CHAPTER

22

Motivated Remembering: Remembering as Accessibility and Accessibility as Motivational Relevance

Baruch Eitam, David B. Miele, *and* E. Tory Higgins

Abstract

This chapter presents a novel framework that integrates motivational relevance and accessibility and outlines its implications for the study of memory. The authors first review a recent analysis of motivation (Higgins, ~~2011~~) and a recent framework linking motivational relevance and accessibility (Eitam & Higgins, 2010). The authors then propose and demonstrate that knowledge activation and recall of information—whether implicit or explicit, and regardless of the type of that information (semantic, episodic, autobiographical, or procedural)—are affected by the motivational relevance of that information at the time retrieval is attempted or measured.

Key Words: motivation, relevance, accessibility, knowledge activation, memory

"Who controls the past," ran the Party slogan, "controls the future: who controls the present controls the past." (Orwell, 1949)

Psychologists' model of human memory has largely shifted from that of a warehouse packed with slowly fading items, to a set of active, dynamic processes working synchronously in an attempt to reconstruct the past (Jenkins, 1974; Koriat, Goldsmith, & Pansky, 2000; for its roots of reconstruction, see Bartlett, 1932). In this review, we focus specifically on the subset of processes associated with the *accessibility* and *activation* of mental representations stored in long-term memory. Within social psychology, accessibility is typically understood as the ease with which an *available* mental representation (i.e., a structured set of information already encoded in memory) can be activated by external stimulation, whereas activation itself refers to whether or not that representation has been accessed *for use* (Bruner, 1957; Higgins, 1996). That is, the accessibility of a mental representation is the amount of external stimulation required in order to shift it from a latent state (available in the mind but currently inactive) to an active one (involved in current thought and action). Although this definition suggests that accessibility is inherently about how people construct current memories from previously encoded information, it is a construct that has typically been employed without reference to memory per se. Thus, a general aim of the present chapter is to highlight the importance of the role played by accessibility in human memory.

A more specific (and primary) aim of this chapter is to examine the ways in which accessibility mediates the effects of motivation on memory retrieval. Although what we remember may closely correspond to what we originally encoded, it also tends to diverge from it in important ways. This divergence has typically been explained in terms of either omission of details that results from decay and fragmentation (Brainerd & Reyna, 1995) or schema-driven constructive processes that go beyond simple forgetting (Anderson & Pichert, 1978; Bartlett, 1932). Alternatively, there is an explanation that suggests that the divergence between what is retrieved and what was originally encoded is not solely a product

of mere memory mechanisms, but instead results from the interaction between memory and motivational processes. From this *motivational* perspective, omissions and commissions reflect the objectives of the rememberer beyond the simple goal of producing an accurate and complete reproduction of all that was originally encoded. Borrowing from George Orwell, Each of us is the Party to our motives, and we ourselves, in the present, control what past we remember.

To explore the various types of objectives that can affect human memory retrieval, we draw on a model of motivation that goes beyond the traditional notion that all of human striving can be reduced to the desire to approach pleasure and avoid pain (Higgins, 2012). Although this model does posit that a major component of motivation is wanting to be effective at having desired outcomes (i.e., value), it also proposes that, at an equally fundamental level, people want to be effective at establishing what's real (i.e., truth) and at managing what happens (i.e., control). Although the concepts of truth and control effectiveness, in comparison to value effectiveness, have received relatively little attention in the motivated cognition literature, we use them here to reinterpret and give structure to previously documented effects of motivation on memory retrieval.

In addition to Higgins' (2012) analysis of motivation, we draw on a novel framework of knowledge activation and information processing (Eitam & Higgins, 2010) in order to explain how the effects of value, truth, and control effectiveness on memory retrieval are mediated by changes in accessibility. The framework, which is called *relevance of activated representations* (or ROAR for short), stipulates that stored mental representations become active (and the concepts they represent accessible) as a function of their actual or perceived relevance for increasing one's value, truth, and control effectiveness. Thus, according to ROAR, a central function of motivation is the *selection* of mental representations for use in thought and action. Before describing the ROAR framework in greater detail, we first review evidence for this claim.

Motivation and Memory

The idea that our experience is the product of cognition and motivation is not new (for reviews, see Kunda, 1990; Molden & Higgins, 2005). Numerous studies have shown that we tend to see or hear those things in our environment that are relevant to our current goals and motives (e.g., Balcetis & Dunning, 2006; Bruner, 1957; Eitam, Schul, & Hassin, 2009; Eitam, Yeshurun, & Hassan, in press; Moray, 1959). This kind of motivated selectivity applies not only to perception but also to the entire range of processes our mind is capable of executing, from believing (Klein & Kunda, 1992) to acting (Rushworth, Walton, Kennerley, & Bannerman, 2004). Why, then, should remembering be any different?

Kunda (1990) coined the terms *directional* and *nondirectional* motivation for describing the different ways in which motivation and cognition interact (see Kruglanski, 1989, for the similar distinction between *specific* and *nonspecific* epistemic motivation). On the one hand, motivation was sometimes viewed as "abducting" otherwise properly functioning cognitive processes in the service of gratifying some hedonic desire. Such directional (or specific) effects were described as resulting from efforts to selectively process information in order to reach a desired outcome or to maintain some comforting or otherwise hedonically pleasing belief (Kunda, 1990). On the other hand, it was also considered possible for motivation to increase the intensity of "properly functioning" cognitive processes in the service of reaching "the truth" or an optimal conclusion (e.g., Eitam, Hassin, & Schul, 2008; Kruglanski, 1989). Such (nondirectional or nonspecific) increases in intensity were thought to be mediated by either increased effort or additional processing.

Most research on motivational effects on memory has examined the effects of directional motivation on memory, and most of this research has focused on abductions of memory processes in the service of maximizing pleasure and minimizing pain. We will briefly illustrate some of this research. In a classic study by Sanitioso, Kunda, and Fong (1990; see also Brunot & Sanitioso, 2004), for example, participants recalled more autobiographical memories that were consistent with a particular personality trait (e.g., introversion) when they were led to believe that this trait was more (as opposed to less) desirable than its opposite (e.g., extroversion). Similarly, Dunning, Perie, and Story (1991) showed that people often activate prototypes or schemas that serve to maintain their sense of self-worth. In one study, participants were asked to specify whether or not certain personality traits fit with the concept of leadership. Participants were more likely to say that an attribute did fit if, at an earlier point in the study, they had claimed to possess that trait themselves. Importantly, they also endorsed these traits more quickly, suggesting that self-relevant personality

traits were more accessible to participants (i.e., more active in their mind) than self-irrelevant traits.

