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4 "Thou Shalt Not Make Unto Thee Any Graven Image": The Distance Dependence of Representation

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INTRODUCTION

The prohibition in the Bible against pictorial representations of God is as famous as it is poorly understood. After all, why is it forbidden to depict God in pictures, but it is not forbidden to depict God in words (cf. Halbertal & Margalit, 1992)? God has been richly represented in written or oral narratives in and out of the Bible. If so, why is it permitted to write about God's hand or face, while it is strictly forbidden to provide a drawing of the hand or the face? In a similar vein, God can be heard, but not seen "for man may not see Me and live" (Exodus, 33:20). Again, it is the visual image that is banned. Portrayals in words are not only endorsed, but actively sought. One can listen to (indeed, should follow) God's words and one is encouraged to sing/write God's virtues. In the tradition of Islam, the prohibition against pictorial representation extends beyond God to such a major prophet as Muhammad. The ban on pictorial depiction also is common in the political realm. Kings of Persia would speak to their subjects from behind a screen and were never seen. The reverse asymmetry is also well known in modern politics: Pictures of the king/dictator are distributed everywhere, but one is discouraged to write/talk about the ruler (beyond the simplest banalities) (again, see Halbertal & Margalit, 1992, for a discussion of the biblical prohibition).

Regardless of the interpretation of the biblical prohibition or some time-honored political exploits, it is clear that pictures and words have been used as different ways of representation from time immemorial. What is the essence of this difference between pictures and words? One clue comes precisely from the representation of God. In monotheistic religions, God is transcendental. God is immeasurably remote and secluded from humans and their pursuits. Is the picture-word divide associated with this infinite distance? Can pictorial representation violate the inaccessibly great remoteness of God? Does the violation result from the concrete, contextual way that pictures construe their referents? If so, words are well suited to represent God because they convey information in a more generic, decontextualized, even categorical fashion.

These observations already highlight the association between imagination and mental simulation on the one hand and the picture-word contrast in mental representation on the other hand. Imagination and mental simulation differ with pictorial and verbal representations. Although the picture-word divide is subsumed under a variety of terms and concepts (as we show throughout this chapter), common to virtually all theories is the perceptual quality and imaginability of the former. Pictures are always imaginable, whereas words sometimes are (concrete terms) and sometimes are not (abstract terms). Even when imaginable, mental simulation based on words (sequentially processed symbols that stand for referents) differs from that based on pictures (spatial icons processed

in a parallel fashion). We elucidate the respective processes and theoretical notions in our discussions and relate them to developments in cognitive psychology and social cognition.

In this chapter, we elucidate the idea of a distance-related difference between pictures and words and augment it through novel empirical observations. In our approach, an essential difference between pictures and words is their association with different values of psychological distance. We argue that the disparate ways that pictures and words transcribe event information makes them singularly potent means of conveying proximal and distant data, respectively. Construal-level theory (CLT) explicates the levels of construal employed by humans to represent events and makes the association of those levels with psychological distance pellucid (Liberman, Trope, & Stephan, 2007; Trope & Liberman, 2003). The picture-word distinction thus becomes a natural derivative of CLT.

Construal-level theory proposes that objects or events can be mentally represented at multiple levels. High-level construals are abstract representations that extract the gist of event information. They are general, goal-oriented, decontextualized, and coherent. Low-level construals are concrete representations. They are goal irrelevant and include contextual, incidental features of the referent object or event (see also Libby & Eibach, Chapter 24, this volume). CLT thus builds on social cognitive theories that have distinguished between local and global representations (Gasper & Clore, 2002); gist and verbatim memory (Reyna & Brainerd, 1995); means and ends in goal hierarchies (Carver & Scheier, 2000; Vallacher & Wegner, 1987); concrete and abstract representations of action (Semin & Fiedler, 1988); the ingroup versus the outgroup (e.g., Linville, 1982; Park & Judd, 1990); behavior identification and trait inferences (Trope, 1986); and specific and general traits (Hampson, John, & Goldberg, 1986).

One factor that determines the level of construal of an object or event is psychological distance. The greater the distance, the more likely events are to be represented on a high level of construal. Near objects, in contrast, are usually represented at a low level of construal. People tend to construct distal events on a higher level because less is known (or remembered) about such events. Also of importance, high-level construal bypasses incidental changes over time and space that the referent object might undergo. The type of representation of the event affects judgments, predictions, and choices regarding the event.

An object can be represented by its picture or by its name. Contrasting the two types of representations, words are exemplars of high-level construal. Each word is actually a fairly wide category; hence, a word provides generic meaning in a relatively abstract fashion. By contrast, pictures are low-level construals. Vital and irrelevant features are sometimes provided equal prominence in pictures. Pictures are contextualized concrete representations, and hence they denote smaller categories than words.

Given the association between level of construal and psychological distance in CLT, an interesting hypothesis concerning pictures and words can be derived. Because pictures are low-construal representations and words are high-construal representations, the former are associated with smaller values of distance than are the latter. Moreover, the hypothesis states that people preferentially use pictures to represent proximal events and words to represent distal events (cf. Coulmas, 2003).

Therefore, in the special case of pictures and words, the two modes of construal have crystallized into dedicated means of representation. Distal events are more likely to be represented verbally, whereas proximal events are more likely to be represented pictorially. Conversely, pictures convey a sense of closeness to the referent event more than do words.

