Perceiving the Link between Cognitive Science and Buddhism

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Abstract

The author argues that the emerging model of perception in the cognitive sciences is an active model in which deliberate perceptual engagement gives rise to refined perception. The author goes on to illustrate that this same active model forms the foundation of the Buddha-Dharma. Consequently, this shared model of perception provides a means to integrate the projects of cognitive science and Buddhism. The manner in which cognitive science and Buddhism can refine one another via said perceptual model is discussed.

1. Introduction

More than 2,500 years ago, using only his mind to probe reality, Siddhartha Gautama developed a rich conceptualization of perception upon which he established a body of teachings concerning the cultivation of well-being. Central to Gautama's notion of well being was the development of an accurate perception of reality. According to Gautama's teachings, individuals develop a synchrony between perception and reality through active participation in perceiving (Santina, 2001). Today, after countless experiments, researchers in the cognitive sciences are uncovering the same conceptualization as Siddhartha Gautama.

In this essay, I intend to establish that the emerging model of perception in the cognitive sciences is the same model of perception that is at the heart of Buddhism. This argument will be made by demonstrating that i) the emerging model of perception in the cognitive sciences is an active model of perception, ii) Buddhism is founded on an active model of perception, and iii) research concerning Buddhist practitioners lends support to an active model of perception.

2. Research today

2.1. The development of perception

Since the establishment of psychology as a discipline, perception has been predominantly characterized as a passive process (Hurley, 1998). These passive characterizations, termed input-output models, assert that perceptual experience results from the cascade of neurological events triggered by sensory stimulation. In the case of vision, for instance, the input-output model of perception asserts that the stimulation of a normal visual system via patterns of light is sufficient for visual perception. This assertion, however, has been challenged experimentally. According to the input-output model, if one were to wear light-reversing goggles, which invert the pattern of light entering the retina, one should experience an inversed perceptual image of the world for as long as he or she wears said goggles. In actuality, individuals who put on light reversing goggles experience a distorted image of the world marked by chaotic displacement of objects and movement (Noë, 2004a). Moreover, individuals who wear these goggles for some time and intentionally interact with the environment come to perceive a normal image of the world, whereas, the visual perception of individuals who stay still remains impoverished (Held & Bossom, 1961). These experiments indicate both that the input-output model is an inadequate account of perception and that some sort of active characterization is more adequate (Noë, 2004a; Noë, 2004b).

The active theory which best explains these sorts of phenomena, actionism, purports that deliberate action equips one with implicit understanding of how sensory change depends on movement and that such an understanding must be put to work in environmental exploration in order to give rise to perception (Hurley & Noë, 2003; Noë, 2004a; O'Regan & Noë, 2001). This active model of perception receives further support from data that demonstrate the necessary conditions for the development of normal visual perception. By rigging one kitten with a harness and placing another kitten in a gondola attached to said harness, Held and Hein (1963) uncovered that self-actuated movement is essential for normal visual development. Both kittens encountered the same visual stimuli, and both kittens moved, but only the active kitten developed normal visual perception. Similarly, blind individuals can develop their visual perception abilities via sensory substitution *only* if they take an active role in their perception, as demonstrated by a review of vision substitution technology that translates images captured by a camera into tactile stimulation (Bach-y–Rita & Kercel, 2003). This review reports that blind individuals develop visual perception using vision substitution technology only if they are in control of the camera. If the camera is manipulated by someone else, the input is experienced as distorted and incomprehensible. Thus, the emerging picture of perception is one in which the perceiver plays an active role in its development. However, the perceiver seems to play an active role in the refinement of perception as well.

2.2. *The refinement of perception*

Consistently, experiments in the cognitive sciences have been uncovering an association between inactive perceiving and distorted perception. These experiments gesture towards the active role of the perceiver in the refinement of perception. Sections 2.2.1 to 2.3 describe these experiments and how they lend support to an active model of perception.