In a related set of studies, Sedikides and colleagues have demonstrated that people exhibit heightened recall of information that supports their desired self-image (Sedikides & Green, 2009). In addition, McDonald and Hirt (1997) have shown that this type of selective recall extends to information about others. Specifically, participants in their experiments distorted their recall and recognition to be consistent with either positive expectations about an individual when this person was someone they liked or negative expectations when this person was someone they disliked. These findings relate to earlier findings by Ross and colleagues demonstrating the centrality of a seemingly "cognitive" factor (i.e., participants' expectancies) for memory reconstruction (Conway & Ross, 1984). However, in keeping with the explanation provided by McDonald and Hirt, we will argue below that expectancies, rather than being just cognitive, also carry motivational relevance because they concern what will *really* happen in the future (truth effectiveness).

More recently, Mather and colleagues documented yet another hedonically motivated directional effect on memory (Mather & Carstensen, 2005). Specifically, as people get older and presumably become increasingly motivated to optimize well-being, they tend to recall positively biased information about past choices and experiences. Furthermore, although this bias may result from self-regulatory processes that require a certain degree of cognitive control, it appears to be unintentional, or at least not consciously intentional (Knight, et al., 2007).

In line with Mather's conceptualization of this positivity bias as a motivated, selective process, others have demonstrated that the act of remembering is closely tied to peoples' current goals or attitudes (e.g., Ross, 1989). For example, Moberly and MacLeod (2006) recently showed that memories that were relevant to participants' self-described goals were more easily accessed than memories that were not goal relevant (see also Crane, Goddard, & Pring, 2009). In addition, Gramzow and Willard (2006) showed that positive bias in college students' memories of past performance (i.e., self-reported grade point average [GPA]) resulted from the dispositional motivation to self-enhance, but only when these memories were relevant to a current goal (i.e., the desire to maintain or improve their GPA). When students' memories were relevant only to a past and completed goal (i.e., self-reported Scholastic Aptitude Test [SAT] scores that were relevant in the past to gain entry to a good college), positive bias instead resulted from a reduction in accessibility of past test scores, which allowed participants to "reconstruct" past performance based on their positive beliefs about the self. Although these effects led Gramzow and Willard to differentiate between *motivational* and *reconstructive* memory processes, they are also a demonstration of the interplay among motivational relevance, accessibility, and memory. Although both students' GPA and SAT scores are relevant for the goal of maintaining a positive self-image, they differ in their current task relevance and hence in their accessibility. Consequently, other sources of relevance such as "expectancies" about oneself that are measured by beliefs about achievement level (and can relate to current truth effectiveness) may have more influence in the second (SAT) case compared with the first.

One final and rather striking example of how motivation can affect remembering is a classic study by Anderson and Pichert (1978). In two experiments, participants adopted the perspective of either a burglar or homebuyer while reading a story about two boys who head back to one of the boys' homes after cutting school. After they finished reading, participants were asked to recall as much of the story as they could remember. Five minutes later, they were asked to recall the story for a second time; however, this time, half of the participants were instructed to switch perspectives (from burglar to homebuyer or vice versa) before doing so. The results showed that, after switching perspectives, participants recalled more of the information that was irrelevant from the first perspective but was now relevant from the second perspective. Hence seemingly forgotten information became accessible after becoming motivationally relevant.

Taken together, the findings reviewed above afford two tentative conclusions. The first is that memory retrieval can be influenced by people's motivations and that these motivations are not limited to the desire to generate a complete or infallible reconstruction of the past. The second conclusion, which we explore more closely below, is that (at least in some cases) the way motivation affects remembering may be analogous to the way motivation affects other, more automatic, forms of knowledge activation.

Motivated Accessibility from Relevance

Within social psychology, knowledge activation has become a prominent mechanistic explanation

for a number of different phenomena (for a recent review, see Eitam & Higgins, 2010). In many cases, this explanation is based on the idea that motivation can affect thought and action by controlling which mental representations become active and how long they stay active. The seed for this idea can be traced back to Bluma Zeigarnik's (1938) pioneering research, which demonstrated that people's memory for uncompleted or interrupted tasks is better than their memory for completed tasks (Förster, Liberman, & Higgins, 2005).

Echoing the literature on motivated memory reviewed above, the majority of the research on knowledge activation has focused on how end states, goals, and needs affect the accessibility of mental representations (i.e., directional effects). For example, in a study by Förster and colleagues (2005), participants were assigned the goal of identifying and responding to a specific visual cue (i.e., a pair of eyeglasses). Response times to eyeglass-related words on a subsequent lexical decision task (which serve as the "gold standard" for measuring a representation's degree of activation) demonstrated that the concept of eyeglasses was more active in participants' minds before (compared with after) the goal had been completed. The relation between motivation and knowledge activation has also been explored more broadly than just in reference to specific task goals. Using the same basic paradigm as Förster et al. (2005), for example, Hedberg and Higgins (2011) reported that the rate of decay in accessibility after the goal is *faster* for individuals with stronger promotion concerns with gains and advancement and is *slower* for individuals with stronger prevention concerns with nonlosses and security (for a discussion of promotion *vs*. prevention concerns, see Higgins, 1997)—a clear indication that motivational concerns can influence accessibility. As other examples, Moskowitz, Gollwitzer, Wasel, and Schaal (1999) have demonstrated that the general goal of being egalitarian can unintentionally reduce people's activation of stereotypes, and Ferguson (2008) showed that this remains true even when people are unaware that they possess this goal.

How, then, does motivation influence knowledge activation? One clue comes from a recent demonstration that relates the "positive affect" that is associated with an active representation to the duration that the representation remains active (Aarts, Custers, & Marien, 2009; for recent reviews, see Eitam & Higgins, 2010; Custers, Eitam, & Bargh, 2012). Such findings suggest that having a goal or a need (e.g., being thirsty) leads the mind to assign "positive valence" or "incentive value" to goal- or need-relevant knowledge (Custers & Aarts, 2005; Ferguson & Bargh, 2004). This, in turn, suggests that the motivational relevance of knowledge representations is dynamically computed (cf., Custers & Aarts, 2010).