Study of the picture-word contrast enriches the network of ideas associated with CLT itself. CLT-induced research to date has mainly addressed levels of construal of concepts. Accommodating the picture-word distinction is conducive to the examination of perceptual processes as well. Perceptual processes dominate with pictures but are virtually absent with words; one can succinctly portray the respective mental processes by saying that pictures are mainly perceived, whereas words are cognized. Consequently, one focus of the present chapter is the examination of differences between perceptual and higher-level organization processes employed by people to represent events in their lives.

LEVEL OF CONSTRUAL AND PSYCHOLOGICAL DISTANCE

Research conducted in the framework of CLT has investigated the association between level of construal and psychological distance. For example, Liberman, Sagristano, and Trope (2002) tested the effect of temporal distance on categorization of items. Note that categorization is a mental activity that entails the collection of different stimuli (objects, events) under the same rubric; creating fewer categories for a given set of stimuli signals deeper mental organization. In other words, the fewer the number of categories, the higher the level of construal. People were presented with a list of "things to do in New York City when a friend comes to visit." The main manipulation was the time of the forthcoming visit: immediate (in a few days) or in the future (in a couple of weeks or months). The task for the participant was to reduce the list items (e.g., Statue of Liberty, Brooklyn Bridge, various monuments) into a few categories. Liberman et al. (2002) found that people in the distant time condition produced fewer categories than did those in the near time condition. Clearly, distal events were more highly organized and abstracted than proximal ones.

Other studies conducted within the framework of CLT have shown that people respond to temporally more distant objects in terms of their primary rather than secondary features. For example, Trope and Liberman (2000) asked participants to judge the attractiveness of a radio-clock planned to be bought "tomorrow" or in "a year from now." The main component of the product was the radio, with the clock as an added feature. Trope and Liberman found, as expected, that a product with a good-quality radio (main feature) but a poor-quality clock (secondary feature) was rated more attractive than one with a poor-quality radio and a good clock. Notably, this difference was amplified with time. The former product was rated more attractive in the future time frame than in the immediate one. With time, the essence of an object gains in importance, whereas the reverse holds for nonessential features.

The concept of psychological distance is not limited to the temporal dimension. Other embodiments of distance create the same respective levels of construal. In a study by Fujita, Henderson, Eng, Trope, and Liberman (2006), spatial distance was manipulated. Two groups of students viewed the same short video recording (of student interaction in classroom), but one group was told that the event was filmed at a close location (in their own campus), whereas another was told that the event was filmed at a distal location (in a campus abroad). Written descriptions of the event by students in the two groups revealed that those at the spatially remote condition used more abstract language than did those at the spatially proximal condition. Further dimensions of distance (e.g., social, hypothetical) yielded similar results (Bar-Anan, Liberman, Trope, & Algom, 2007).

Psychological distance (in its various senses) has been shown to influence level of construal, but the reverse influence, that of level of construal on distance, has also been demonstrated. Thus, Liberman, Trope, McCrae, and Sherman (2007) have shown an effect of construal level on temporal distance, and Wakslak, Trope, Liberman, and Alony (2006) did the same for the distance dimension of hypotheticality. Clearly, the association between level of construal and psychological distance is bidirectional (cf. Stephan, Liberman, & Trope, 2007).

These and other CLT studies demonstrated that features of high construal are associated with distal objects or events, whereas features of low construal are associated with proximal objects or events. Because words are inherently high construal and pictures are inherently low construal, we expect words to be associated with distal events and pictures to be associated with proximal events.

HIGH- AND LOW-LEVEL CONSTRUAL VERSUS WORDS AND PICTURES

Consider Table 4.1. The pair of left-hand columns provides the attributes associated with different levels of construal according to CLT (see Trope and Liberman, 2003). The right-hand half of Table 4.1 presents the attributes of pictures and words culled from pertinent research in cognitive psychology. The parallelism between the two halves of Table 4.1 is interpretative. It is the subject

TABLE 4.1
Construal of Far and Near Events (Trope & Liberman, 2003) and Attributes of Words and Pictures Uncovered in Studies of Cognitive Psychology

Construal Level		Modes of Representation	
High Construal	**Low Construal**	**Words**	**Pictures**
Abstract	Concrete	Abstract[a]	Concrete[a]
Simple	Complex	Simple[b]	Highly distinctive[b]
Structured coherent	Unstructured incoherent	Generalized[c]	Context bound[c]
Decontextualized	Contextualized	Primary, core[c]	Peripheral[c]
Primary, core	Secondary, surface	Arbitrary[a]	Analogous to the world[a]
Goal relevant	Goal irrelevant		
Superordinate	Subordinate		

[a] Paivio (1986), Glaser (1992).
[b] Mintzer & Snodgrass (1999).
[c] Durso & Johnson (1979).

of the present chapter. Table 4.1 demonstrates that words are high-level construal par excellence, whereas pictures are singular examples of low-level construal.

Why have two systems of representation evolved in humans? Arguably, pictures and words serve different cognitive functions. Words preserve the essential properties of stimuli across momentary changes in appearance and through changes in space and time. They function somewhat like perceptual constancies (Rock, 1983), abstracting the stimulus into its basic, invariant properties. Words have evolved to represent distal events because, with distance, one needs to preserve the essential, invariant properties of the referent event. If you plan to buy a car next year, many particular features of the car (e.g., color, seat, type of radio) are relatively unimportant and irrelevant at that stage. Pictures, by contrast, preserve the object in minute detail for immediate use. Words transcend the here and now, pictures instantiate the present. Indeed, the association of pictures with small distance and words with great distance might be overgeneralized by people. Even when the available information is comparable, people prefer to represent distal events verbally and proximal events through pictures.

