# The Role of Visual Imagery in Social Cognition

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Abstract

We outline the history of theoretical beliefs about mental imagery's status as a representational tool, and we review evidence supporting the current predominant view, focusing on visual imagery's relevance to social cognition. According to the current predominant view, visual imagery is a legitimate form of mental representation that functions specifically in representing concrete, perceptual information. However, emerging evidence suggests imagery may also have the capacity to represent abstract information, and we propose modifications of the current predominant view of visual imagery's function. We explore how variation in imagery ability and use, as well as perceptual qualities of images (e.g., vividness, visual perspective), corresponds with variation in social information processing. Evidence demonstrates the function of visual imagery in a wide range of social processes including attribution, impression formation, memory, emotion, persuasion, communication, and judgment and decision-making; with implications for understanding phenomena such as addiction, false memories, supernatural belief, and cultural differences.

Keywords:

visual imagery, mental simulation, mental representation, social cognition, vividness, visual perspective, abstraction

# The Role of Visual Imagery in Social Cognition

"The soul never thinks without an image." -Aristotle

The idea that mental imagery serves a representational function can be traced back at least as far as the ancient Greeks. People can experience mental imagery in all sensory modalities. In this chapter we focus on mental imagery in the visual modality, the most common modality in which people report experiencing mental imagery in their everyday lives (Kosslyn, Seger, Pani, & Hillger, 1990). Psychologists' views on the role of imagery in cognition have varied widely over the years, ranging from positions like Aristotle's—that imagery is the basis for all thought—to the other extreme—that images are irrelevant to cognition—and occupying various points in between. We begin with a brief overview of the history of views on imagery in psychology. We then elaborate on a predominant current view, focusing on the evidence as it relates to social cognition. We end by presenting recent findings that pose a potential challenge to this view and speculate about possible revisions.

## WHAT IS IMAGERY?

Before starting out it will be important to clarify exactly what we mean when we use the term, "imagery," in this chapter. Informally the term can be understood to refer to "pictures in the mind." For a more technical definition we turn to Stephen Kosslyn and his colleagues, who have conducted some of the most influential psychological research on visual imagery. In the words of these experts:

> A mental image occurs when a representation of the type created during the initial phases of perception is present but the stimulus is not actually being perceived; such representations preserve the perceptible properties of the stimulus and ultimately give rise to the subjective experience of perception. (Kosslyn, Thompson, & Ganis, 2006, p. 4)

This definition highlights two features of mental imagery that are essential to understanding and evaluating its role in cognition. First, imagery is fundamentally tied to sensory modalities. In the case of visual imagery this means that the brain recruits the visual system to form and maintain mental images. Second, images are characterized by a perceptual correspondence with objects and events they represent. These features of imagery distinguish it from other forms of representation that are proposed to be amodal—not tied to any particular sensory system—and do not bear any necessary resemblance to the objects or events they represent. For example, an image that represents the concept, "dog," has the visual properties one would perceive if encountering an actual furry four-legged Fido, whereas this is not true of a set of propositional statements or semantic associations that represent the concept, "dog," amodally.

A central question when it comes to evaluating the role of imagery[1] in cognition is whether imagery is functional, in the sense that it is involved in carrying out cognitive processes, or whether it is epiphenomenal, in the sense that it is a byproduct that serves no purpose in and of itself. The field has gone back and forth on this question over time, and the details of this history are an interesting topic in their own right (e.g., see Kosslyn, 1980; Kosslyn et al., 2006; Tye, 2000). For the purposes of this chapter it is most important just to hit the highlights, and it is these that we outline next.

## A BRIEF HISTORY OF IMAGERY

Imagery was a central topic of study in the early days of psychology. This was the time when introspection was the dominant tool for investigation, and upon introspection images can be quite prominent in mind. Wilhelm Wundt found them so prominent, in fact, that he came to a conclusion that echoed Aristotle's: images were the basis for all thought (Wundt, 1894). William James also deemed imagery to be a legitimate cognitive tool, although his introspections

[1]Henceforth, our use of the term, "imagery," in this chapter is intended to refer to visual mental imagery in particular, unless otherwise noted.

suggested a more circumscribed function: images serve to represent concrete objects, but words are used to represent abstract concepts (James, 1890/1910). James was not the only one who failed to experience imagery associated with all thought, and Wundt's position was challenged (e.g., Mayer & Orth, 1901; Marbe, 1901, as cited in Humphrey, 1951). Wundt countered this "imageless thought" critique with further introspective evidence, thus proving the futility of using this methodological tool as a basis for settling the debate.

The problems with introspectionism were not limited to the study of imagery, and behaviorism was a response to these problems. From the perspective of behaviorism, imagery was by definition irrelevant to understanding human psychology. According to John Watson, images were "sheer bunk" (1928, p. 76) and could be accounted for by subvocalizations that contained the information allegedly depicted in imagery. B.F. Skinner (1953) allowed that images might actually exist but argued that they were epiphenomenal and could be explained as conditioned behaviors. While behaviorism avoided the difficulties of studying mental contents, such as imagery, it also was unable to account for aspects of human functioning that depended on them.

Thus, the cognitive revolution was born, bringing new tools for studying internal representations, including imagery. Using these tools, Allan Paivio (1969) found that words differed in the extent to which they evoked imagery and that those that evoked imagery were better recalled. Roger Shepard and Jaqueline Metzler (1971) showed that the time it took to determine whether two rotated geometric figures were the same or different corresponded linearly to the angle they needed to be rotated to make the comparison. Stephen Kosslyn and colleagues demonstrated that the time it took to shift attention from one part of an imaged object to another corresponded to the physical distance between those two points on the physical object itself (Kosslyn, 1973; Kosslyn, Ball, & Reiser, 1978). Although such findings provided compelling support for the status of imagery as a functional form of representation, it was

possible to come up with explanations that accounted for them without relying on imagery, and Zenon Pylyshyn did just that (e.g., 1973). Known as “the imagery debate” the disagreement persisted for quite some time (see Tye, 2000). However, once again methodological advances and theoretical shifts helped move the understanding of imagery forward. Neuroimaging techniques provided converging evidence that helped resolve the debate for many (Kosslyn et al., 2006; Reed, 2010). Currently, there seems to be a good amount of agreement across areas of psychology about the legitimacy of imagery and also about its limitations. We outline this current predominant view next, focusing on the implications for social cognition.

## THE CURRENT PREDOMINANT VIEW

It is now generally agreed that imagery is a legitimate representational tool. Images exist as representations that are generated within the visual system and are perceptually isomorphic with the objects and events they represent. In addition, it is now widely believed that images play a functional role in cognition. However, it is also widely believed that as a representational tool, imagery has limitations. The predominant view holds that imagery is not the only form of representation, and it works better for some kinds of information and tasks than for others. We believe that emerging evidence presents potential challenges to the predominant view about the limitations of imagery; however, before discussing potential revisions to the predominant view we devote this section to reviewing the evidence that supports it, first outlining evidence to support claims about the legitimacy of imagery and then outlining evidence to support claims about the limitations of imagery.