Motivations Other than Attaining Desired Outcomes

Much of the literature on motivated knowledge activation has focused on how information pertaining to desired outcomes tends to have relatively high levels of accessibility. However, approaching desired outcomes and avoiding undesired outcomes do not account for the entire spectrum of human motivation. Indeed, many of the examples noted above, such as the effect of expectancy on memory, are hard to reconcile with a uniformly hedonic perspective on motivation. As mentioned earlier, Higgins (2012) has recently proposed that, beyond pleasure and pain, motivation can be thought of as fundamentally wanting to be effective at three things: at having desired outcomes (value), but also at establishing what's real (truth) and at managing what happens (control). Although value effectiveness (which itself is more than just hedonic concerns) has received more attention in the literature than truth or control effectiveness, the previously reviewed findings, as well as other important findings, can be reinterpreted in terms of all three motivations rather than just hedonic value. Before returning to these findings, however, it is important to distinguish more clearly between these three different ways of wanting to be effective.

According to Higgins (2012), value effectiveness is being successful in having what's desired. Thus, value effectiveness is really about the consequences of goal pursuit—accruing benefits versus costs, experiencing pleasure versus pain, and succeeding versus failing to satisfy basic needs. Truth effectiveness, on the other hand, is being successful in establishing what's real. In one sense, something can be considered real if it accords with an actual state of affairs or represents things as they actually are. In another sense, for something to be real, it must be correct, right, and legitimate—in contrast to things that are imaginary, spurious, or counterfeit. In both respects, being successful in establishing what's real is just as critical to the well-being of humans and other animals as being successful in having what's desired. The problem is that, as far as we know, there is no innate marker that differentiates between true and false representations of the world. Indeed,

young children, and some troubled adults, find it difficult to distinguish reality from fantasy. It is also evident from ideological battles about religion and politics that what is reality to one group can be mere illusion or delusion to another. Despite such differences, one thing is clear: both individuals and groups are often strongly motivated to know what is "really" the case—to pursue truth effectiveness. This plays out in myriad ways, including concerns with accuracy, legitimacy, justice, genuineness, and honesty.

Finally, control effectiveness is being successful at managing what is required (procedures, competencies, resources) to make something happen (or not happen). By making something happen, we mean exercising direction or restraint upon action in order to achieve a particular outcome. Whereas value effectiveness relates to the outcome itself (e.g., a benefit vs. cost) and truth effectiveness relates to reality, control effectiveness relates to the *strength* of one's influence over something. Such strength can be exerted with respect to muscles, eyesight, effects on the environment, intellect, character, arguments, willpower, teamwork, and so on. Although high control effectiveness increases the likelihood that beneficial outcomes will be obtained, it is independent of these outcomes, as reflected in a personal motto such as, "I would rather do *anything* than nothing at all."

Linking Motivational Relevance to Mental Activation: The ROAR Framework

Building on Higgins' (2012) distinction between value, truth, and control as three domains in which people seek to be effective, Eitam and Higgins (2010) recently proposed a novel framework that relates these motivational domains to the dynamics of accessibility and knowledge activation. This framework, the ROAR framework, represents a significant shift from viewing motivation as separate and removed from cognition (with motivated processes abducting the otherwise "rational," "veridical," or "proper" functioning of cognitive processes) to viewing the two constructs as different sides of the same information processing coin.

According to ROAR, motivation concerns the *relevance of represented information content (i.e., the relevance of a representation)* with respect to value, truth, or control. The relevance of the represented information is dynamically computed as soon as the representation is triggered by some set of external stimuli. Once computed, it takes the same form regardless of how the corresponding content is represented— that is, whether the content is an episodic memory, fact, procedure, stereotype, or even a goal. The primary effect that motivational relevance has on cognitive functioning is to determine the degree to which the represented information is *accessible* and, thus, how likely it is to become *active*. As a result, only sufficiently relevant information becomes available for use by other mental processes, such as associative learning, deductive reasoning, and action planning. This conceptualization of motivational relevance has, in a previous review (Eitam & Higgins, 2010), allowed us to account for an array of seemingly unrelated phenomena, such as the effects of priming on behavior, reductions in accessibility due to negation (e.g., Kaup, 2001), and the supposed outcomes of selective attention (e.g., "inattentional amnesia"; Wolfe, 1999; see also Eitam et al., in press).

Implicit Memory and Motivational Relevance

As we stated earlier in the chapter, although the study of knowledge activation and the study of memory have produced separate literatures, it seems beneficial to consider them in tandem, *with knowledge activation understood as part of the process of memory reconstruction*. One immediate implication of this conceptual integration is that a model of motivated knowledge activation should be useful in understanding the underlying processes that give rise to motivated memory. Thus, we now turn to a discussion of how ROAR can help to explain why there is often a divergence between the information about an event that is encoded and the information that is eventually retrieved.

The semantic and procedural forms of memory described as *implicit,* such as knowing what things are or knowing what to do (Tulving, 1972), do not require intentional activation or awareness of a memory. Because they typically cannot be made explicit by the individual, they are often measured in terms of knowledge accessibility using lexical decision, stem completion, and other semantic and perceptual priming-related tasks. Considering that ROAR was designed to explain the dynamics of knowledge accessibility and activation, it may be a particularly useful framework for understanding the effects of motivation on implicit memory.

According to ROAR, multiple internal representations (e.g., semantic knowledge) can be implicitly stimulated by the same external event, but only those with a sufficient degree of motivational relevance will actually affect thought and

action. Importantly, these motivational effects are *not* biases, but rather are the outcomes of a dynamic selection process that augments other, more fixed or structural forms of memory selection, such as semantic association and spread of activation. As previously explained, this selection process computes the relevance of representations with respect to value, truth, or control. For example, the truth relevance of a representation should vary in accordance with the perceived likelihood of encountering the corresponding object or event in the near future (i.e., with expectancy) or with the perceived validity of the object (see below).