According to CLT, proximal and distal events are processed in a different manner. We extend this idea to apply to words and pictures as generic means of representation. We propose that words typically serve to represent objects that are distal in time, space, society, or culture, whereas pictures serve to represent objects that are proximal along the various dimensions of distance. This distance-medium association carries several implications. First, words comprise a higher level of construal than do pictures. Thus, when people categorize a given set of items as words or as pictures, they produce fewer categories with the former. Because each word is a category, it already comprises an organization of data. Again, words are cognized, whereas pictures are mainly perceived. Second, cognitive processing is most efficient when there is a congruency between psychological distance and medium. Incongruity between medium and distance takes a toll on cognitive processing. The distance-medium association is automatic and reflexive to the extent that people react optimally to pictures in a proximal position (spatially, temporally, or culturally) and to words in a distal position but react in a suboptimal fashion to the reverse arrangement. Third, the distance-medium association dictates preferences. People tend to use pictures to represent proximal events but tend to use words to represent more distant events. Finally, the distance-medium association extends into memory to govern the dating of past events. This is not a new principle, but its implications for memory retrieval are of great importance. Thus, pictures are better at engendering memories for recent events, words for distant events. The reverse also holds: People tend to think of recent events

in pictures but of more distant events in words. The next section presents several novel experiments testing these predictions.

ILLUSTRATIVE DISTANCE-MEDIUM RESEARCH

Categorization of the Same Objects as Pictures Versus Words

The first study, tailored after Liberman et al. (2002), was designed to test the idea that words are high construal whereas pictures are low construal. In the study by Liberman et al., participants were asked to create categories from a pool of items associated with a specific event (e.g., "things to do in New York City when a friend comes to visit"). There were several events. In each case, the event was near (e.g., the friend comes tomorrow) or distal (the friend comes in several months). Liberman et al. found that people generated more categories in the near future condition than in the distal future condition, thereby revealing higher-level construal of distal events. A twist in the procedure rendered the experiment a study on the association between distance and medium. The current participants were asked to think about three events (adapted from Liberman et al., 2002): a camping trip, moving an apartment, and a yard sale. For each scenario, we presented a set of items in two forms, one of words and the other of pictures. Presented with a set of items, the participant was asked to classify the items into as few categories as she or he found comfortable. One group of participants was asked to categorize the words, and another group was asked to categorize the pictures. The results showed that, for each event, participants created fewer categories for words than for pictures of the same objects. In fact, there were almost twice as many categories created for the pictures than for the words. These results support the idea that words are high-level construal, whereas pictures are exemplars of low-level construal. Startlingly, the current results with pictures and words also reproduced the Liberman et al. results with words only at different time frames.

Speeded Classification of Objects Represented as Pictures and Words

Social Distance

According to our hypothesis, cognitive processing is more efficient when medium and distance are congruent (i.e., pictures represent proximal objects and words represent distal objects) than when they are incongruent (pictures represent distal objects and words represent proximal objects). The following experiments tested this prediction with various embodiments of psychological distance (Bar-Anan et al., 2007). The dimension of distance tested in this experiment was social distance.

The participants were presented with objects that belonged in their own culture (proximal condition), and with objects that did not belong to their culture (distal condition). For our Israeli participants, the socially proximal objects were the Israeli shekel, a soccer ball, and the Knesset building. The socially distal objects were an American dollar, a football, and the Tower of Pisa. Each object was presented either as a picture or as a word. In each block, there were two stimulus items, one proximal and one distal (e.g., an Israeli shekel and a dollar). Each of the four objects thus produced (a picture of a shekel, the word SHEKEL, a picture of a dollar, the word DOLLAR) was presented several times in a random order. On each trial, a single stimulus appeared, and the participant's task was to decide, while timed, whether the object was a shekel or a dollar, regardless of the medium of presentation (picture or word). The participant responded by pressing one of a pair of lateralized keys standing for the respective stimuli.

The most revealing outcome of this experiment was that participants responded differently to the same objects depending on the distance of the objects from their social milieu and on the mode of appearance. When the objects belonged to the observer's cultural sphere, pictorial representations yielded faster classification responses than verbal ones. When the objects belonged in another culture, however, verbal representations held an advantage over pictorial ones. Thus, participants

responded faster to the picture of an Israeli shekel than to the word SHEKEL, but they responded faster to the word DOLLAR than to the picture of a U.S. dollar.

These results show an influence of the distance-medium association on mental organization. Socially proximal objects (whether perceived pictorially or in written form) are more familiar than socially distal objects. One might then expect more efficient processing, expressed in faster responses to familiar than less-familiar objects. Yet, familiarity did not explain the results. Rather, the interaction of distance-medium did, such that congruent stimuli (proximal pictures or distal words) were better processed than were incongruent stimuli (distal pictures or proximal words). Thus, the distance-medium association modified the effect of familiarity.

Temporal Distance

We designed another study to generalize the results obtained with social distance. Obtaining similar results with stimuli separated in time can provide converging evidence to support the claim that medium is associated with distance. The same paradigm was used. Participants were presented with ancient items (a carriage, a quill pen, and an oil lamp) and parallel modern items (a car, a Pilot pen, and a lamp). In each block, there were two stimulus items, one proximal and one distal (e.g., a car and a carriage). On each trial, a single stimulus appeared, and the participant's task was to decide, while timed, whether the object was a car or a carriage, regardless of the medium of presentation (picture or word).