2.2.1. *Change blindness*

Change blindness is the inability to detect large changes in a visual scene, due to an inadequate retention of details (Simons & Levin, 1997). This phenomenon has been shown to be highly pervasive both within and outside of lab settings. Grimes (1996) had lab participants gaze at a picture of two men wearing hats and informed them that the image may change. Despite anticipating a change, 0% of participants noticed that the two men had exchanged their visually prominent hats. Similarly, when watching a modified short film, 77% of participants did not notice that a central actor had been replaced (Levin & Simons, 1997). Astonishingly, this phenomenon maintains its impact in natural settings. Simons and Levin (1998) demonstrated that 67% of university students did not notice that a stranger, with whom the participants had been discussing directions, had been replaced with by an individual wearing different clothing. Moreover, the phenomenon of change “blindness” extends beyond the sense modality of vision. In the auditory domain, it has been experimentally demonstrated that 60% of individuals cannot correctly determine the changing auditory stimulus among six sounds (Gregg & Samuel, 2008). Thus, across modalities and settings it has been reliably shown that perception is impoverished when adequate details are not retained. This implies that if one were to deliberately sustain attention across multiple details in a visual scene one could reduce change blindness. By enhancing one's sensitivity to change via active participation in perception one would begin to form more accurate representations, and subsequently, one would refine his or her perception.

2.2.2. *Inattentional blindness*

Inattentional blindness refers to the complete failure to notice an unexpected object or event when focusing on another object or event, as a result of attentional rigidity (Simons, 2000). Whereas change blindness refers to a gap in perception at the level one is attending to, inattentional blindness refers to a lack of perception concerning a level which is not immediately attended to. Like change blindness, inattentional blindness has been established as a strong and multi-modal phenomenon across settings. Mack and Rock (1998) demonstrated that when focused on tracking a distinct object in an artificial environment, 75% of participants failed to notice an unexpected object that appeared in their fixation point. Using a more lifelike paradigm, Simons and Chabris (1999) demonstrated that inattentional blindness extends beyond artificial environments. Said authors created a video of two groups of students, distinguished by white or black outfits, passing a ball within their groups. Around half way through the video, a woman dressed as a black gorilla walks through the student groups, beats her chest, and walks off. When attending to the basketball passes among the group of students wearing white, only 27% of participants noticed the gorilla.

In the auditory modality, Wood and Cowan (1995) have induced inattentional deafness. When focusing on a message being played in one ear, 71% of participants failed to notice that the message in the opposite ear was played backwards. Thus, across senses and environments, the perceptual deficit induced by rigid focus on stimuli has been reliably demonstrated. This data implies that if one were more proficient at deliberately flipping between levels of attention, he or she would be less susceptible to inattentional blindness. Active attentional directing, then, would afford a more multi-dimensional representation of the environment and thus refine one's perception.

2.2.3. *Perceptual biases*

Heuristics are general principles which reduce the complexity of judgment tasks to a set of simple operations (Tversky & Kahneman, 1974). For instance, humans use clarity as an indicator of distance, rather than performing cognitively and physically taxing operations to calculate distance. However, because heuristics are not cross-contextually sensitive, they inevitably result in perceptually-distorting-biases. In the case of the distance heuristic, for instance, disturbed clarity due to weather conditions results in underestimations of distance. Research in the cognitive sciences has uncovered many perceptual biases which arise from heuristic processing. Judgments concerning ambiguous images tend be directed by preferences (Balcetis & Dunning, 2006), readily accessible concepts (Balcetis & Dale, 2003), and environmental regularities (Tomassini, Morgan, & Solomon, 2010). Judgments concerning the incline of slopes seem to be guided by physiological conditions, as hills appear steeper for tired, elderly, unfit, and unhealthy people, as well as people wearing a heavy load (Bhalla & Proffitt, 1999). Judgments concerning the severity of a threat are influenced by the self-relevance of said threat, as individuals who tend to fear heights perceive ledges as taller than people with less fear (Teachman, Stefanucci, Clerkin, Cody, & Proffitt, 2008). Because biases skew actual perceptual information, biases corrupt the accuracy of perception. This implies that if one were to deliberately prevent automatic heuristic processing, subsequent biases would be prevented, and perception would be refined.