Evidence for this claim comes from studies investigating the effects of negation on the activation of schematic and propositional knowledge. Specifically, sentences that include negation (e.g., "Elizabeth bakes no bread"; MacDonald & Just, 1989) or that describe a situation in which an object is absent (e.g., "Sam wished that Laura was wearing her pink dress"; Kaup, 2001; Kaup & Zwaan, 2003) appear to lower the accessibility of the objects in question ("bread" and "pink dress," respectively). Because both negation and absence imply that the likelihood of actually encountering the mentioned objects is reduced, decreases in accessibility can be attributed to corresponding decreases in the objects' truth relevance (i.e., the objects are not currently real). This should be the case even if objects or concepts are originally memorized before the introduction of information concerning their truth relevance. For instance, if people intentionally memorize or incidentally process the word *bridge* without any added context, implicit memory for this word when later presented in the context of *constructed bridge* should be better than when presented in the context of *dismantled bridge*. This is because in the latter case, the bridge is no longer real, it has ceased to exist; hence, the truth relevance of the corresponding representation is lower compared with the representation for the existing (constructed) bridge. Indeed, in a recent study we have obtained initial evidence that this is indeed the case. Participants were presented with a list of 40 to-be-encoded words (Eitam, Kopietz & Higgins, unpublished manuscript). Ten of these words were piloted to be effectively modified in their truth relevance when imbedded in a "construction" or "destruction" phrase—the target words. In a subsequent recognition memory test phase, participants were required to identify words, embedded in either construction or destruction phrases, as being "old" or "new". Note that "old" responses are more likely when a word has higher accessibility. For the critical target words, we found reliably *fewer* "old" responses when they appeared in a destruction phrase than in a construction phrase.

ROAR also provides a framework for reinterpreting some more straightforward effects of motivation on implicit memory. As opposed to truth relevance, these effects are better understood in terms of an object or concept's value relevance (i.e., its relevance for being effective at "having what is desired" or "not having what is undesired"; Higgins, 2012). For example, earlier in the chapter, we reviewed multiple demonstrations of *positive* value relevance (the "having what's desired" part) resulting in the retrieval of inaccurate information. But, according to ROAR, negative value relevance can also affect memory, as in the case of threatening or anxiety-producing objects and events. To the extent that one must be aware of such objects (e.g., snakes) in order to avoid undesired outcomes (e.g., getting bitten), their corresponding representations should be highly accessible in memory. A recent meta-analysis on memory of threatening items suggests that this is indeed the case (Mitte, 2008). Specifically, the results of 14 studies showed that implicit memory of threatening items (as measured by a lexical decision task) was stronger than memory of neutral items.

It is worth reiterating that, according to ROAR, the relevance of a mental representation from value, truth, or control effectiveness is *dynamically* computed as soon as it is stimulated, and this relevance determines whether the representation will be available to other mental processes. Thus, in a certain sense, the dynamic computation of relevance is what makes context-sensitive remembering (and "forgetting") possible (e.g., Tulving & Thomson, 1973). That is, changes in the external environment or the internal state of the individual influence what gets remembered by virtue of their effect on the relevance of the stimulated item. If the current relevance of the item in the retrieval context is different from what its relevance was in the encoding context, then there should be an observable difference in the item's level of accessibility or duration of activation between the two contexts (we will return to this point when discussing the effects of "shared reality" on memory). The strongest version of this prediction is that a representation with insufficient relevance will not be remembered. Conversely, one with high relevance may be easily remembered regardless of whether or not it was recently stimulated. For example, after a representation is initially stimulated by an implicit memory probe (such as an item in a lexical decision task), its high relevance

may cause it to be active in mind and (potentially) to produce a false implicit memory effect (i.e., an error of commission).

One particularly illuminating example of low relevance induced "forgetting" comes from an experiment on the implicit learning of artificial grammars by Dienes, Altman, Kwan, and Goode (1995). Implicit learning tasks may measure slightly different phenomena (Frensch, 1998), but one common feature is that the learning involved is often unintentional (Reber, 1967). In a typical implicit learning experiment, participants are exposed to stimuli (e.g., letter strings) that are structured on the basis of complex rules. Structure learning is then (unexpectedly) tested by asking participants to classify novel stimuli as being "grammatical" (i.e., as conforming to some set of rules). Multiple studies have shown that people classify these novel stimuli on the basis of valid structural knowledge, even when they feel as though they are guessing.

In the experiment by Dienes and colleagues (1995; Experiment 5), participants attended to a set of such structured stimuli and were then informed that the experiment had ended. At this point, the participants were asked to participate in another ostensibly unrelated study that was being conducted in a nearby room. As part of this study, participants were asked to classify various letter strings as either obeying or violating a complex system of rules (they were also told that only half of the stimuli obeyed the rules). Importantly, half of the participants were informed of the fact that these rules were the same as those used to structure the stimuli from the original study, whereas the other half were told nothing. Remarkably, only the "informed" group's performance on the classification task indicated that they had implicitly learned the rules. The low-relevance, "uniformed" group "forgot" the rules.

Because the learning phase of the experiment preceded the context manipulation (informed *vs.* uninformed), it is safe to assume that participants' learning of the rules was identical in both groups. This, coupled with the fact that participants could not have intentionally recalled or applied the rules during the classification task (because they were implicit), suggests that the effect must have been due to differences in perceived relevance at the time of the "second study." That is, the contextual information provided to the "informed" participants increased the relevance of the previously learned rules, resulting in the activation and use of this knowledge during the classification task. In contrast, the relevance of the rules remained low for the "uninformed" participants (who were not provided with contextual information), which explains why the same knowledge was not activated or used in this condition.

Shared Reality: The Dynamics of Truth Relevance and Its Effect on Recall

As previously explained, ROAR was designed as a framework for understanding the effects of external stimulation on the accessibility of mental representations. Because implicit memory effects are often measured in terms of accessibility, they can easily be accommodated by ROAR. However, explicit measures of memory such as recognition or free recall may involve underlying processes different from those captured by implicit measures. For example, both recognition and recall may involve an intentional attempt to retrieve or reconstruct what was previously learned and, thus, may tap into aspects of remembering that do not pertain to implicit memory. Recently, however, researchers have suggested that this may not be the case (Voss & Paller, 2008), which implies that the effects of motivational relevance on memory should emerge even when explicit measures are used. In the next section, we describe a particularly striking example of how (truth) relevance affects explicit memory.