The results showed that responses were faster to pictures of modern objects than to pictures of ancient objects, but that subjects were faster to respond to words denoting ancient objects than to words denoting modern objects. These findings further support the hypothesis that pictures are associated with proximity and words with distance. The results demonstrate that the relation between medium and distance is not limited to social distance but extends to temporal distance. Notably, as in the previous study, the distance-medium association superseded the effect of familiarity, such that congruent stimuli (proximal pictures and distal words) were better processed than incongruent stimuli (distal pictures and proximal words).

Spatial Distance

The spatial distance experiment tested our hypothesis with stimuli defined by the most natural depiction of distance, spatial layout. In addition to providing converging evidence, spatial distance affords a further bonus. The *same* stimulus can be presented in both a close and a far-off position. To create a feeling of distance, we made use of a pair of vertically oriented converging straight lines (emulating the Ponzo illusion). These lines served to place the target stimuli, presented as an outline of drawings and words, in a near (bottom) or a distal (top) position. As in the previous experiments, two stimulus items appeared in each block. In the first block, the stimuli were a bird and a pear; in the second block, they were an ice cream and a lamp. Again, the task for the participant was to classify the objects while ignoring location and medium of presentation.

The results showed that responses were faster to proximal pictures than to distal pictures and were faster to distal words than to proximal words. Thus, spatial distance had an opposite effect on pictures and words: Proximity improved the processing of pictures, whereas distance improved the processing of words. In other tests of the distance-medium hypothesis, the objects standing for proximal and distal values are different. Only spatial distance permits the use of the same objects at the two positions, thereby controlling for all extraneous variables (e.g., familiarity, likeableness). The results of this experiment show that it is distance alone that instantiates the differential processing of pictures and words.

Speeded Categorization of Objects Represented as Pictures and Words: Spatial Distance

In the speeded tasks reported, participants were asked to classify objects. In the next experiment, we changed the task to that of speeded categorization. The stimulus objects belonged to two groups:

clothes (tie, dress, pant, and jacket) and animals (lion, bird, camel, and elephant). The items were presented as words and as outline drawings. As in the previous experiment, the items were placed at the ends of two converging straight lines, either in the top end ("distal"), or in the bottom end ("proximal"). On each trial, a single stimulus appeared, and the participant's task was to categorize the item as either a piece of clothing or an animal and to ignore the medium of representation and location of the objects. We predicted that categorization would be faster for congruent stimuli (i.e., proximal pictures or distal words) than for incongruent stimuli (distal pictures or proximal words).

The results indicated that categorization of pictures was generally faster than that of words. However, this main effect was modified by the interaction between medium and distance, such that categorization was faster for near pictures than for distal pictures and was faster for distal words than for proximal words. The results of the current study strongly support the notion that the distance-medium association is task independent. A change in task did not affect the fundamental association between medium and distance. This strengthens our confidence in the robustness of this particular mental organization. Note that the change from identification to categorization effected in this study is a substantive one. Categorization entails quite extensive semantic processing, the placing of different objects under a common rubric. Nevertheless, the distance-medium bond remained intact.

Effect of Distance on Medium Preferences

In the previous studies, medium (picture, word) and distance (close, distal) were manipulated jointly. They each affected performance in tasks of speeded classification and in tasks of speeded and nonspeeded categorization. However, most revealing in the results were not the main effects of medium and distance but rather their interaction. Medium and distance interacted in a particular way to affect cognitive processing. In this study, we tested the relationship between distance and medium themselves. We manipulated psychological distance and observed its influence on people's favored medium. We predicted that pictures would be the preferred medium of representation for proximal events, whereas words would be the preferred medium of representation for distal events.

Distance was manipulated socially and geographically by referring in the experimental cover story to students in either one's own university or at another university. Favorite medium was tested by the amount of space that the participant devoted to text or to pictures on the computer screen. The experiment was presented as a computerized "blind date" project—creating a site for one's own university or for another university. Initially, equal-size text and picture boxes were under the participant's control, such that the participant decided their final size (more space for text or more space for picture) on the "member card." We predicted that participants would allocate *relatively* more space to text than to pictures when the candidates were from another university.

We found that participants indeed devoted more space to text than to pictures for another university's site, but that this difference almost vanished for one's own university site. Although the space allocation for picture and text did not fully reverse across distance, these findings demonstrate that distance is a potent determinant of the preferred medium of representation. This experiment revealed the causal effect of distance on medium. Can the reverse causal chain also be demonstrated? This was attempted in the next experiment.

Effect of Medium on Memory Retrieval

We tested how medium influences the dating of events in memory. In an experiment by Semin and Smith (1999), participants were presented with words that were either trait terms (abstract stimuli) or verbs (concrete stimuli). For each stimulus, participants were asked the date or time elapsed since an associated event occurred. Semin and Smith (1999) found that abstract cues (traits) elicited more remote memories than concrete cues (verbs). In this study, we used the Semin and Smith (1999) task but presented different stimuli. The participants were presented with words and pictures. Following

Rosch's (1975) taxonomy of categories, there were three different levels of abstraction for words: superordinate (e.g., food, animal, furniture); basic (e.g., fruit, dog, chair); or subordinate (e.g., apple, bulldog, kitchen table). Notably, we also presented pictures. The participants were asked to recall an occasion when the presented item appeared in their life and to briefly describe it. They were then asked to specify the date on which the event occurred and rate how long ago it happened (on a scale ranging from 1 [recently] to 7 [long time ago]). We predicted that the more abstract cues would elicit more distant memories. In particular, we predicted that a picture of an object would elicit more recently dated memories than would the name of the same object. We found that words (from all levels of abstraction) elicited memories that were older by more than 400 days than did pictures. Moreover, the most concrete word cues, those at a subordinate level, elicited even older memories than did the pictures. These findings suggest that medium affects the temporal distance of the memories.

