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How intelligent is preception?

Is our perceptual experience a veridical representation of the world or is it a product of our beliefs and past experiences? This taps into questions that lie at the heart of understanding how perception works. To outline the debate let's first define the intuitive concepts of perception and cognition. Perception is the organization, identification, and interpretation of sensory information in order to represent and understand the presented information or environment. Cognition is usually understood as a process of transforming an informational input which has already some level of unification (in the case of visual input, e.g. a percept) by psychological processes like learning, memorizing, imagining, attending, considering, decision making, linguistic expression etc. Cognitive penetration describes the influence of higher level cognitive factors on perceptual experience and has been a debated topic in philosophy of mind and cognitive science. 'There is no truth. There is only perception' - Gustav Flaubert Fig 2 shows a shape and texture-map continuum between a prototypical White face and a prototypical Black face used by Levin (2000). In viewing these faces, Mahzarin R. Banaji noticed an interesting illusion. First, even though Levin had stated that White and Black faces were controlled for reflectance, the White face appeared to Banaji to be lighter than the Black face. This goes to show that background knowledge (and expectations based on it) about the relative skin tone associated with faces of varying races affects the perceived lightness of those faces.

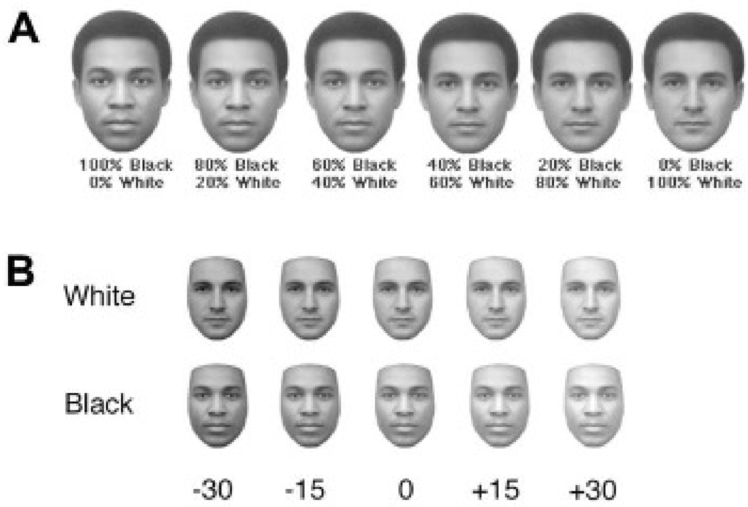

Figure 2. A: An equal-reflectance continuum between a Black average face and a White average face. B: Samples of Black and White average faces at different lightness levels.

Delk and Fillenbaum (1965) showed subjects shapes of various objects (typically red ones such as a love-heart shape or lips, and other objects such as a square, a bell or a mushroom) which were cut out from the same orange sheet of paper. Subjects were told to instruct the experimenter to make the color of the background on which the cut-out shapes were placed more yellow or more red until it was the same color as the cut-out shape, so that the objects could no longer be distinguished from the background. The results of the study demonstrated that subjects are more likely to perceive the color of an object as more red if the shape of the object suggests a characteristically red color due to its semantic association (e.g. the object heart) than if the object does not have this semantic association (e.g. a square).

Bannert Bartels (2013) presented subjects with grey-scale images of typically colored objects (e.g. a banana, a broccoli or a coke can) and demonstrated that the memorized associated color can be decoded from fMRI activity patterns in V1.

Russians lexicalizes the category blue with two basic level terms: "siniy" for darker blues and "goluboy" for lighter blues while the English have just one basic–level term "blue". Students were asked to decide as quickly as possible whether a top color exactly matched a color on its left or on its right. While all shades of colors were in the category "blue" for the English, the colors were part of the two different basic categories of "blue" for the Russian speakers. Winawer et al. (2007) found a categorical perception effect only for the Russian speakers, i.e. the Russian – but not the English – had slower reaction times (RTs) on within-category than between-category trials.

In a study by Chalk et al. (2010), subjects were implicitly trained to expect certain motion directions as more frequent than others in a dot motion detection task. Subjects demonstrated a bias towards the trained (more likely occurring) motion directions even when no coherent motion was presented (i.e. when dots moved randomly). This shows that expectations acquired by fast statistical learning bias subject's perception of motion even in the absence of coherent motion.

For example, Kitayama et al. (2003) provided evidence for possible cultural influences on basic line length judgments, a classical process of early vision. Here, Westerners performed better when line length was judged ignoring the perceptual context (a surrounding box) compared to when a proportional judgment was required that necessitated taking the perceptual context into account. Asians, by contrast, show the opposite performance pattern. The authors of the study suggest that Westerners, due to their more individualistic culture are less influenced by contextual information, whereas Asians, due to their more holistic culture, are influenced by contextual information even in low-level perceptual tasks such as line length comparison. There is also converging neuroimaging evidence supporting this interpretation: Westerners compared to East Asians activate more areas related to object-processing when viewing complex visual scenes (Gutchess et al., 2006), whereas East Asians are more sensitive to incongruencies between foreground objects and the background, an effect also observable in object processing areas (Jenkins et al., 2010).