One of the primary ways in which people strive to be effective at establishing what's real is by constructing a *shared reality*. Shared reality is a commonality of inner states between oneself and other individuals that confers validity and reliability to information about the world (Echterhoff, Higgins, & Levine, 2009; Hardin & Higgins, 1996). According to ROAR, information that pertains to a successfully shared reality should be higher in truth relevance and, thus, more active in mind than information that does not pertain to a shared reality (assuming that the levels of value and control relevance are similar in both cases).

For the most part, experiments that have explored the creation of shared reality, and that have examined its effects on memory, have used a variant of the *saying-is-believing* paradigm (Higgins & Rholes, 1978). Typically, this involves having participants read an essay about the behavior of another individual (the target person) who supposedly agreed to be part of a long-term research project on person perception. The essay usually consists of several passages that describe the target's actions in an evaluatively ambiguous manner, that is, in a manner that makes it equally likely for the actions to be interpreted positively or negatively. For example, the behavior in the

following passage can readily be construed as either "independent" or "aloof": "Other than business engagements, Michael's contacts with people are surprisingly limited. He feels he doesn't really need to rely on anyone" (Echterhoff, Higgins, Kopietz, & Groll, 2008). After participants finish reading the essay, they are asked to convey a message about the target person's behaviors (without revealing his identity) to another volunteer who they are told happens to be personally familiar with him. They are also told that, afterward, the audience volunteer will try to identify the target person from a set of several possible targets based on the contents of the message. Finally, in order to manipulate their beliefs about the audience's attitude toward the target, participants are informed (in an offhand manner) that the audience either likes or dislikes the target.

It has been shown repeatedly that, under these circumstances, participants tend to engage in audience tuning; that is, they construct an evaluatively positive message when they believe the audience likes the target and an evaluatively negative message when they believe the audience dislikes the target. More importantly, when participants are asked after a delay to accurately recall the contents of *the original essay* about the target person, their responses tend to be evaluatively consistent with their previous, audience-tuned message, rather than the original essay. This result is commonly referred to as the *saying-is-believing effect* because it suggests that participants end up remembering and believing what they said to the audience rather than what they originally learned about the target.

Conditions for Establishing a Shared Reality

A number of recent studies by Echterhoff, Higgins, and colleagues (see Echterhoff, Higgins, & Levine, 2009, for a review) have demonstrated that the saying-is-believing effect depends entirely on whether or not participants were successful in creating a shared reality about the target person with their audience. More specifically, participants' mental representations of the target remain *unbiased* by their audience-tuned message when any one of the following four conditions is *not* satisfied. First, individuals must experience a correspondence between their *inner states*, not just between externally observed states or behaviors. Of course, one of the primary ways in which people infer a commonality of inner states is by observing similarities in their outward behavior. For example, an individual who is applauding at a political rally will assume that the other audience members who are applauding share her favorable attitude toward the candidate who is speaking. However, the point is that she must go beyond the simple observation that other people are moving their hands in the same way that she is and infer that these movements signal a shared positive attitude about a common target (i.e., the candidate and his beliefs); if not, she might (for example) conclude that the audience is just being polite, which would actually be detrimental to her chances of establishing a shared reality.

This example also serves to illustrate the second condition, which is that shared reality must be *about* some target referent. That is, in order for shared reality to occur, the mental object that individuals have in common cannot be detached or diffuse; instead, it must be about some discrete feature, object, or state that has an identifiable form. The assumption is that only inner states that are about a concrete target can be the object of a shared reality. Returning to the previous example, this suggests that in seeing her fellow audience members applaud the candidate, she infers that they share her *positive attitude about that candidate*—this will then lead her to confirm her belief that the candidate is someone worth supporting. However, if she merely infers that the other audience members were clapping because they were simply being polite, in a good mood, drunk, or feeling happy that day, that is, the clapping is not *about* the candidate, she will not learn anything new about the merits of the candidate, and her beliefs about the candidate will not be affected.

The third condition, which is most directly relevant to the present topic, is that shared reality as an outcome cannot be separated from an individual's motivation for establishing it (i.e., truth). That is, although people can create the appearance of commonality between their and others' inner states for a number of different reasons (such as being polite or currying favor), this commonality will not be considered informative about the true nature of reality unless it stems from a motivation to acquire or validate knowledge about the world (i.e., truth effectiveness). Returning again to our example, this implies that an individual whose primary motivation is to establish what is real through shared reality will utilize the audience's positive attitude toward the candidate that is revealed by that audience's clapping as information relevant to how she should communicate her beliefs about the candidate (e.g., by clapping to communicate to the audience her shared positive attitude toward the candidate), whereas an individual whose only motivation is

to make political connections at the rally will utilize the audience's clapping as information regarding how she should respond in order to gain their approval (i.e., by clapping in order to behave similarly). As we demonstrate in more detail below, only the first individual's memory will be affected by the audience's attitude in the long term.

Finally, and crucially, the fourth condition for establishing a shared reality is that those involved must believe that their inner states have been shared. That is, even when people have taken the necessary steps to create a commonality of inner states with another individual, a shared reality will not be established unless they also perceive these steps to have been successful. Conversely, it is possible for people to establish a shared reality with another individual without there actually being an objective commonality of inner states, as long as they *believe* that the commonality actually exists. With respect to our example, this suggests that an individual will utilize the applause as information relevant to her beliefs as long she perceives it to be an expression of the audience's shared positive attitude toward the candidate (regardless of whether this is actually true or not). In contrast, the individual will not see the applause as relevant to her beliefs if she believes that it is merely an expression of politeness rather than a shared positive attitude toward the candidate (again, regardless of whether this is actually true), or if she believes that the audience thinks that *she* is simply clapping to be polite (i.e., a failure to communicate to the audience her shared positive attitude toward the candidate).