In summary, the theoretical framework of CLT and the novel empirical observations support the idea that an essential difference between pictures and words is the level at which these alternative representations are construed. According to the present theory, pictures and words are specific cases of low- and high-level construal, respectively. Consequently, they carry the gamut of distinctive characteristics associated with these two types of mental organization. A potent diagnostic feature is the connection with psychological distance: People tend to construct proximal events at a lower level than they do distal events. Pictures and words exemplify these propensities and indeed amplify them at the boundary. Conversely, the presentation of pictures and words conveys differing values of psychological distance. These ideas predict an array of novel intriguing empirical observations with pictures and words.

How does the current framework of ideas and data fit with those on picture-word processing as pursued in cognitive psychology? The processing of pictures and words has been studied quite extensively within cognitive psychology. The following selective review reveals a rich network of potentially important connections. CLT can provide a conceptual umbrella to unify a substantial portion of the sundry data that have been collected. Conversely, research and ideas from mainstream cognitive psychology can inform CLT research and, in particular, the current conceptualization of the difference between pictures and words.

WORDS AND PICTURES AS HIGH- AND LOW-CONSTRUAL REPRESENTATIONS: INSIGHTS FROM PICTURE-WORD PROCESSING IN COGNITION RESEARCH

A renewed look at Eleanor Rosch's (1975; Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976) famous scheme of natural categories can serve as a convenient point of departure. This fresh scrutiny reveals that Rosch's taxonomy mainly applies to words—and much less to pictures—as vehicles to represent categories. Words have larger category width than do pictures. Larger category width is in turn compatible with construal at a higher level and indeed might enable such a construal in the first place.

Rosch's Taxonomy: Larger Category Width for Words Than for Pictures

According to Rosch, people categorize natural objects at three levels that differ in category width. The *superordinate level* comprises objects collected under an abstract rule. An example of this level is the category of "furniture." The *basic level* entails the classifications of everyday life. It includes classes of objects that share a great number of perceptual and functional features. An example of this level is "chair." Presented with an object and asked to name it, people typically respond by using a basic-level term. Finally, the *subordinate level* is the most specific or least inclusive category. An example for an item at this level is "kitchen chair."

It is sometimes overlooked that Rosch's classification mainly applies to words. There cannot be a pictorial representation of "furniture." It is arguable whether there exist pictures to represent categories at the basic level. Consider the basic-level term *chair*. Even the most impoverished outline

drawing of a chair is specific to an extent that might compromise the attempt to represent this basic-level concept pictorially. Note that people might well rely on images when thinking about concepts or objects at a basic level (or at a superordinate level). Philosopher David Hume made this point forcefully in his *Enquiry* (1739/1951). However, this underlying cognitive process of individuation actually accentuates the difference between the particularity of the picture-image and the generality of a word. Each word is a category (including words that denote concepts at a subordinate level), a feature that enables a higher level of construal with words than with pictures. Pictures are more concrete and contextualized than words, features that are compatible with a lower level of construal.

The last point is notable. It means that even the words denoting subordinate concepts in Rosch's scheme entail fairly wide categories. It also means that these terms cannot be fully represented as pictures. The subordinate level in Rosch's taxonomy is the most concrete level possible, yet it is still a fairly wide category. Consider the subordinate term SPORTCAR. *Any* outline drawing would reveal details such as the number of doors, size, shape, color, insignia, or plate—information that is not conveyed by the word SPORTCAR. A subordinate word also fails to capture the excessive concreteness of a picture. The upshot is that all of Rosch's categories include discriminably different objects that cannot be represented by a picture. Language does not assign a word to each specific example of the endless variety of states of nature. Pictures, by contrast, are more concrete and, under certain circumstances, can even function as singular representations. In those cases, pictures can perhaps be conceived as zero-width categories.

This CLT-inspired review of Rosch's taxonomy is important for several reasons. Three stand out. First, uncritical acceptance of the taxonomy has fostered the notion that it applies universally. Rosch experimented with pictures herself, further encouraging the notion of picture-word comparability. Our analysis shows that the taxonomy actually applies to words, and hence, that pictures and words are qualitatively different representations. Second, our analysis reinforces the idea that pictures and words are not fully interchangeable means of representation. Indeed, a main point of the CLT conceptualization is picture-word incommensurability from a psychological point of view. Third, the concept of category width is elaborated and applied to pictures and words.

If, following Hume and many modern-day psychologists (e.g., Johnson-Laird, 1983; Logan, 1988; Medin & Schaffer, 1978), people think about concepts or categories of objects by retrieving a special exemplar, then this process should be faster with pictures than with words. The reason is that a picture already *is* or is very close to the sought exemplar. Retrieval is more time consuming with words due to the wider width of the associated category. Consequently, tasks that entail semantic processing (notably, categorization) should be faster with pictures than with words. Tasks that do not entail semantic processing (e.g., naming, identification) should not hold a similar advantage and may actually be faster with words than with pictures due to the highly overlearned graphemes-to-phonemes mappings.