### Imagery is Legitimate

One of the challenges in studying imagery is that images cannot be directly observed by anyone but the person having them. Luckily we have many more methodological tools at our disposal than the introspectionists did. While we still can’t look into people’s minds and see the images they report, we can look into their brains and see the patterns that are activated. Given

the topographical nature of coding in areas of primary visual cortex, this can come pretty close to directly observing mental images. For example, in one experiment participants visualized a geometric figure either in a vertical or a horizontal orientation. Corresponding differences in activation were observed in an area of primary visual cortex that codes the vertical or horizontal orientation of externally observed objects. In fact, the patterns of activation in this area when participants visualized the figure were nearly identical to those that appeared when participants viewed external images of the visualized figure (Klein et al., 2004). Other investigations have used more complex social objects and have found analogous effects. For example, there are areas of the brain that differentially activate in response to viewing faces versus places. These same areas are also differentially activated when people visually imagine faces versus places (O'Craven & Kanwisher, 2000). Whether or not these areas are necessarily unique to faces vs. places (cf. Gauthier, Skudlarski, Gore, & Anderson, 2000), the result does support the idea that the same areas involved in visual perception are involved in visual mental imagery.

Some elegantly simple reaction-time experiments provide converging evidence that these images are perceptually similar to actual objects they represent. Participants were presented with sentences describing events (e.g., *The ranger saw an eagle in the sky.*); after each sentence an outline of an object appeared and participants had to indicate whether or not the object was part of the event in the sentence. On trials in which the object had appeared, the outline either matched the shape implied by the sentence (e.g., eagle with wings outstretched) or mismatched that shape (e.g., eagle with wings folded). Participants were quicker to respond when the outline matched, suggesting that not only had they formed images of the events while reading the sentences, but that the perceptual features of the images matched the perceptual features of the events described (Zwaan, Stanfield, & Yaxley, 2002). Similar results were obtained in experiments where participants read sentences involving objects that would have appeared at varying levels of resolution (e.g., seeing a moose through foggy vs. clear goggles)

and then responded to photographs of those objects that varied in their resolution. Participants were quicker to respond when the resolution of the photograph matched the implied resolution in the sentence than when it did not (Yaxley & Zwaan, 2007).

Together, neuroimaging and behavioral data provide compelling evidence that imagery is "real:" images perceptually resemble the objects they represent and these images are based in the same brain system as visual perception. However, this sort of evidence does not itself establish the status of imagery as a representational tool. It could be that the visual system is indeed used to create pictures in the mind, but that these pictures are purely epiphenomenal. Indeed, people report that the majority of their everyday experiences of imagery occur spontaneously and seem to serve no identifiable purpose (Kosslyn et al., 1990). On the other hand, they also report sometimes using imagery deliberately to solve problems and to regulate emotion and motivation (Kosslyn et al., 1990). While individuals do have privileged access to the subjective qualities of their own mental images, self-reports about the processes by which cognition occurs are unreliable (e.g., Nisbett & Wilson, 1977). Thus, in order to establish the status of imagery as a functional tool, it is crucial to review evidence from experiments that objectively assess its role in cognitive processes.

## The Functional Role of Imagery is Legitimate

One approach to studying the functional role of imagery is to test the effect of impairments of the visual system. If images created by the visual system play a functional role in cognition, then impairments of the visual system should impair performance on tasks proposed to rely on imagery. Another approach to studying the functional role of imagery is to test the effect of variation in the perceptual qualities of images. If images serve a representational function, then variation in the perceptual qualities of those images should correspond with variation in information represented, and this should have consequences for responses made on the basis of those images. We will review evidence from each approach in turn. Together the

evidence provides strong support for the claim that not only are visual images "real" but that they are also used to carry out cognitive processes, thus establishing images as a legitimate representational tool.

### *Variation in Ability to Use the Visual System*

Impairments to the visual system produce corresponding impairments on tasks proposed to rely on visual imagery. Some evidence for this comes from studies of individuals with physical impairments to the visual system. For example, one case study followed a patient who underwent a medically necessary procedure to remove one side of her occipital lobe, thus reducing by half the width of the brain area used to topographically represent objects in visual space. Comparison of the horizontal and vertical span of the patient's mental images before and after the procedure revealed that the horizontal span in particular was reduced by roughly half, corresponding to the brain area removed (Farah, Soso, & Dasheiff, 1992). Other research has investigated congenitally blind individuals. It is possible to represent spatial relations without visual imagery, but fundamentally visual aspects of imagery should not be possible without the visual system and thus should not be observed in blind individuals. Indeed, while blind individuals can accurately perform tasks such as reporting on which letters of the alphabet have any curved lines (e.g., by simulating the motion of writing), blind individuals show impaired performance on tasks that require an understanding of a fundamentally visual property of the way objects appear in space—specifically, that objects appear smaller at greater physical distances (Arditi, Holtzman, & Kosslyn, 1988). Use of the visual system can also be manipulated temporarily by means of transcranial magnetic stimulation. Introducing a magnetic field over the area of the head where visual cortex is located causes impairments in visual perception and corresponding impairments on performance in tasks proposed to rely on imagery (Kosslyn, Pascual-Leone, Felician, Camposano, Keenan, Thompson, Ganis, Sukel, & Alpert, 1999).

Another way to interfere with the use of the visual system for creating imagery is by introducing a competing visual task. If visual processing resources are tied up in processing externally generated information they should be less available to form mental images, and thus performance that relies on them should be compromised. The implications for social cognition are demonstrated in an experiment on impression formation (Claypool & Carlston, 2002). Participants formed impressions about individuals on the basis of a photograph and verbal description. The photographs were either attractive or unattractive and the description was either positive or negative. After forming an impression, participants engaged in a distractor task that either involved the use of the visual system or not. Then, they were asked to rate the attractiveness of the individuals from the photographs. The visual distractor task, but not the control distractor task, reduced the effect of the photographs on judgments, suggesting that the visual system was needed to incorporate the visual information into the evaluation of the individual. Thus, regardless of whether the visual system is physically or behaviorally impaired, permanently or temporarily, corresponding impairments emerge in performance on tasks proposed to rely on imagery. This supports the idea that images created by the visual system play a functional role in cognition.

### *Variation in the Perceptual Qualities of Images*

Further evidence for the functional value of imagery comes from experiments that investigate variation in perceptual qualities of images. If images serve a representational function, variation in their perceptual qualities should correspond with variation in responses made on the basis of those images. Specifically, there should be evidence both that variation in the perceptual qualities of images causes corresponding variation in responses, and that people employ variation in perceptual qualities of images in the service of achieving corresponding effects on their responses. We review both sorts of evidence with regard to two sorts of variation in perceptual qualities: vividness and visual perspective.

*Vividness*

Images can vary in how vividly they depict the perceptual properties of objects and events. If this depictive aspect of imagery is functional, then the more clearly the image depicts the object or event, the better that image should function as a cognitive tool. In support of this logic, research from clinical psychology suggests that reduced image vividness is at least partly responsible for effects like the one we described earlier in which a competing visual task reduces the effectiveness of imagery. For example, engaging in a competing visual task reduces the vividness of traumatic images in individuals with post-traumatic stress disorder, and with this reduction in vividness comes a reduction in emotive response (Andrade, Kavanagh, & Baddeley, 1997).

Other research has applied a similar methodology to explore the implications for understanding and treating addiction. It has been proposed that when people crave addictive substances they form images of those substances that further intensify the craving, and thereby promote the addictive behavior (Kavanagh, Andrade, & May, 2005). Support for this hypothesis comes from research that tested the effect of image vividness on food cravings, which contribute to compulsive eating and binging. Engaging in a competing visual task reduces vividness of food imagery and thereby reduces cravings (Kemps, Tiggemann, & Hart, 2005; Kemps, Tiggemann, Woods, and Soekov, 2004; McClelland, Kemps, & Tiggemann, 2006). Notably, the same reduction in vividness and cravings does not occur when the competing task uses verbal processing (Kemps et al., 2005). Thus, reducing the vividness of imagery influences emotion regulation in the case of trauma and self-regulation in the case of food cravings.