Images of faces were paired with positive, negative or neutral gossip, i.e. affective social information such as "threw a chair at his classmate". Under conditions of binocular rivalry (i.e. when one eye is presented with the image of a face and the other eye is presented with the image of a house), faces paired with negative gossip were perceived more frequently than faces paired with neutral or positive gossip. That is, previously learned and socially relevant information biases the perceptual content of visual consciousness. Given that binocular rivalry involves V1 (Lee et al., 2005), this finding indicates that complex high-level information may bias low-level visual processes.

All these examples demonstrate that visual perception, particularly those aspects of visual perception that are associated with early visual processes, are substantially influenced by factors such as expectations and context as well as emotional, social and cultural information.

If one wants to deny cognitive penetration in this case, one has to argue that the alleged change in experience is actually only a change in some non-conceptual processes and takes place exclusively in a low-level or a high-level perceptual module. Wu (2013) also recently argued against cognitive impenetrability by showing that intentions penetrate visual perception. He uses the example of space constancy: the fact that we perceive the world as stable despite the constant change of the retinal image due to eye movements. He reviews the neuroscientific evidence demonstrating the crucial role of motor signals in space constancy and as such how intentional eye-movements can penetrate early vision. He also adds another condition for cognitive penetration: penetrating cognitive contents must serve as informational resource for visual computation to be effective penetration.

The heart is cognitively "penetrated" by my intention to do calisthenics since it results in doing calisthenics, resulting in my heart rate increasing

The sarcasm in the above statement said by Fodor (1988) is apparent. Fodor has argued that observation is theory neutral, since the perceptual systems are modular, that is, they are domain-specific, encapsulated, mandatory, fast, hard-wired in the organism, and have a fixed neural architecture.

In the famous Muller-Lyer illusion, the line with the inward pointing arrowheads appears longer than the line with the outward pointing arrowheads. Even once people are fully assured that the lines are of the same length, tehy see one as longer than the other. Knowledge of the facst of the matter does not affect perception. Churchland (1988) answers that using this illusion to support impenetrability is a poor choice, because as Fodor admits, children with less experience with edges and corners are less susceptible to the illusion. But this means that this illusion is the result of learning from experience, which shows the cognitive penetrability of perception.

The duck-rabbit and the Necker cube configuration exemplify illusions in which a figure or a scene is so ambiguous that its resolution seems to rely on higher-order cognitive factors. The context may dictate whether the rabbit-duck configuration is perceived as the picture of a duck or a rabbit, or the way the cube is perceived. Thus, perception is shown to be cognitively penetrable. This need not be the case, however. The weak interaction model can account for this phenomenon. The bottom up processes of vision propose in parallel both duck and rabbit, and higher cognitive states select one. Since the production of the output of the visual input systems is not affected by any top down processes, their impenetrability is not undermined. Fodor (1988) offers another reply, which is worth discussing. He argues that one does not get the duck-rabbit configuration to flip by changing her assumptions and that "believing that it's a duck doesn't help you see it as one."

Churchland's (Churchland, 1988) favorite example, finally, is the case of "inverted fields" in which people who wear lenses that invert the retinal image, after a period of disorientation, succeed in adjusting to the new perceptual regime and behave quite normally. According to Churchland, this is a clear demonstration of the penetrability and plasticity of our vision, since some very deep assumptions guiding the computations performed by the visual system can be reshaped in view of new experiences. He thinks that the adaptation to the inverting lenses shows the plasticity of some deep assumptions implicit in visual processing, such as the specific orientation of the visual field. These assumptions can be reshaped in a week or two, a fact that shows the plasticity and penetrability of perception. Fodor, however, denies that this is the case, since one might expect to find this kind of plasticity on good ecological grounds. He claims, that there may be specific mechanisms that "function to effect the required visual-motor calibrations" that are required for the adaptation of the subjects to the new inverted retinal images

Conclusion

We looked at how sensation and perception can independently exist. For example, in the case of prosopagnosia, the sensation is intact while the parts of the brain responsible for face perception are damaged. We also looked at how perception need not necessarily follow sensation as in the case of sensory adaptation or unchanging stimuli. The phenomenon of phantom limbs, hallucinations indicate that perception can occur without stimulus from the external environment. Lastly we looked at how memory or context can shape perception. Hence I believe that sensation and perception are different stages and although occur in a chronology, sometimes may even exist independently. I would also like to add: As in the case of the image of '13' or 'B', for a person who is illiterate both of them might still appear to be just a bunch of lines. That's also a reason why I state that 'raw sensations' although they exist, in some sense are difficult to pinpoint. Years of evolution, experience, viewing the physical world, making sense of the information around, organizing ideas, ordering the cacophonous chaos of our environment, have trained us so well in in associating meaning, identifying patterns, using heuristics and short cuts, to make 'educated guesses' about the nature of reality to fill in the gaps reconstructing the most plausible picture.

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