Naming and Categorizing With Words and Pictures

An object can be construed at a high or at a low level; as a special case, it can be (re)presented by a word or by a picture. Now, consider the following fundamental results from cognitive psychology (Glaser, 1992; Smith & Magee, 1980): When people are asked to name an object, they are faster to do so when it is a word than when it is a picture. However, when people are asked to categorize the same object (e.g., to decide whether it is a piece of furniture or a fruit), they do so faster with its picture than with its verbal name. Finally, when a picture and a word appear in tandem (e.g., the word is superimposed on the picture), the word interferes with the picture in tasks of naming. Thus, people *name* the picture faster in congruent combinations (the word is the name of the picture) than in incongruent combinations (word and picture mismatch). However, when the task is changed to that of categorization, pictures interfere with word performance.

How can this naming-categorization difference be explained? First, consider naming. A widely accepted account implicates differential semantic processing of pictures and words (Glaser, 1992).

To name (read) a word, one does not have to engage the semantic system but can use the direct route between the graphemes seen and the phonemes spoken. This mode likely dominates in the standard laboratory task of speeded naming of words presented briefly for view. Each word activates its vocal expression in a direct way. Clearly, words can be named in a meaningless manner. A ready example is the ability to name (read) a word in a foreign, unfamiliar language. In contradistinction, pictures cannot be named without semantic involvement. One cannot name a picture without engaging its meaning. There does not exist a direct route between pictorial and articulatory features. This mandatory semantic processing with pictures is time consuming, hence the advantage of words in naming.

Next, let us consider categorization with pictures and words. Categorization, unlike naming, is a semantic task with both pictures and words because it entails the collection of discriminably different objects in the same class under a common name. However, the genuinely semantic nature of pictures affords them an advantage over words in such processing, hence the faster categorization of pictures.

Based on the current theoretical framework and experiments, we propose an alternative account for the advantage of pictures over words in categorization. Our account is based on the semantic underpinning of words and pictures. The pertinent differences are cognitively interpretable. Pictures are species of low-construal representations, whereas words are species of high-construal representations. Underlying this difference is the larger category width of words. Representing something by a word is tantamount to conferring on it at least a modicum of high-order meaning; in effect, the event is thereby categorized into a meaningful concept. Representing the same thing by a picture accomplishes less semantic work because less categorization is involved. On the other hand, pictures entail a larger amount of perceptual processing than do words.

Therefore, the task of categorizing words and pictures presents people with decisions to make with respect to stimulus items that differ in category width. One must code the presented items as concepts; otherwise, categorization is impossible. People think of concepts by retrieving specific exemplars (images). Because this process of retrieval is done more readily with pictures than with words, categorization is easier with pictures than with words. The low level of construal with pictures coupled with the propensity to retrieve concepts at precisely those levels conspire to produce the good categorization performance observed routinely with pictures.

CAVEAT: PICTURES AND WORDS ARE SPECIAL CASES OF LOW- AND HIGH-LEVEL CONSTRUAL

Let us issue a few caveats before proceeding. Pictures and words comprise examples of low- and high-level construal, respectively. Recognizing their membership in these CLT-defined classes advances our understanding of their sundry functions and processing characteristics. However, one ought to realize that the picture-word contrast is a highly specific one in the generic low- and high-construal distinction.

Consider pictures first. Pictures are unique members in the class of low-level construal in that they lack a linguistic component. Many other instances of low-level construal entail long, often rich, verbal depictions. A picture, though, is language blind, which explains the frequent use of pictures in places in which familiarity with (a particular) language is not expected (e.g., airports, tourist attractions, museums). Inevitably, a picture represents the referent event in a concrete (often, retinal-image-like) fashion. Task-relevant and task-irrelevant details sometimes are given equal exposure. A picture does often allude to its main referent and can impart meaning (DeLoache, Pierroutsakos, & Uttal, 2003; DeLoache, Pierroutsakos, Uttal, Rosengren, & Gottlieb, 1998), but not in the abstract, unambiguous way that language does. Indeed, language is often employed to disambiguate the message carried in an image.

The upshot is that pictures entail perceptual or quasi-perceptual processes that are missing in other low-construal representations. CLT research to date has not focused on perceptual processes;

the low- versus high-construal divide has not hitherto entailed perception as a classification principle. Perceptual analysis is a major feature of picture processing to the extent that some investigators maintain that "recognizing pictures comprises essentially the same cognitive processes as perceiving the objects themselves" (Glaser, 1992, p. 62; see also Gibson, 1980; but consult DeLoache et al., 1998, or Ittelson, 1996, for a more moderate view). Regardless of what other processes they undergo, pictures are foremost perceived.

Consider now the word anchor of the picture-word contrast. By this anchor we usually mean a single word that is the accepted name of the referent object or event. This word comprises a higher-level construal of the object than does a picture of the same object. The reason is that a name is the end product of a deeper semantic analysis of the referent object than that associated with a picture. A word bestows a meaning on the object that is more abstract and poignant than its picture can be. Nevertheless, the names associated with the picture-word contrast comprise special cases of high-level construal. Most instances of high-level construal entail deeply elaborated depictions, not single nouns or adjectives. A single word—a name—is a high-level construal when considered in the context of being compared to a kindred picture.