2.3. *The emerging active model*

Experiments demonstrating change blindness, inattentional blindness, and perceptual biases indicate that automatic and non-deliberate perceptual processing results in perceptions that are out of touch with reality. By establishing passivity as the source of impoverished perception, these experiments imply that active perception is a means to resolving perceptual gaps. For instance, if one were to intentionally squint to see clearer, shift eyes to uncover features, or maintain a gaze in order to be vigilant, one would be, more or less, actively perceiving and subsequently refining perception. Active perception may thus be understood as a qualitative deliberate focus through the senses. One is a less active perceiver if one rarely directs his or her own attention, seldom sustains attention deliberately, and does not resist heuristic or biased processing. Conversely, one is a highly active perceiver if one often deliberately directs and sustains his or her attention and resists heuristic and biased processing. In the change blindness, inattentional blindness, and perceptual bias experiments, participants demonstrated minimally active perception. The result of less active perception is an incomplete or distorted picture of the world, and subsequent misunderstanding, whereas the result of highly active perception is a model of the world which is deeply in touch with reality and thus apt for producing understanding.

Because perceptual development requires deliberate action, and perceptual refinement requires deliberate focus, it is apparent that perception is not a static process. Rather, the emerging model of perception in the cognitive sciences indicates that individuals must exercise perception in order to afford ideal contact with reality. This has been a central assumption of Buddhism since its establishment.

3. Buddhism

Buddhism is founded upon the *Buddha-Dharma,* Gautama Buddha's teachings concerning the cultivation of wisdom (Wallace & Shaprio, 2006) and the dissolution of *dukkha,* the sense of unsatisfactoriness which humans are prone to associate with unpleasant feelings, change, and unreliability (Teasdale & Chaskalson, 2011). Dukkha arises from *ignorance,* the incongruity between human projections of meaning and the true nature of reality. *Wisdom,* the synchronization of perception with reality that affords deep understanding, represents the inverse of ignorance (Santina, 2001). Thus, the cultivation of wisdom, one goal of Buddhism, results in the dissolution of ignorance and subsequent containment of dukkha, another goal of Buddhism. A central element of Buddha-Dharma is meditation practice, which synchronizes individuals to their environment, subsequently affording the cultivation of wisdom and the dissolution of dukkha (Santina, 2001).

Meditation broadly refers to the deliberate practice of concentrating on one's bodily sensations, emotions, thoughts, and mental objects (Thittila, 1992). The oldest and most pervasive Buddhist meditative practice, Vipassana meditation, concerns focusing attention on the present moment while detecting and disengaging sporadic thoughts in order to experience the flow of consciousness with a clear and neutral mind (Lutz, Slagter, Dunne, & Davidson, 2008). Today, derivatives of this sort of practice are termed mindfulness meditation (Bowen et al., 2006). Because the Buddha-Dharma was founded on mindfulness meditation (Thittila, 1992), and because this sort of meditation has been extensively studied, I will be exclusively refer to mindfulness meditation in my examination of meditation.

According to its definition, mindfulness meditation may be parsed into three interconnected practices: deliberate sustaining of attention, deliberate directing of attention, and deliberate interference of automatic cognition. Deliberate sustaining of attention refers to the maintenance of concentration on an object or a scene. Deliberate direction of attention refers to the switching of attention within or between scenes. Deliberate interference of automatic cognition refers to the disengaging of automatic and reflexive cognitive responses. The division of meditation into these three practices is supported by neural imaging data which demonstrate that meditation results in neuroplastic enhancements of neural structures associated with attentional sustaining, attentional directing, and executive control (Green & Turner, 2010; Lazar et al., 2005; Luders, Toga, Lepore, & Gaser, 2009; Vestergaard-Poulsen et al., 2009). Thus, meditation may be understood as a set of active-perceiving practices.