Role of Truth Relevance in Saying-Is-Believing Memory Effects

As mentioned above, the four conditions for successfully establishing a shared reality have been tested in a number of studies that used the saying-is-believing paradigm. For example, in two experiments by Echterhoff, Higgins, and Groll (2005), the audience-tuning effect on memory was found when participants learned that the audience had correctly identified the target based on their message, but no effect was found when they learned that the audience had *failed* to identify the target correctly from their message (i.e., when the fourth condition was violated). Furthermore, this memory effect was mediated by a measure of perceived shared reality that was collected after the feedback manipulation (but before the recall task). That is, participants in the failure feedback condition reported lower levels of epistemic trust than participants in the success condition, which in turn led them to exhibit a lower saying-is-believing effect. In a later unpublished study, this reduction in the audience-tuning effect on memory was observed even when the failure feedback was given *a week after* the message was produced.

The ROAR explanation for these results is that the information participants added to their original message (i.e., from audience tuning) remained high in truth relevance as long as they continued to believe that it was shared with the audience. When they learned that this was not the case, the information lost its truth relevance (i.e., it was perceived as being no longer trustworthy in terms of establishing what is real) and, thus, ceased to be active in memory. Because participants in the latter condition did not receive failure feedback until well after they had encoded the added information, this finding joins those of Anderson and Pichert (1978) and Dienes and colleagues (1995) in showing that changes in motivational relevance (truth relevance in the current case and value relevance in the others) dramatically affect memory retrieval *independent of their effects on encoding.*

It is worth noting that competing models of memory, especially those that appeal to the concepts of decay and interference, cannot account for the results of the studies by Echterhoff, Higgins, and Groll (2005). For instance, decay fails as an alternative explanation for the difference in memory between the success and failure feedback conditions because the amount of time that elapsed between participants' encoding of the biased message and their recall of the original essay was identical in both conditions, as was the time between the receipt of the feedback and actual recall. Similarly, because there was no difference between conditions in the information that participants received before their encoding of the biased message, and because they did not receive different feedback information until at least 10 minutes, and up to one week, after they had encoded the message, it would be difficult to argue that there was greater proactive or retroactive interference in one feedback condition compared with the other. The memory effect from audience tuning also does not depend on the audience's attitude influencing how the original essay is encoded because the same memory results have been found when communicators learn about the audience's attitude *after* they have already read and encoded the essay (Kopietz, Hellmann, Higgins, & Echterhoff, 2010). In sum, then, it is difficult to think of how a model of remembering could account for these

findings without taking motivational relevance into account.

In another set of studies that has important implications for ROAR, Echterhoff and colleagues (2008) demonstrated that the saying-is-believing effect does not emerge when the third shared reality condition has been violated (i.e., when participants established a commonality of inner states for goals other than determining what is real). Specifically, participants in these studies either received the standard saying-is-believing instructions (which were expected to elicit the epistemic motivation to reduce uncertainty about the evaluatively ambiguous essay) or were given a nonepistemic goal, such as gaining monetary rewards from giving a message that agreed with the audience (an ulterior motive). The results showed that only participants in the standard condition showed the audience-tuning effect when recalling their original message, and they did so up to three weeks after having produced the message. Furthermore, this effect was again mediated by participants' reported trust in their audience.

Again, in contrast to models of memory that do not discuss motivational relevance, ROAR can account for these results. Specifically, ROAR suggests that, after participants have communicated their message to the audience, the audience-tuned representation that they formed of the original essay only continues to have relevance (and thus only continues to be active) when they are motivated to continue to establish what is real about some target. Any value relevance that the representation received from ulterior motives, such as those produced by monetary incentives, ceases to exist once the opportunity for achieving these goals has passed (i.e., once the message has been conveyed). In contrast, the truth relevance that the representation receives from being part of a shared reality persists because the fundamental goal of establishing what is real remains (given that it is epistemic status has not been challenged).

Episodic and Autobiographical Memories and Relevance

Up to this point we have focused largely on various forms of semantic memory. We now consider evidence for the effect of relevance on episodic and autobiographical memory. Tulving (1972) has argued that episodic memory is different from other forms of memory (such as semantic memory) in that it alone pertains to autonoetic consciousness (i.e., awareness of one's subjective experiences in the past, present, and future; see also Wheeler, Stuss, & Tulving, 1997). But even if the experience, content, and (perhaps) structure of episodic memory differ from those of semantic memory, it is still possible that they are activated or retrieved in much the same way.

In a series of highly influential studies, Loftus and her colleagues demonstrated that false episodic memories can be experimentally induced—the so-called misinformation effect (Loftus, 2005). Interestingly, one feature of Loftus's memory induction method is to implicitly increase the plausibility of the false event, which suggests that perhaps episodic memories are more likely to be retrieved if they are relatively high in truth relevance. For example, in one study (Loftus, Miller, & Burns, 1978), participants first viewed a sequence of slides depicting a car accident and were then asked (among many other questions), "Did another car pass the red Datsun while it was stopped at the stop (yield) sign?" When they later viewed a new sequence of slides and were asked to identify which ones had been included in the original sequence, participants tended to falsely identify slides as a function of the information they were incidentally exposed to during the question phase (e.g., they recognized a picture with a yield sign when they actually saw one with a stop sign but were asked about a "yield" sign). The ROAR explanation for this result is that the incidental misinformation in this study has provided "What is it?" information about the sign, which is another source of establishing what's real and thus has truth relevance (see Higgins, 2012). This would increase the accessibility of the concept of a yield sign. It is also worth noting that, consistent with the results of the saying-is-believing studies described above, the misinformation affected memory even when it was manipulated just before retrieval, suggesting that the false memory effect cannot be explained solely in terms of differences in encoding.

Additional evidence that autobiographical memory is influenced by motivational relevance comes from a number of studies that have employed manipulations of positive value relevance. For example, in the experiment by Sanitioso and colleagues (1990) that we briefly mentioned earlier, participants were unobtrusively led to believe that either extroversion or introversion generally leads to more academic and professionally success. Later, in an ostensibly unrelated memory experiment conducted in a different room, they were asked to recall events in which they behaved in either an extroverted or introverted manner. Participants consistently recalled more autobiographical examples of

the type of behavior that they were led to believe was predictive of future success. Although it can be argued that this result reflects some form of deliberate self-presentation bias, the subtle nature of the manipulation and its dissociation from the recall task suggest that the result is actually an example of unintentional knowledge activation due to an increase in value relevance. That is, past behaviors have more value relevance and hence are more accessible when they are predictive (as opposed to not predictive) of future success.