In sum, the perception-semanticity continuum is not critical when comparing instances of high- and low-level construal in general. However, it is of importance when comparing pictorial and verbal means of representations—themselves special instances of low- and high-level construal. This contrast can enrich the level of construal continuum itself. Novel developments within CLT (Liberman, Trope & Stephan, 2007) indeed develop the notion of zero distance (at which perception dominates) and contrast it with some positive value of distance (at which higher levels of construal are relevant). Along these lines, we turn next to a further discussion of the picture-word difference.

Icons, Indexes, and Symbols

What then is the basic difference between pictures and words? According to philosopher C. S. Pierce (cf. Hartshorne & Weiss, 1965), there are three types of representations. The first is called *icon*. The representational quality of icons is based on physical similarity between the representation and the object. A representation is an icon if it is "like that thing (it represents) and used as a sign of it" (pp. 143–144). Pictures are icons. They are representations based on physical similarity to the object denoted. The second type is called *index*. Its representational quality is based on a causal relationship with the object being represented (e.g., metonymy). The third type is called *symbol*. The representational quality of a symbol is based on convention or law, hence the relation with the object denoted is arbitrary. The representational quality of words and of language in general is based on such an arbitrary assignment. The names of objects or events are symbols. Therefore, according to Pierce's influential scheme, pictures and words comprise qualitatively different representations. Pictures represent the referent objects in an analogous manner by virtue of similarity. Pictures are not arbitrary representations; they are fairly unique—almost as unique indeed as the objects denoted sometimes—and have few alternatives. Words, by contrast, are arbitrary representations established by convention.

Goodman (1976; see also DeLoache et al., 1998) has challenged Pierce's classification and argued that convention-based components in pictures are actually larger than is usually recognized. However, Goodman (1976) also acknowledges that pictures hold a more analogous and hence less-arbitrary relationship with their referents than do words. On the analogue-convention continuum, pictures are closer to the former end than are words. Thus, the processing of pictures (icons) entails a larger perceptual component than does the processing of words (symbols). Although this view is widely held, an important implication is not widely recognized. A trivial stipulation for perception is exposure to the object; otherwise, the stimuli do not impinge on the sensory surface. This stipulation does not hold when processing *pictures* of objects. Nevertheless, the semiperceptual processes associated with pictures might well impart a feeling of proximity. Because such components are missing from word processes, feelings of proximity are not generally conveyed by words.

In summary, people tend to construe distal events at a higher level than they do proximal events. The reverse also holds. A higher level of construal tends to be associated with events at a distance (in a spatial, temporal, or cultural sense). Because pictures and words are low- and high-level representations themselves, they also act according to these same rules. However, in the special case of pictures and words, a further mechanism may be involved to augment their function as markers of psychological distance. Pictures often carry a quasi-perceptual quality that is weaker or nonexistent with words. This difference acts to reinforce the distance-medium association above and beyond the impetus provided by differential levels of construal.

Conceiving words and pictures as instances of high- and low-level construal entails further bonuses. It enables deeper glimpses into further dynamic processes of cognition and the drawing of intriguing predictions. High-level construal means, among other things, tolerance to momentary, incidental changes in the focal object or event. It is the gist of the event that is preserved. Low-level construal is, on the other hand, much less forgiving when alterations occur. The implications for cognitive organization of these features are considerable. Because a word is high-level construal, it is able to function as a better conveyor of information than a picture. A picture might be too unique a vehicle to convey useful information. It is these implications that we discuss next.

Pictures and Words in Priming and Memory: Some Evidence

In experiments within the priming paradigm (see Neely, 1991, for a review), two stimuli are presented in a sequence, the prime and the target. The task for the participant is to respond to the target. It is typically found that responses to the target are facilitated by a related prime, even though this stimulus does not require a response. How do pictures and words function as primes? In a study by Durso and Johnson (1979), participants named a picture (target) preceded by itself or by a word that was the picture's name (primes). In other conditions, participants named a word (target) preceded by itself or by a pictorial representation of the word (primes). The results showed that word primes facilitated the subsequent naming of the target *regardless* of the modality of the target (i.e., picture or word). By contrast, picture primes facilitated the naming of subsequent picture targets but not of word targets. Efficient naming of a word was not facilitated by having been exposed to a pictorial representation of that word prior to its naming. The authors concluded that pictures differ qualitatively from words. Pictures are like "words in context—they generate … specific representations. … [In contrast, a] word … activates … a large set of semantic features" (Durso & Johnson, 1979, p. 457).

Therefore, words were better conveyors of semantic information than were pictures. Because pictures are context-bound representations, the benefit from prior exposure of pictures was confined to those pictures themselves. Due to their higher level of construal, words were able to survive surface changes and serve as potent conveyors of meaning and semantic organization. The same resistance to change, even in surface characteristics, affects memory for pictures. Memory for words, by contrast, withstands such changes successfully. In this domain, too, stimuli of low- and high-level construal carry cognitive consequences.

Mintzer and Snodgrass (1999) probed memory for concepts presented in different contexts. In the study phase, participants were presented with common objects as either pictures (e.g., the picture of a dog) or as words (the word DOG). On a subsequent recognition test, the studied (old) stimuli were presented to the participants in either the same form (e.g., the studied picture of the dog tested as a picture) or in a different form (e.g., the studied picture of the dog tested as the word DOG). New nonstudied items were presented as well. Participants were then instructed to respond "old" to any item that had been presented in the study even if that item appeared in a different form; otherwise, they were asked to respond "new" to any nonstudied item. The results showed that changing the form of an item between study and test took a toll on memory performance. Notably, the cost of form change was appreciable for pictures but not for words. Studied words survived changes in their form during test, such that memory was hardly affected. Studied pictures, by contrast, were vulnerable to changes in appearance.