Converging evidence that variation in the vividness of images produces changes in responses based on those images comes from research that investigates the effect of individual differences in the ability to create vivid images. This research uses a self-report questionnaire (e.g., Marks, 1973) that asks respondents to form a variety of different visual images and report

on how vivid those images are. On the basis of these responses individuals can be classified as more or less vivid imagers, and this classification is then compared with performance on tasks proposed to rely on imagery. One line of work used this approach to demonstrate consequences of image vividness for memory of social information. If images serve to represent information in memory, then when people form images, vivid imagers should remember more information. Indeed, when participants were instructed to recall information from a video interview, vivid imagers correctly recalled more information than did non-vivid imagers. This result was not due to vivid imagers just being better at memory in general; the memory advantage for vivid imagers emerged only when participants were asked to recall information from a video interview, not from an audio interview (Swann & Miller, 1982). In other words, when there was something to form a visual image of, vivid imagers performed better because they could form clearer images and these images functioned to aid their memory.

Not only does variation in the vividness of imagery have demonstrable psychological effects, but people also attempt to deliberately cultivate more vivid imagery to achieve certain effects. For example, in one well-publicized case a man who was accused of ritual satanic abuse of his children tried to vividly visualize the crimes he was accused of in an attempt to retrieve possibly repressed memories of these events (Wright, 1994). Through this process he came to believe in and confess to crimes that he initially denied. However, evidence suggests that his memories of these crimes may have been the result of his vividly visualizing them rather than his actually committing them. An investigator who was suspicious of the man's confessions made deliberately false accusations against him to test the effect on the man's later confessions. The investigator's suspicions were confirmed when the man came to confess to these fictitious crimes. Further evidence consistent with the idea that these false confessions were a result of the man's vivid visualizations comes from empirical research documenting that vividly visualizing fictitious autobiographical events can lead to the formation of false memories

(Hyman & Pentland, 1996). These results are troubling because guided imagery is a technique that many therapists report using to recover repressed memories of childhood abuse (Poole, Lindsay, Memon, & Bull, 1995). Vivid mental imagery is also deliberately cultivated in the religious rituals of many cultures such as. For example, novice shaman are trained in techniques to increase the vividness of their visual imagery of the supernatural and this appears to have the intended effect of heightening their feelings of spiritual awareness (Noll, 1985).

*Visual Perspective*

When it comes to social cognition, actions and events are an important source of information, and people often picture actions and events in their mind's eye when they think about them (Moulton & Kosslyn, 2009). Social events can be pictured from various vantage points. To the extent that images play a functional role in representing and processing information about social events, variation in visual perspective should correspond with variation in the information that is represented and have corresponding consequences for responses made on the basis of that information. Here we focus on the use of visual perspective in imagery to represent two aspects of events—motion and content—and we highlight implications for comprehension, memory, emotion, judgment, and culture.

*Representing direction of motion*. Motion is a central aspect of many events, ranging in significance from crossing the road to walking down the aisle. When motion occurs, it is possible to witness that motion as movement away from a vantage point or as movement towards a vantage point. There are subtle variations in language that implicitly code which reference point is intended (Fillmore, 1966). For example, when describing a wedding, the officiant would say that the bride "came" down the aisle (i.e., motion towards the self), whereas the tardy guest who made it into the back of the church just as the wedding march began would say that the bride "went" down the aisle (i.e. motion away from the self). Research on event comprehension

suggests that people also use imagery—specifically, the visual perspective of that imagery—to represent this aspect of motion, and, further, that this has consequences for emotion.

An early suggestion that people use visual perspective in imagery to represent direction of motion in social events came from experiments that measured comprehension time for pairs of sentences in which the first sentence specified a reference location (e.g., "Mary was reading a book in her room," implies a reference point inside Mary's room) and the second sentence described motion relative to that location (e.g., a person walking into Mary's room) (Black, Turner, & Bower, 1979). The key manipulation involved the verb used to describe the motion in the second sentence—it either implied the same reference point as was specified in the initial sentence (e.g., "John came in," implies that the action is perceived from a reference point inside Mary's room, as motion towards that point) or it implied a shift in reference point (e.g., "John went in," implies that the action is perceived from a reference point located somewhere outside Mary's room, as movement away from that point going into the room). Participants took longer to comprehend the information when a shift in reference point location was implied than when it was not. This result is consistent with the idea that people had been forming images of the event as a mode of comprehension: creating a new image from a different reference point perspective should have taken longer than maintaining an image from the reference point perspective already established.

While reference point perspectives from which an event is perceived can be specified in event descriptions (e.g., Mary's room in the experiment we just described), people also vary in the reference points they habitually tend to adopt, as a function of their tendency to understand events from others' perspectives. Those from Eastern cultures tend to understand events from others' perspectives more than those from Western cultures do, and evidence is consistent with the idea that imagery plays a role in supporting this cultural difference (Cohen, Hoshino-Browne, & Leung, 2007). For example, Asian-American participants were quicker to comprehend

sentences in a story about a friend when the language implied the friend's perspective as the reference point from which action was perceived (e.g., the teacher "came" towards the friend) than when it did not (e.g., the teacher "went" towards the friend), whereas Euro-American participants showed no such facilitation (Cohen et al., 2007).

These differences in comprehension time as a function of reference-point shifts are consistent with the idea that people use imagery to code the direction of motion in social events. Of course, it is also possible that processing was disrupted by a nonconventional use of language, rather than use of images. Further evidence for the imagery interpretation comes from research documenting differences in speed of comprehension based on past experience with seeing actions from the implied perspective (Jiang & Wyer, 2009). For example, men have more experience seeing someone walk into a men's restroom than women do; women have more experience seeing someone walk into a women's restroom than men do. People should be quicker to construct an image of a scene when it has been more frequently observed, so if people use imagery as a representational tool, people should be quicker to comprehend actions described with reference points that match their experience than with reference points that don't. Indeed, this is the case. Further, the effect is not limited to experiences that vary by gender—e.g., college students of both genders were quicker to comprehend "Frank went into the prison" than "Frank came into the prison," consistent with their lack of experience viewing events from inside a prison—and the effect is not dependent on familiarity with the events themselves (apart from the perspective from which they are most often observed). However, the effect is moderated by individual differences in chronic tendencies to use imagery. Some people tend to think with images more than others do (Childers, Houston, & Heckler, 1985), and it was only among those who tended to think in images that the past experience with seeing actions from specified reference points influenced comprehension (Jiang & Wyer, 2009). This is exactly what should happen if the effect depends on the use of imagery as a functional tool.

Converging evidence that this variation in imagery is serving a functional purpose in the processing of information, rather than simply being an epiphenomenon, comes from a follow-up study that measured emotional responses to events depending on the implied direction of motion in language. The emotion-evoking potential of some events varies depending on the physical location with which one witnesses them. For example, being inside a bank that is being robbed is more frightening than being outside of it. If images have a functional impact on the meaning that is represented, then emotional responses to events should vary depending on the implied reference point of motion, and this should be true only to the extent that people use imagery to represent the event. Indeed, "the robber came into the bank" produces a greater emotional response than "the robber went into the bank," but only among people who tend to think in terms of images (Jiang & Wyer, 2009). Thus, implied perspective in language influenced the emotional impact of events as a result of variation in a feature of images—their perspective. Together with the results of the comprehension studies, these findings show that people shift perspective in imagery according to the direction of motion implied and that this variation is not ephiphenomenal; it has consequences for event comprehension and emotional response.