Another example that we touched on earlier comes from Mather and colleagues' work on "positivity bias" in the elderly. Based on this work, they have argued that a shift of focus associated with aging, from acquisition of information to maintenance of emotional well-being, leads to increased emotion regulation, including heightened attention to emotional memories (Mather & Carstensen, 2005). It would be very interesting to determine whether this change in goals leads to a decrease in the relevance and accessibility of nonpositive information. Although it is certainly possible that "decreased attention" to nonpositive autobiographical memories occurs after they have already been retrieved, it is also possible that the low value relevance of these memories makes them less likely to be retrieved in the first place—not only because they have little positive relevance but also possibly because their negative relevance has also lessened over time. In passing, it is worth noting that the relation between motivational relevance, remembering, and affect is bound to be more complex than the simple picture we are attempting to paint here. For example, it is unclear whether increased emotion regulation on the part of older adults increases the proportion of positive memories they recall by (1) lowering the value relevance of negative memories, (2) weakening the nonpositive feelings that they produce in the rememberer after they have been accessed, or (3) affecting whether they are even endorsed "as one's *own* memories." Of course, although less parsimonious, it is also possible that some combination of these processes contributes to better memory for more positive events.

Finally, ROAR may also be useful for understanding the effects of certain psychopathologies on episodic memory. For example, there is some evidence that people suffering from post-traumatic stress disorder (PTSD) show increased activation of trauma-related mental representations, and even that such activation predicts the severity of some PTSD symptoms (amount of flashbacks) over and above initial severity (Michael, Ehlers, & Halligan 2005). Although this example deals with pathologically negative value relevance, ROAR predicts the same outcome for pathologically positive value relevance. This suggests that, for people suffering from drug addition, drug-related information should be particularly accessible and, hence, easier to recognize and recall (an extreme case of which may be the Hallucinogen Persisting Perception Disorder [flashbacks]). Such ease of retrieval may exacerbate the drug craving and hamper attempts of rehabilitation (see Gawin & Kleber, 1986). In support of this hypothesis, a recent study demonstrated that disrupting reconsolidation of drug-related memories decreased future drug-seeking behavior (Lee, Di Ciano, Thomas, & Everitt, 2005).

Concluding Remarks

Our goal in this chapter was not to exhaustively review all previous demonstrations of motivation's effects on memory. Rather, our two major goals were, first, to establish a link between research on the activation of mental representations and research on memory and, second, to build on this link by offering a framework for understanding when and how motivation—more specifically, motivational relevance—affects mental activation and remembering.

Our review has completely ignored certain types of memory (e.g., procedural memory) and only touched others in a cursory manner (e.g., episodic memory). Still, the findings we reviewed support our contention that, because all memory systems involve some form of knowledge activation, they all involve retrieval processes that are influenced by motivational relevance. Consequently, ROAR may be particularly useful in predicting which memories people are likely to remember.

In closing, we would like to reiterate three points regarding the nature of ROAR and its relation to memory. First, as we emphasized in our discussion of the saying-is-believing effect, ROAR allows for different memories, or even different features of the same memory, to be recalled at different times *even though their availability* (i.e., their memory "trace") *remains constant*. For example, ROAR can account for the results of the Anderson and Pichert (1978) study discussed earlier in the chapter by positing changes in motivational relevance that accompanied participants' changes in role perspective toward the story. As long as the originally encoded information is still available, then changing perspective can make some subset of the information suddenly relevant and, thus, accessible for retrieval. Second, ROAR

does not compete with models of memory decay or fragmentation, such as the fuzzy-trace model (Reyna & Brainerd, 1995); rather, it supplements such models by offering a mechanism for predicting what information will be selected among representations of similar strength or integrity. Finally, by linking mental activation, memory, and motivation, ROAR may serve as a bridge between psychological research on memory and recent neuroscientific findings that show substantial involvement of the brain's "reward system" in memory-related brain activity (see Shohamy, & Adcock, 2010, for a recent review).

References

Aarts, H., Custers, R., & Marien, H. (2008). Preparing and motivating behavior outside of awareness. *Science*, *319*, 1639–1639.

Aarts, H., Custers, R., & Marien, H. (2009). Priming and authorship ascription: When nonconscious goals turn into conscious experiences of self-agency. *Journal of Personality and Social Psychology*, *96*, 967–979.

Anderson, R. C., & Pichert, J. W. (1978). Recall of previously unrecallable information following a shift in perspective. *Journal of Verbal Learning and Verbal Behavior*, *17*, 1–12.

Balcetis, E., & Dunning, D. (2006). See what you want to see: motivational influences on visual perception. *Journal Personality and Social Psychology*, *91*, 612–625.

Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. New York: Cambridge University Press.

Brainerd, C. J., & Reyna, V. F. (1995). Autosuggestibility in memory development. *Cognitive Psychology*, *28*, 65–101.

Bruner, J. S. (1957). On perceptual readiness. *Psychological Review*, *64*, 123–152.

Brunot, S., & Sanitioso, R. B. (2004). Motivational influence on the quality of memories: Recall of general autobiographical memories related to desired attributes. *European Journal of Social Psychology*, *34*, 627–635.

Cherry, E. C. (1953). Some experiments on the recognition of speech, with one and with two ears. *Journal of the Acoustical Society of America*, *25*, 975–979.

Conway, M., & Ross, M. (1984). Getting what you want by revising what you had. *Journal of Personality and Social Psychology*, *47*, 738–748.

Crane, L., Goddard, L., & Pring, L. (2009). Specific and general autobiographical knowledge in adults with autism spectrum disorders: the role of personal goals. *Memory*, *17*, 557–576.

Custers, R., & Aarts, H. (2005). Positive affect as implicit motivator: On the nonconscious operation of behavioral goals. *Journal of Personality and Social Psychology*, *89*, 129–142.

Custers, R., & Aarts, H. (2010). The unconscious will: How the pursuit of goals operates outside of conscious awareness. *Science*, *329*, 47–50.