In the Buddha-Dharma, the active-perceiving practices of meditation are used to afford perceptual synchronization with reality, which gives rise to a deeper understanding of reality. In turn, this deeper understanding and connection resolves the incongruence between meaning and reality which is the basis of dukkha. In this way, Buddhism endorses active perceptual practices as a means to both cultivate wisdom and dissolve dukkha. Because meditation is vital to both of the central projects of Buddhism, and because meditation is essentially a set of active perceiving practices, active perception is clearly a vital component of Buddhism. Moreover, given that the Buddha-Dharma explicitly establishes meditation as a means to attain insight into reality (Santina, 2001), Buddhism asserts that active perception gives rise to refined perceptions which form the basis of deeper understanding. This conceptualization of perception is akin to the emerging characterization of perception in the cognitive sciences today.

Given that the Buddha-Dharma endorses meditation as a means to refined perception, we may verify the validity of an active model of perception by examining meditators' performances on change blindness, inattentional blindness, and perceptual bias tasks.

4. Verifying the active model

Because meditation is the deliberate practice of attentional directing, attentional sustaining, and the resistance of automatic processing, it should not be surprising that meditators exhibit enhanced attentional directing ability, enhanced attentional sustaining ability, and improved resistance of automatic processing (Lutz et al., 2008). Because these improved abilities correspond to the deficiencies which give rise to change blindness, inattentional blindness, and perceptual biases, theoretically, meditators should overcome these phenomena. For instance, change blindness is caused by an inadequate retention of details. Subsequently, the improved sustained attention ability, afforded by practicing meditation, enables meditators to focus on more details of a scene at once, thereby increasing their ability to detect change. Inattentional blindness results from attentional rigidity when focusing on one level of a scene. Because meditation improves attentional directing abilities, meditators are more apt to switch between objects of focus, and thus, are less susceptible to inattentional blindness. Perceptual biases result from reliance on automatic heuristic processing. Thus, because meditation affords greater aptness to resist automatic processing, meditators demonstrate fewer perceptual biases.

A handful of experiments in the cognitive sciences have established meditation as a means to refine perception. Meditation seems to improve detection of stimuli (Brown, Forte, & Dysart, 1984; Jha, Krompinger, & Baime, 2007), and reduce the refractory period on attentional blink tasks (Slagter et al., 2007). Moreover, meditators seem to be less misled by visual illusions (Tloczynski, Santucci, & Astor-Stetson, 2000). Thus, it should not be surprising that meditators experience less change blindness than non-meditators. Hodgins and Adiar (2010) demonstrated that regular meditators detect more changes than non-meditators on change blindness tasks, and meditators detected changes more quickly than non-meditators on these same tasks (Hodgins and Adiar, 2010). Likewise, meditators seem to experience less inattentional blindness than non-meditators. Cozza (2010) found that 42% of meditators noticed the unexpected stimulus in an inattentional blindness task, compared to 23% of non-meditators. Similar effects have been found concerning perceptual biases. For instance, meditators struggle less with the interfering bias to name colours during Stroop tasks, compared to non-meditators (Moore & Malinowski, 2009). Because meditation refines active perceiving abilities, and because meditators demonstrate more refined perception, meditation lends support to an active model of perception.

5. Conclusion

Both Buddhism and cognitive science regard perception as a process that can be refined via deliberate action by perceivers. Because both Buddhism and cognitive science have independently arrived at the same conception of perception, and because Buddhist practices provide support to the hypotheses posed by perceptual experiments which gesture towards an active-perception model, Buddhism and cognitive science can develop one another. For instance, the rich collection of meditative methods found across Buddhist schools provide a large set of active perceiving practices which can be used in experimentation in order to uncover a more nuanced model of perception in the cognitive sciences. The results of such experimentation inevitably identify the most useful techniques for perceptual refinement. Thus, Buddhist schools can utilize this data to adopt new and more effective practices that can facilitate the goals of Buddha-Dharma. As meditation experiments are becoming more rigid and popular in the cognitive sciences, it is likely just a matter of time before cognitive science and Buddhism co-develop a detailed and accurate model of perception that can be used to better cultivate insight into reality and subsequent well-being.

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