*Representing the visual and psychological content of events*. In addition to occupying different positions relative to motion in a scene, different viewpoints also afford access to different visual details in a scene. For example, in a game of poker each player's viewpoint affords information about the cards in her own hands, but not the cards in the other players' hands (if everyone is playing fairly!). Different viewpoints also tend to be associated with access to different types of information. For example, in that game of poker, each player's viewpoint is associated with direct access to her own thoughts, feelings, and bodily sensations but not those of the other players, and each player's viewpoint affords her access to others' external appearance but not her own. To the extent that imagery plays a functional role in cognition, the perspective people use to picture a scene should influence the details incorporated into their

representation of it, and conversely people should shift perspective according to the details they intend to incorporate. We review evidence for such effects and highlight consequences for memory, emotion, judgment, and culture.

In an early investigation (Abelson, 1975), participants listened to a story about a character walking down a street lined with buildings. Participants had either been told to visualize the events from the perspective of the character, from the perspective of an observer on a hotel balcony, or they were given no visualization instructions at all. Afterwards they completed a surprise memory test for details in the story. On the cued-recall portion of the test, balcony-observer participants had better memory than did actor participants for "far visual details," features that were better viewed from the balcony vantage point (e.g., a sign above a bank building). Actor participants had better memory than did balcony-observer participants for details about the physical sensations the character experienced (e.g., sore arm, drinking hot coffee). In each of these categories no-visualization participants tended to score similarly to participants in the "wrong" perspective condition—that is, relatively poorly. Supporting the idea that these effects were the result of visual images, the differences between the perspective conditions were more pronounced among those with better visualization skills. Further, when asked to reproduce as much of the story as they could from memory, no-visualization participants recalled less overall than did participants in either of the visualization conditions, who did not differ in the amount recalled, although the content was again biased by perspective (Abelson, 1975). Other research replicated such effects of perspective-taking on memory when participants were instructed to visualize a scene from a character's perspective, but not when they were instructed to empathize with that character (Fiske, Taylor, Etcoff, & Laufer, 1979). This result provides converging evidence that the effects of visual perspective manipulations on memory for the content of events depend on visual imagery per se.

Just as people can form images of events they hear described in language, they can also form images of events they experienced in their own lives. And, given the reconstructive nature of memory, life events can be pictured from different perspectives as well: the *first-person* visual perspective that one occupied while the event was occurring or a *third-person* visual perspective that an observer would have had (Nigro & Neisser, 1983). The effect of perspective on the types of information recalled from one's own life events mirrors those observed in the experiments on memory for events described in stories. For example, in one experiment participants completed a series of manual tasks (e.g., folding paper with gloved hands to match an abstract model, throwing a basketball through a hoop, molding clay) and then were taken to a different room where they were asked to recall as much as they could of what they had just done. All participants were instructed to visualize the events, but some were instructed to use a first-person perspective and others were instructed to use a third-person perspective. First-person participants recalled more about their bodily sensations, affective reactions, and psychological states than third-person participants did. Third-person participants recalled more about their physical appearance and the spatial layout of the room than first-person participants did (McIsaac & Eich, 2002).

Investigations of memory for life events occurring spontaneously outside the lab, and at longer intervals, suggest a similar effect of imagery perspective on recall of emotions experienced during the event: people reported recalling more of their original emotion when using the first-person than the third-person perspective (although accuracy of these reports was not measured) (McIsaac & Eich, 2004; Robinson & Swanson, 1993). Experimental manipulations provide converging evidence that this effect reflects the representational function of imagery perspective. For example, people are especially likely to spontaneously adopt the first-person perspective to picture real life events when they are told to describe the feelings they experienced at the time, compared with when they are asked to describe the "concrete,

objective circumstances" (Nigro & Neisser, 1983). This work provides evidence for the function of first-person imagery in representing details about one's own internal experiences; other work provides converging evidence for the function of third-person imagery in representing details about how one appears from an external vantage point.

One line of research investigates the attributional consequences of variations in perspective. The well-known tendency for observers to attribute greater responsibility to actors than actors themselves do may be in part due to the fact that actors are more salient objects of attention from observers' point of view than from actors' (Jones & Nisbett, 1972). Consistent with this idea, research that uses video to manipulate actual visual perspective shows that people attribute more causal responsibility to the actor who was most visually salient from their experimentally assigned point of view (Storms, 1973; Taylor & Fiske, 1975). It turns out that visual perspective in mental imagery can have the same effect on attributions. For example, people were more likely to attribute their behavior in a social interaction to their personality traits when they visualized the interaction from the third-person perspective than when they visualized it from the first-person perspective (Frank & Gilovich, 1989).

Not only does the third-person perspective provide individuals access to information about how they appear from an external vantage point, but evidence also suggests that people may actively adopt the third-person perspective in imagery of past events when seeking out that very information. For example, people from Eastern cultural backgrounds are more likely than those from Western cultural backgrounds to adopt the third-person perspective when recalling situations in which they were the center of attention (Cohen & Gunz, 2002). This may be because Eastern cultures emphasize an interdependent self and thus encourage people to monitor how their behavior might be perceived by others in their social group. The third-person perspective could provide just this sort of information. Also, within Western culture women are more motivated than men to monitor how they appear to others in mixed-sex recreational

situations, and they are also more likely than men to adopt the third-person perspective when recalling past events of that type (Huebner & Fredrickson, 1999).

The evidence reviewed thus far supports the conclusion that imagery is "real": the pictures that people report experiencing in their minds share many of the properties and are represented using much of the same machinery as is visual perception of external objects. Further, evidence supports the conclusion that imagery is not merely epiphenomenal: variation in the use of the visual system corresponds with variation in the effect of visual information on judgment, and variation in the images people form corresponds to variation in what and how much people recall about events, how well they comprehend events, how they respond emotionally, and how they explain the causes of behavior. Cumulatively these findings explain why it is widely believed that the functional role of imagery is legitimate. We also noted that it is widely believed that the functional role of imagery is limited. We turn to the evidence consistent with this conclusion next.

## The Functional Role of Imagery is Limited:

### Images Specialize in Representing Concrete, Perceptual Information

> No image could ever be adequate to the concept of a triangle in general. It would never attain that universality of the concept which renders it valid of all triangles, whether right-angled, obtuse-angled, or acute angled; it would always be limited to a part only of this sphere. (Kant, 1781/1965, p. 182)

Kant's argues that the representational value of images is limited to the depiction of perceptual information. Because abstract ideas generalize beyond perceptual features, images should not be adequate to represent abstract ideas. Because perceptual features tend to be what define concrete, specific instances as such, imagery should be well-suited for representing concrete ideas and specific events. James (1890/1910) came to a similar conclusion, and

classic work in cognitive psychology suggests empirical support: concrete nouns are better remembered than are abstract nouns because only concrete nouns evoke imagery, and this facilitates memory (Paivio, 1969). On the basis of his work, Paivio (1986) proposed the dual-coding hypothesis: that information can be represented in two separate modes—one based on imagery and the other based on abstract meaning. The currently predominant view of imagery in cognitive psychology and social cognition reflects a similar assumption—that the brain uses amodal forms of representation, in addition to imagery. And, the functional value of imagery has to do with the representation of concrete information. There is a good deal of evidence that appears consistent with these conclusions, both from cognitive psychology and social cognition, as we will review next. However, to foreshadow where we will go after that, we believe that these tenets of the predominant view are the ones most likely to change in light of emerging evidence, and we will conclude the chapter with a discussion of potential revisions.

