2004). *Action in Perception*. MIT Press. Retrieved from <https://www.amazon.com/Action-Perception-Representation-Mind-Alva/dp/0262640635>
- Ogilvie, R., & Carruthers, P. (2015). Opening Up Vision: The Case Against Encapsulation. *Review of Philosophy and Psychology*. <https://doi.org/DOI.10.1007/s13164-015-0294-8>
- Pylyshyn, Z. (1999). Is vision continuous with cognition? The case for cognitive impenetrability of visual perception. *Behavioral and Brain Sciences*, 22(3), 341–365.
- Raftopoulos, A. (2005). *Cognitive Penetrability Of Perception: Attention, Action, Strategies, And Bottom-up Constraints*. Nova Publishers.
- Samaha, J., Boutonnet, B., Postle, B. R., & Lupyan, G. (2016). How prior knowledge prepares perception: Prestimulus oscillations carry perceptual expectations and influence early visual responses. *BioRxiv*, 076687. <https://doi.org/10.1101/076687>
- Teufel, C., & Nanay, B. (2016). How to (and how not to) think about top-down influences on visual perception. *Consciousness and Cognition*. <https://doi.org/10.1016/j.concog.2016.05.008>