Mintzer and Snodgrass (1999) explained the results by the enhanced distinctiveness of pictures in comparison with words. Pictures form distinctive stimuli, so changes in their appearance are highly noticeable. Words are less discriminable from one another, so a change in form does not impair memory (cf. Snodgrass, 1984; Snodgrass & McCullough, 1986). We question the authors' account as a full or major explanation of the results. We maintain that the picture-word difference would have remained the same even with the differences in discriminability removed (but see Arieh & Algom, 2002, for qualifications). One can create word stimuli that are as distinct perceptually as pictures, yet the latter only will suffer a change cost. In our account, the underlying reason for the word-picture contrast is the different construal of words and pictures as means of representation. Words are larger categories than pictures and hence are also more abstract than pictures. It is the context-bound nature of pictures that makes them distinctive cognitively and exacts a heavy price on any change in this mode of representation.

Dual-Coding Theory

How does the current conception fare with the one formulation in the cognitive psychology literature that is explicitly devoted to exploring the differences in processing between pictures and words?

According to Paivio's dual-coding theory (Paivio, 1971, 1986), there are two separate cognitive systems. One is specialized for representing information conveyed by spatial, nonverbal objects, and the other is specialized for representing words and language information (see also Kosslyn & Moulton, Chapter 3, this volume). Words are initially represented by the verbal system, and scenes and pictures are initially represented by the nonverbal or imagery system. In subsequent processing, each type of stimulus can be coded by the other system as well, hence the possibility of dual coding. The theory does not posit mutually exclusive processing of words and pictures. On the contrary, each stimulus can be encoded and processed by each of the two systems. The major explanatory variable in the theory is the imaginability of the input. Pictures are readily imaginable. Concrete words are also easily imaginable; therefore, such words are likely to be encoded by the image system as well as by the verbal system. In contrast, abstract words are likely to be encoded by the verbal system only. This difference explains the superiority in memory of concrete over abstract words and, often, of pictures over words.

The concrete-abstract distinction in dual-coding theory is well taken. It is somewhat analogous to the high- versus low-construal distinction at the base of CLT. There are some minor differences, though. The concrete-abstract distinction in dual-coding theory is orthogonal to the picture-word distinction as a means of representation. Words can be as concrete as pictures (although pictures cannot be as abstract as some words). When concreteness (or abstractness) is comparable, then processing is comparable. We agree in principle but maintain that, in practice, a word is always higher construed than is a picture.

Concrete words, such as the word TABLE, and pictures, such as a drawing of your table, are close relatives in dual-coding theory. Both stimuli are dual coded by both systems. Consequently, comparable performance is expected with such stimuli. In the current approach, there is a difference between the word TABLE and the picture of a table, although admittedly both items are highly imaginable. The reason is that the word TABLE encompasses a larger category (innumerable individual tables, including your desk) than does the picture of a table. As a result, pictures are categorized better than words (including concrete, readily imaginable words), are less-valuable primes, are more vulnerable to incidental changes, and impart a sense of proximity. All of these features are either difficult to account for or ignored in dual-coding theory.

CONCLUDING REMARKS

The marriage between CLT and the picture-word contrast as studied in cognitive psychology is a good one, but as in most marriages, the partners do not fit perfectly. Pictures and words have served

humans to represent their environment, their past, and their future, from time immemorial. We are now beginning to understand the common and different functions of these tools. CLT greatly sustains this quest to understand the psychological underpinnings of pictures and words and helps us to predict when they are likely to be used and what associations they engender beyond their explicit contents. Conversely, research on cognition with words and pictures helps one to appreciate the variegated nature of the differences that exist among instances of low- and high-level construal. Perceptual processes dominate with some but not with other representations. Cognition research also shows stimuli of low and high construal in action; it shows how they shape cognitive processing in tasks of naming, categorization, priming, and memory.

An essential contribution of CLT is its integration of the word-picture contrast into mainstream psychological theorizing. Major differences between words and pictures thus become a natural derivative of substantive theory. A chief contribution is the association of the two means of representation with level of construal. The association explains how words and pictures function at deep layers of cognition and how the two representations have evolved to satisfy their differing goals. Another major contribution is the association with psychological distance. This association is missing from routine research in cognitive psychology. It explains when pictures and words are likely to appear and the way that they in turn affect the observer. The network of CLT variables connecting to pictures and words results in a general conclusion of considerable import: Pictures and words are *not* interchangeable means of representation.

Nevertheless, pictures and words are unique species of low- and high-level construal. Unlike many other low-level representations, pictures entail perceptual or perception-like processing. These processes enhance the feeling of closeness to the referent object beyond that engendered by low construal per se. Words, needless to say, lack such perceptual processing. Unlike many instances of high-level construal, a single word stands for the name of an object in the context of the picture-word contrast. This word is high construal in this context, although richer and more extensive verbal depictions might be low construal in a more general context.

Finally, research in cognition adds dynamic detail to the CLT distinction between levels of construal. For example, the advantage of pictures in classification or the advantage of words in priming are not immediately obvious effects of construal level. Cognitive research and theory show them to be quite natural outcomes of such construal. A fuller understanding of the picture-word divide remains a daunting task, but harnessing CLT into this mission makes it look more manageable.

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