### *Evidence from Cognitive Psychology*

As did Paivio's model, currently dominant models of imagery in cognitive psychology make the assumption that the brain uses dual or multiple systems of representation: sensory forms (e.g. visual imagery) and amodal forms (Kosslyn et al., 2006; Reed, 2010). By these accounts, the function of imagery stems from the fact that it makes perceptual information about objects and events immediately apparent, and thus the function of imagery should be analogous to the function of vision (Kosslyn, 1995). One function of vision is to track moving objects (e.g., for the purpose of navigation and action control). Correspondingly, evidence mentioned earlier shows that imagery is also used to track motion, as when comprehending action in events (Bower et al., 1979; Cohen et al., 2007; Jiang & Wyer, 2009). Imagery ability has also been shown to predict performance at sports that rely on precise planning of motion through space (e.g., MacIntyre, Moran, & Jennings, 2002).

A second function of vision is to identify the features and orientation of objects. Correspondingly, evidence mentioned earlier shows that imagery is used to represent the features and orientation of objects (Klein et al., 2004; Yaxley & Zwaan, 2007; Zwaan et all, 2002). Kosslyn (1995) argues that people are especially likely to use imagery to access information about perceptual features of objects when those features have not previously been explicitly considered or labeled and thus cannot be inferred based on semantic knowledge (e.g., People tend to report using imagery to respond to the question, "Which is darker green, a Christmas tree or a pea?"). When people do have semantic knowledge they report relying on that instead.

Results from research on eyewitness identification are consistent with Kosslyn's claim (Schooler & Engstler-Schooler, 1990). Face perception typically operates on the basis of perceptual gestalt, which is not well captured in language (Fallshore & Schooler, 1995). And, instructing people to verbally rehearse the features of faces reduces eyewitness identification accuracy relative to instructing them to rehearse mental images or providing no instructions at all, which produce equivalent levels of accuracy (Schooler & Engstler-Schooler, 1990). Thus, in a domain where people do not typically have semantic knowledge because perception relies on a perceptual gestalt, they tend to use a form of representation—imagery—that captures the appearance of the gestalt directly. However, inducing people to "translate" the perceptual information into semantic knowledge leads them to rely on that instead, reducing their accuracy because perceptual gestalt is not well captured in language. This result, along with the fact that accuracy is equivalent in the imagery and no-instruction conditions, supports the idea that imagery functions to provide direct access to perceptual information.

Other research suggests that, as a result of highlighting perceptual features, imagery promotes a concrete understanding of objects and ideas. Participants received instructions to study a list of animal names either by picturing each animal or by repeating the names verbally.

Later participants were asked to provide associations to each animal name. Those who had used visual imagery to study the animals were more likely to provide associations that related to physical features of the animals (e.g., dog → brown) whereas those who had used verbal processing were more likely to provide associations based on category membership (e.g., dog → animal) (Aylwin, 1977). Picturing the object leads people to understand its verbal label in terms of the specific instance that was visually represented, whereas thinking about the verbal label itself leads people to understand it in terms of its abstract meaning in relation to conceptual structures. Thus, changing the format of the representation appeared to change the stimulus itself, defining it either as a specific instance or as representative of a category.

Support for the idea that it is the visual component of imagery that is responsible for promoting a concrete construal of the stimulus comes from research that manipulated whether stimulus objects were presented using verbal labels or line drawings. Concrete construals of stimuli are linked to psychological closeness (e.g., temporally, socially; Trope & Liberman, 2010), and a series of experiments showed that people interpret information as closer on a variety of dimensions (e.g., temporal, cultural) when it is conveyed in pictures than in words (Amit, Algom, Trope, & Liberman, 2009).

### *Evidence from Social Cognition*

To the extent that models of social cognition explicitly consider the role of imagery, they tend to adopt the same basic assumptions as the cognitive models do. First, these models assume that the brain uses amodal forms of representation in addition to imagery. And, second, these models assume that as a result of depicting perceptual features of objects and events, imagery functions in representing and reasoning about specific, concrete instances rather than representing and reasoning about abstract concepts or semantic knowledge (Carlston, 1994; Wyer & Radvansky, 1999; Wyer, 2004). For example, according to Wyer and Radvansky (1999), when comprehending a statement people first represent it in terms of its semantic

meaning and then only if the information pertains to a temporally and situationally constrained instance do people construct a mental simulation involving imagery. Thus, people would use imagery to represent the statement, “the man bought a car” but not to represent “the man owns a car.” Earlier we described experiments in which participants used imagery in the process of representing and comprehending social information presented in language (Black et al., 1979; Jiang & Wyer, 2009; Zwaan et al., 2002). The information tended to pertain to specific events (e.g., “The ranger saw the eagle in the sky,” or “John went into Mary’s room.”), and this may have been crucial in producing the effects that were observed.

Evidence from a variety of domains is consistent with the idea that imagery specializes in the processing of information about specific instances rather than abstract facts. We describe findings that illustrate implications for persuasion, emotion, and judgment and decision-making.

*Persuasion*. Research in persuasion is consistent with the idea that people are more likely to experience imagery when processing information about specific instances than about abstract facts. And, as should be the case if this selective use of imagery is functional, imagery appears to contribute to the persuasive power of appeals that rely on narratives about specific instances, but not appeals that rely on abstract facts. According to the transportation-imagery model of narrative persuasion, visual imagery evoked by narratives of specific events promotes transportation—a state in which the reader becomes absorbed in the story and leaves the real world behind (Green & Brock, 2002). And, when people are more transported into a narrative they are more likely to change their attitudes to fit the themes of the narrative (Green & Brock, 2000). For example, after reading a story about a young child who was brutally stabbed to death in a mall parking lot by a psychiatric patient, participants who reported being highly transported into the story, imaging in vividly, later estimated that violence was more common and the world was less just compared to participants who reported low levels of transportation..

Further evidence that imagery enhances the persuasiveness of narratives of specific events comes from a study in which researchers measured individual differences in the vividness of visual imagery and then assigned participants to view one of two videotapes of a media story about a UFO sighting (Sparks, Sparks, & Gray, 1995). One version was the original news story containing images of the alleged UFO. The other version was the same news story with the UFO images edited out. When participants saw the unedited version, high and low vivid imagers did not differ in their ratings of the believability of the story or their belief in UFOs. However, when participants saw the edited version, high vivid imagers rated the story as more believable and reported more belief in UFOs than did low vivid imagers. These results suggest that when no images of the UFO were shown to participants, the high vivid imagers generated their own mental imagery of UFOs and thereby found the story more persuasive. Thus, vivid imagery evoked by narratives of specific events appears to enhance the effectiveness of those narratives in shaping people's attitudes.

Other evidence suggests that whereas imagery contributes to the persuasion process as it occurs in response to narratives of specific events, imagery does not contribute to the persuasion process as it occurs in response to abstract facts (Adaval & Wyer 1998; Petrova & Cialdini, 2005). For example, imagery instructions and the presentation of supporting photographs strengthened the persuasive power of a travel advertisement that followed a narrative format, leading to a significant increase in persuasion when both were included. This did not occur when the advertisement was structured in a factual format (Adaval & Wyer 1998). Conversely, whereas attitude change in response to appeals based on abstract facts is reliably correlated with individual differences in need for cognition, attitude change in response to imagery evoked by narratives of specific events is not (Green & Brock, 2000).

Converging evidence that narrative persuasion reflects the use of visual imagery per se comes from an experiment that manipulated participants' ability to use the visual system in

processing information from radio advertisements (Bolls & Muehling, 2007). These advertisements were either high or low in imageability, as determined by pilot test ratings. Inspecting the content of the advertisements reveals that highly imageable ads tended to use a narrative format (e.g., a story in which a woman's business presentation was saved by AT&T fax service) whereas low imageable ads consisted of appeals based on factual information (e.g., dexterity is needed to button the fly of Levi's jeans). While listening to the advertisements, some participants were assigned to engage in a competing visual task and others were not. Later evaluation of the products in the advertisements revealed that the visual task reduced effectiveness of high-imagery radio advertisements but had no effect on the effectiveness of low-imagery advertisements. These results are consistent with the idea that the effectiveness of the narrative advertisements depended on the visual system to produce imagery whereas the effectiveness of the factual advertisements did not. Narratives depict a specific, concrete instance whereas abstract facts do not. Thus, the evidence that people use imagery when processing narratives in particular, along with the evidence that imagery contributes to the persuasive impact of narrative appeals in particular, is consistent with the idea that imagery specializes in representing concrete information.

*Emotion*. Other research has investigated the effect of imagery on emotion, suggesting that imagery enhances emotions in part because it focuses people on the concrete features of an emotionally charged event. In a series of experiments participants listened to emotional scenarios and were instructed either to visualize them or to focus on the verbal meaning. Imagery increased the emotional impact of the scenarios, increasing negative feelings in response to negative scenarios (Holmes & Mathews, 2005) and increasing positive feelings in response to positive scenarios (Holmes, Mathews, Dalgleish, & Mackintosh, 2006). Analysis of the subjective interpretations of scenarios when they were imaged versus processed verbally supports the idea that imagery produced a greater emotional response by leading people to

think about the scenarios in more concrete and specific terms. Participants who were instructed to visualize the scenarios were more likely to think of the scenarios as involving the self, specific events, and specific emotions and sensations, whereas participants who were instructed to verbally process the scenarios were more likely to call on generic semantic knowledge with less personal and emotional impact (Holmes, Mathews, Mackintosh, & Dalgleish, 2008).

*Judgment and decision making*. Research in judgment and decision making is also consistent with the idea that people process information more concretely when they use images to represent it rather than words. According to dual-process models, judgments are the product of an intuitive system that is automatic, fast, capable of parallel-processing, associative, holistic, and affective and a rational system that is intentional, slow, reliant on serial processing, rule-based, analytic, and relatively cold (Epstein, 1994; Kahneman & Frederick, 2002). These models propose that the intuitive system operates primarily on concrete, imagistic representations (Epstein & Pacini, 2000-2001; Kahneman & Frederick, 2002, Slovic, 2007). If images function to create such representations, then processing information via imagery should be more likely to evoke intuitive processing than should processing information without using imagery.

One experiment that supports this hypothesis investigated the effects of imagery on the ratio bias. This bias is the preference to play a gambling game in which one selects items from a large bowl containing 10 winning items and 90 losing items over playing the same game with a small bowl containing 1 winning item and 9 losing items (Kirkpatrick & Epstein, 1992). People feel that they have a stronger chance of winning with the large bowl because the concrete number of winning items in the larger bowl is much larger than in the smaller bowl, even though the abstract ratio is the same. The ratio bias is believed to result from intuitive processing because most people acknowledge that the preference for the large bowl is illogical even as they feel intuitively compelled to prefer it (Kirkpatrick & Epstein, 1992). People exhibit the ratio

bias when they are asked to choose between two real bowls but not in a hypothetical version of the game in which the bowls and their contents are described in words (Kirkpatrick & Epstein, 1992). However, if in the hypothetical version participants are instructed to form visual images of the two bowls before expressing a preference between them, they exhibit the ratio bias about as much as participants who play the real version of the game (Epstein & Pacini, 2000-2001). Furthermore, in the hypothetical version with visualization instructions, participants who report poor visual imagery do not exhibit the ratio bias. Thus the power of the visualization instructions to induce the bias appeared to rely on the formation of images.

Other findings are also consistent with the idea that representing information by means of imagery promotes intuitive processing. Implicit measures provide a window on intuitive processing by capturing responses in the relative absence of rational elaboration. If images evoke intuitive processing, then implicit measures should predict participants' responses better when participants represent information in terms of images than when they do not. Evidence supporting this logic comes from an experiment in which participants were led to believe that they would be interacting with another student in a situation that would offer the opportunity to express power and affiliation motives (Schultheiss & Brunstein, 1999). First, all participants completed implicit measures of their power and affiliation motives. Next, some participants were instructed to visualize the upcoming social situation whereas others received no such visualization instructions. Then, all participants completed measures of their affective state and their commitment to success in the interaction. Participants' implicit motive scores were significant predictors of their affective responses and goal commitment in the imagery condition but not in the control, no imagery condition. This suggests that mental imagery facilitates the engagement of intuitive processes (Schultheiss & Brunstein, 1999).

The idea that intuitive processing depends on imagery could explain some of the limitations and shortcomings of intuitive processes. For example, people's affective responses

to a situation are remarkably insensitive to information about the scope of a problem (Hsee & Rottenstreich, 2004, Slovic, 2007) or the probability of various outcomes (Rottenstreich & Hsee, 2001). Scope and probability tend to be abstract features of events, and if the function of imagery is limited to representing concrete information then imagery should not be an effective medium for encoding information about scope and probability. To the extent that people's intuitive emotional responses to events depend on the images those events evoke, then these affective responses should be insensitive to information about scope and probability. So, people may be willing to pay approximately the same amount to save 2,000 migratory birds from an oil spill as they are to save 200,000 birds because the mental image that they form of an oil-drenched bird, and thus the feelings of outrage they experience, are likely to be the same regardless of the number of birds at risk (Kahneman & Frederick, 2002).

Although as devices for representing concrete, perceptual information images may tend not to include information about scope and probability, Slovic (2007) suggests that it is possible to use creative techniques to incorporate scope information into visual imagery and thereby enhance emotional responsiveness to scope information. To illustrate this point, Fetherstonhaugh, Slovic, Johnson, and Friedrich (1997) review examples of activists who attempt to make the scope of social problems imageable through techniques like imagining the 170 million people executed in state-sanctioned killings during the 20$^{th}$ Century as "a chain of bodies laid head to toe reaching from Honolulu, across the Pacific and the continental U.S., to Washington D.C. and then back again more than 16 times" (p. 284). Thus, by making abstract information about the scope of a problem more concrete and imageable it may be possible to influence people to be more emotionally responsive to scope.

Considering the evidence we have reviewed in this section, it makes sense that there is widespread agreement that the function of imagery is limited to representing concrete, perceptual information. Results appear consistent with the idea that imagery specializes in

processing the details of specific instances as opposed to general, abstract facts. And, results also appear consistent with the idea that this use of imagery has corresponding functional consequences, shaping processing to rely on specific, concrete instances. Further, these effects have been observed in a wide range of contexts: narrative persuasion, emotion, motivation, and intuitive judgment. If it sounds like we are hedging our bets in summarizing this evidence, it is because we are. While we do not doubt the quality of the evidence, we do think that there is reason to hold off on using it to draw definitive conclusions about the representational limits of imagery. If the history of study on this topic has taught us anything, it's that another change in understanding could be right around the corner. In the next, and final, section of this chapter we review some findings that suggest it may be reasonable to reconsider the conclusion that the functional value of imagery is limited to representing concrete, perceptual information, and we speculate on various ways this conclusion might be modified.

## DOES THE CURRENT PREDOMINANT VIEW NEED REVISION?

Although, as the previous section demonstrates, there is widespread agreement that the function of imagery is limited to representing concrete, perceptual information, there is some evidence that suggests the possibility that imagery could be a more flexible form of representation. We already mentioned speculation about creative ways that abstract information could be made concrete in order to incorporate it into imagery (Slovic, 2007). However, it may not only be possible to incorporate abstract information into concrete images but it also may be possible to manipulate imagery to affect whether people think abstractly or concretely about the same set of information. We begin this section by reviewing some of this evidence (for a more complete review see Libby & Eibach, 2011a). The findings challenge the idea that the representational value of imagery is limited to its ability to depict concrete, perceptual information. The evidence suggests that simply varying a qualitative feature of event imagery—

specifically, the visual perspective from which is constructed—allows images to function either to represent the concrete features of an event or to represent its abstract meaning.

For example, in a series of experiments (Libby, Shaeffer, & Eibach, 2009) participants pictured themselves engaging in a variety of actions (e.g., locking a door, painting a room, voting). They received instructions either to form the images from their own first-person perspective or from an observer's third-person perspective. After they had formed the image of each action (e.g., voting) they were given two potential descriptions of it: both were accurate, but one was concrete, describing the specific, observable motions involved in the action (e.g., pulling a lever), and the other was abstract, framed in terms of traits, goals, or identities (e.g., influencing the election). Results revealed an increased preference for abstract descriptions when participants used the third-person as opposed to first-person perspective to picture themselves doing the actions. In another experiment participants also pictured themselves engaging in the actions, but this time the actions were introduced either in concrete or abstract terms (e.g., pulling a lever while voting vs. influencing the election while voting) and participants were simply instructed to picture themselves doing the actions from whichever perspective they chose. Results revealed an increased tendency for participants to use the third-person perspective when the actions were described in abstract as opposed to concrete terms (Libby et al., 2009).

Other experiments replicated these findings using the same designs but manipulating and measuring visual perspective with photographs rather than mental imagery, thus supporting the idea that the findings are indeed a product of visual images. Earlier we noted that different visual perspectives often afford access to different information in a scene; however, the relationship between perspective and abstraction does not depend on such differences. Evidence shows that the link between perspective and abstraction only became stronger when visual perspective was manipulated with photographs that varied visual perspective

independent of the objects that were visible in the scene and the physical distance to the action (see Figure; Libby et al., 2009, Shaeffer, Libby, & Eibach, 2011). Thus, the effect of perspective on action construal appears to be a function of the point of view on the action and not variation in which objects are depicted in the scene, nor the physical distance to the action. Together these findings suggest the possibility that the representational value of imagery may not be limited to depicting concrete, perceptual details. Imagery – in this case, third-person imagery – seems to have the potential to represent more abstract interpretations.

Further evidence provides additional support for this idea and demonstrates the implications for social cognition. One set of studies shows that when people recall and imagine real life events, thinking about those events in terms of what they mean in their lives more broadly, as opposed to thinking about the concrete details of what happened, makes people more likely to picture the events from the third-person perspective (Libby & Eibach, 2011b). Other research demonstrates that manipulating perspective influences the extent to which people think about actual life events abstractly in terms of the meaning in relation to their general self-knowledge, and this has consequences for self-judgment, emotion, motivation, and behavior (Libby, Eibach, & Gilovich, 2005; Libby, Valenti, Pfent, & Eibach, in press; Libby, Shaeffer, Eibach, & Slemmer, 2007; Valenti, Libby, & Eibach, 2011; Vasquez & Buehler, 2007).

For example, using the third-person as opposed to first-person perspective to picture working on an upcoming assignment caused students to construe that assignment in terms of its relevance to their academic goals more broadly, and this caused them to be more motivated to complete the project (Vasquez & Buehler, 2007). A similar effect was observed on actual behavior in an experiment that manipulated the perspective that citizens used to picture themselves voting in an upcoming election. Using the third-person perspective caused citizens to be more likely to actually turn out to the polls (Libby et al., 2007).

Other work shows that the accessibility of self-knowledge is more biased by abstract self-beliefs when people picture events from the third-person as opposed to first-person perspective, and emotional responses to those events show the same pattern (Libby et al., in press; Valenti et al., 2011). For example, picturing a past personal failure from the third-person as opposed to first-person perspective caused the accessibility of positive versus negative self-knowledge to be more biased in the direction of participants' trait self-esteem. Accordingly, using the third-person perspective to picture failure decreased feelings of shame amongst those with high self-esteem but increased feelings of shame amongst those with low self-esteem (Libby et al., in press).

Earlier we described research suggesting that people report reliving emotions more from the first-person perspective, and this effect is often interpreted to mean that first-person imagery is necessarily more emotional (e.g. McIsaac & Eich, 2004). However, the greater reliving reported with first-person imagery may be limited to emotions that reflect an immediate response to the concrete situation—e.g., fear in response to being approached by an assailant. Other types of emotional responses—e.g., shame in response to failure—reflect the event's abstract meaning when considered in the broader context of one's life. When this level of construal increases the emotional impact of an event—e.g., in the case of low self-esteem individuals recalling failure—third-person imagery increases rather than decreases such emotional responses (Libby et al., in press). This result supports the idea that third-person imagery represents events in terms of their meaning in relation to abstract self-knowledge structures.

Thus, evidence from experiments that measure the visual perspective that people spontaneously adopt in their imagery reveals that an effort to frame an event abstractly in terms of general self-knowledge, as opposed to concretely in terms of its specific details, causes

people to use the third-person perspective. And, research that manipulates the perspective that participants adopt in their imagery reveals that using the third-person, rather than first-person imagery, to picture an event causes people to understand that event abstractly in terms of their general self-knowledge rather than specific details. Together these findings are consistent with the idea that imagery can function to represent abstract ideas, in addition to functioning to represent concrete information. Our purpose in presenting this evidence is not to provide definitive proof of this hypothesis, but rather to suggest that it is reasonable to consider the possibility. Next, we speculate on ways the currently predominant view of imagery's limitations could be revised to incorporate a functional role of images in representing abstract ideas, and we identify open questions that these speculations highlight.

## Alterative Accounts of How Imagery May be Used to Represent Abstract Information

*The nuclear option*. One possible interpretation of the emerging evidence that imagery can function to represent abstract ideas is to conclude that Aristotle was right: images are fundamentally involved in representing all thought, including abstract thought. Thus, rather than there being two modes or systems of representation, as the currently dominant view suggests, there is only one and it is based in imagery. This may seem at odds with findings we reviewed that distinguished effects of imagery from non-imagistic thought. And, wasn't it the failure to account for "imageless thought" that sunk Wundt's image-based theory so long ago? However, emerging theoretical frameworks and new evidence about how cognition works suggests that the experience of "imageless thought" need not be at odds with the idea that imagery is involved in representing all knowledge.

Embodied theories of cognition propose that all knowledge is grounded in modality-specific representations that employ sensory-motor systems (Barsalou, 1999; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005). This claim directly contradicts a fundamental assumption of the predominant view on imagery that we have outlined here. That

view assumes that images function as part of a representational system separate from (although interacting with) amodal forms of representation. But, in embodied accounts there are no amodal representations; people use sensory-motor systems even to represent abstract information. There is compelling evidence to support this theory. For example, people systematically attribute specific spatial relations to abstract concepts such as hope and respect (Richardson, Spivey, Edelman, & Naples, 2001), and processing these abstract words activates the associated spatial dimension (Richardson, Spivey, Barsalou, & McRae, 2003). Other work demonstrates that the abstract concepts of personal warmth and importance are associated with and activated by concrete sensations of physical warmth (Williams & Bargh, 2008) and physical heaviness (Jostmanns, Lakens, & Schubert 2009), respectively. One reason that such findings are so intriguing is that introspection provides no evidence of the involvement of sensory and motor systems that the results suggest is occurring. This speaks to a fundamental idea in embodied theories, which is that much of the perceptual representation on which thought is based occurs outside of conscious awareness.

At first the idea of non-conscious imagery seems like an oxy-moron: imagery is typically thought of as fundamentally defined by subjective experience. In fact, we ourselves defined visual imagery that way in the introduction of this chapter. However, other phenomena that people typically think of as defined by subjective experience have been shown to operate non-consciously—for example, emotion (Winkielman & Berridge, 2004). Further evidence supporting the idea of non-conscious imagery comes from the phenomenon of “blindsight” (Weiskrantz, Warrington, Sanders, & Marshall, 1974) Individuals with this condition report not to be able to see anything in a particular region of their visual field, yet reliably can respond appropriately to information presented there. This demonstrates that the visual system can represent and process information without conscious awareness, suggesting that non-conscious imagery could be possible.

The idea that images can be non-conscious invites a reframing of results we presented earlier suggesting that responses to information differ depending on manipulations that instruct people to use image-based processing or alternate forms. Instead, these results may reflect a difference in response depending on whether images are conscious and intentional as opposed to non-conscious and unintentional. This maps onto the broader question about the role of consciousness in cognition more generally (Winkielman & Schooler, 2008). This question has yet to be definitively answered. However, there are other examples in which the same process appears to operate differently when conscious as opposed to non-conscious (e.g., people's attitudes may change when they consciously examine the reasons for their preferences; Wilson, Dunn, Kraft, & Lisle, 1989) and even evidence consistent with the argument that consciousness serves a functional purpose (Hoffmann & Wilson, 2010). Thus, the idea that conscious imagery could be functionally different from non-conscious imagery would not be unprecedented. It would be a radical overhaul, though, of predominant views on imagery to claim that images are the representational form for all thought.

*The Goldilocks option*. A potentially less radical revision would maintain the notion that images are not the only form of representation. However, analogous to the idea that words can be used to represent both concrete and abstract ideas, it could be the case that images can also be used to represent both concrete and abstract ideas. If we retain the idea that there are multiple modes of representation, then an important question is how they interact. Paivio's (1969) classic work suggests that concrete words create a link from amodal (verbal) and sensory (visual) forms of representation: concrete words activate images of their referents. It could be the case that certain forms of imagery, for example third-person imagery, create a link from visual representation to amodal representation. If this were true, the results suggesting that third-person imagery promotes abstract representations could reflect third-person images

activating relevant amodal representations such as semantic knowledge. This would be complementary to Paivio's finding that concrete words activate visual representations.

In addition to considering how imagery and amodal varieties of representation interact, it would also be important to resolve whether the two modes have equal capacities to represent information along the dimension of abstraction or whether images are still generally better for representing concrete information and amodal forms for representing abstract information, even though there may be overlap in the ranges they can represent. To distinguish between these possibilities with regard to the function of perspective, in particular, it would be informative to know how first- and third-person imagery compare with non-visual processing of events. None of the experiments we referenced linking perspective to abstraction included non-imagery conditions.

It is possible that there are a variety of dimensions on which images can vary, allowing them to represent abstract ideas. The evidence that we are aware of, and presented in this chapter, focused on variation in the perspective of images depicting experiences, actions, and events involving social agents. To the extent that the ability of images to represent abstract information is limited to variation in imagery perspective, it is possible that the abstract functions of imagery are limited to representing information about social events (see Kosslyn & Kagan, 1981, for a relevant discussion of the potential role of imagery in social cognitive development).

Concepts from the study of memory suggest one way to conceptualize the role of imagery perspective in representing social event information at different levels of abstraction. Episodic memory involves representing the experience of a specific event, whereas semantic memory involves representing abstract knowledge, apart from the experience of the event in which it was acquired (Tulving, 1972). Given that much of the same mental machinery is used in recalling the past as in thinking about the future, it has been proposed that these two forms of representation are also relevant for understanding how people represent information about the

future (Atance & ONeill. 2005; Schacter, Addis, & Buckner, 2007). In the research we reviewed implicating third-person imagery in abstract representation, picturing specific actions and events from the third-person perspective led people to define those actions and events in terms of abstract knowledge about traits, goals, and identities. Third-person imagery could function by creating a link from episodic representations to semantic knowledge.

Evidence consistent with this interpretation comes from a series of experiments that involved participants' memory for events that occurred in their childhoods (Libby, 2003). In one experiment participants were first asked to indicate which incidents on a list had actually occurred, but the wording of the questionnaire was manipulated. Participants were either asked to indicate which items on the list they "remember doing" or they were asked to indicate which items on the list "happened to you." In both conditions participants were asked to recall the events they endorsed and to report the visual perspective they used. Participants were more likely to use the third-person perspective when the events were identified as ones that had "happened to" them as opposed to ones they "remembered doing". "Remember doing" references a specific instance whereas "happened to you" can rely on semantic knowledge. Thus, the results are consistent with the idea that first-person imagery is used to represent episodic information and third-person imagery is used to represent semantic information.

Follow-up experiments suggested that not only does perspective vary according to the type of representation people are referencing but that the perspective of images serves as a cue to identify event information as episodic or semantic. Participants were either instructed to use the first-person or third-person perspective to imagine events having occurred in their childhood that had in fact not. Later, participants were asked to complete the same inventory of childhood events that was used in the initial experiment, and the wording was manipulated in the same way. The false childhood events appeared on the list, and participants' tendency to endorse those events as having occurred depended on the match between the perspective they had

used to imagine them and the wording of the questionnaire. The pattern of results suggested that when participants were asked to indicate events that they "remembered doing" they evaluated their memories for evidence of episodic knowledge, and first-person images they had generated of the false events were more likely to be mistaken as that sort of evidence than were third-person images. When participants were asked to indicate events that "happened to" them they evaluated their memories for evidence of semantic knowledge, and third-person images were more likely to be mistaken for that sort of evidence than were first-person images. Thus, together with the earlier experiment, these findings are consistent with the possibility that imagery plays a functional role in representing both episodic and semantic knowledge about the self, with perspective serving to define the representation one way or the other.

To summarize, the evidence showing that imagery is implicated in at least some abstract representations suggests that it may be necessary to revise the consensus view that imagery only supports concrete thought. Future research will determine how extensive the revision to the existing consensus will need to be. One possibility is the radical revision suggested by embodied cognition, which proposes that all thought, including highly abstract concepts, may be dependent on sensory imagery. Another possibility is a more modest revision which maintains the consensus opinion that imagery primarily specializes in representing concrete information but proposes that certain types of imagery—e.g., third-person imagery—may be functionally implicated in abstract representations in a limited set of contexts—e.g., those involving social agents.

## CONCLUSION

The field's understanding of imagery is still evolving. At this stage it seems safe to conclude that images are "real" in the sense that they are visual representations created within the visual system that are perceptually isomorphic with the objects they represent. In addition, it

seems safe to conclude that images play a functional role in cognition. When it comes to the boundary conditions of this function, the picture is not quite as clear. While there is a good deal of evidence that appears consistent with the idea that images function specifically for representing concrete, perceptual information, other evidence supports the exciting possibility that images also have the capacity to represent more abstract information. We look forward to the next methodological and theoretical advances that will bring us closer to knowing whether or not Aristotle was right all along.

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Figure

An example of the distance-controlled action photograph pairs used to measure and manipulate visual perspective in studies testing the link between perspective and abstraction (Libby et al., 2009; Shaeffer et al., 2011). These photographs depict the action of wiping up a spill. Left: First-person perspective. Right: Third-person perspective. From Libby et al. (2009), p. 511, published by American Psychological Association.