Custers, R., Eitam, B., & Bargh, J. (2012). Implicit and explicit goal processes. In Henk Aarts and Andrew Eliot (Eds.), *Goal-directed behavior* (pp. 231–266). New York: Psychology Press/Taylor & Francis.

Dienes, Z., Altman, G. T. M., Kwan, L., & Goode, A. (1995). Unconscious knowledge of artificial grammars is applied strategically. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *21*, 1322–1338.

Dunning, D., Perie, M., & Story, A. L. (1991). Self-serving prototypes of social categories. *Journal Personality and Social Psychology*, *61*, 957–968.

Echterhoff, G., Higgins, E. T., & Groll, S. (2005). Audience-tuning effects on memory: The role of shared reality. *Journal Personality and Social Psychology*, *89*, 257–276.

Echterhoff, G., Higgins, E. T., Kopietz, R., & Groll, S. (2008). How communication goals determine when audience tuning biases memory. *Journal of Experimental Psychology: General*, *137*, 3–21.

Echterhoff, G., Higgins, E. T., & Levine, J. M. (2009). Shared reality. *Perspectives on Psychological Science*, *4*, 496–521.

Eitam, B., Hassin, R. R., & Schul, Y. (2008). Nonconscious goal pursuit in novel environments: The case of implicit learning. *Psychological Science*, *19*, 261–267.

Eitam, B., & Higgins, E. T. (2010). Motivation in mental accessibility: Relevance of a representation (ROAR) as a new framework. *Social and Personality Psychology Compass*, *4*, 951–967.

Eitam, B., & Higgins, E. T. (unpublished manuscript). Motivation in mental accessibility: the case of truth relevance.

Eitam, B., Schul, Y., & Hassin, R. R. (2009). Goal relevance and artificial grammar learning. *Quarterly Journal of Experimental Psychology*, *62*, 228–238.

Eitam, B., Yeshurun, Y., & Hassan, K. (in press). Blinded by irrelevance: pure irrelevance induced 'blindness'. *Journal of Experimental Psychology: Human Perception and Performance*.

Ferguson, M. J. (2008). On becoming ready to pursue a goal you don't know you have: Effects of nonconscious goals on evaluative readiness. *Journal of Personality and Social Psychology*, *95*, 1268–1294.

Ferguson, M. J., & Bargh, J. A. (2004). Liking is for doing: The effects of goal pursuit on automatic evaluation. *Journal Personality and Social Psychology*, *87*, 557–572.

Förster, J., Liberman, N., & Higgins, E. T. (2005). Accessibility from active and fulfilled goals. *Journal of Experimental Social Psychology*, *41*, 220–239.

Frensch, P. (1998). One concept, multiple meanings: On how to define the concept of implicit learning. In M. A. Stadler & P. A. Frensch (Ed.), *Handbook of implicit learning* (pp. 47–105). Thousand Oaks, CA: Sage.

Gawin, F. H., & Kleber, H. D. (1986). Abstinence symptomatology and psychiatric diagnosis in cocaine abusers: Clinical observations. *Archives of General Psychiatry*, *43*, 107–113.

Gramzow, R. H., & Willard, G. (2006). Exaggerating current and past performance: Motivated self-enhancement versus reconstructive memory. *Personality and Social Psychology Bulletin*, *32*, 1114–1125.

Hardin, C., D., & Higgins, E. T. (1996). Shared reality: How social verification makes the subjective objective. In R. M. Sorrentino & E. T. Higgins (Eds.), *Handbook of motivation and cognition, Vol. 3: The interpersonal context* (pp. 28–84). New York: Guilford Press.

Hedberg, P. H., & Higgins, E. T. (2011). What remains on your mind after you are done? Flexible regulation of knowledge accessibility. *Journal of Experimental Social Psychology*, *47*, 882–890.

Higgins, E. T. (1996). Knowledge activation: Accessibility, applicability, and salience. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 133–168). New York: Guilford Press.

Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist*, *52*, 1280–1300.
Higgins, E. T. (2012). *Beyond pleasure and pain: How motivation works*. New York: Oxford University Press.
Higgins, E. T., & Rholes, W. S. (1978). "Saying is believing": Effects of message modification on memory and liking for the person described. *Journal of Experimental Social Psychology*, *14*, 363–378.
Jenkins, J. J. (1974). Remember that old theory of memory? Well, forget it! *American Psychologist*, *29*, 785–795.
Kaup, B. (2001). Negation and its impact on the accessibility of text information. *Memory & Cognition*, *29*, 960–967.
Kaup, B., & Zwaan, R. A. (2003). Effects of negation and situational presence on the accessibility of text information. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 29*, 439–446.
Klein, W. M., & Kunda, Z. (1992). Motivated person perception: Constructing justifications for desired beliefs. *Journal of Experimental Social Psychology*, *28*, 145–168.
Knight, M., Seymour, T. L., Gaunt, J. T., Baker, C., Nesmith, K., & Mather, M. (2007). Aging and goal-directed emotional attention: distraction reverses emotional biases. *Emotion*, *7*, 705–714.
Kopietz, R., Hellmann, J. H., Higgins, E. T., & Echterhoff, G. (2010). Shared reality effects on memory: Communicating to fulfill epistemic needs. *Social Cognition*, *28*, 353–378.
Koriat, A., Goldsmith, M., & Pansky, A. (2000). Toward a psychology of memory accuracy. *Annual Review of Psychology*, *51*, 481–537.
Kruglanski, A. W. (1989). *Lay epistemics and human knowledge: Cognitive and motivational bases*. New York: Plenum Press.
Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin*, *108*, 480–498.
Lee, J. L. C., Di Ciano, P., Thomas, K. L., & Everitt, B. J. (2005). Disrupting reconsolidation of drug memories reduces cocaine-seeking behavior. *Neuron*, *47*, 795–801.
Loftus, E. F. (2005). Planting misinformation in the human mind: A 30-year investigation of the malleability of memory. *Learning & Memory*, *12*, 361–366.
Loftus, E. F., Miller, D. C., & Burns, H. J. (1978). Semantic integration of verbal information into a visual memory. *Journal of Experimental Psychology: Human Learning and Memory*, *4*, 19–33.
MacDonald, M. C., & Just, M. A. (1989). Changes in activation levels with negation. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *15*, 633–642.
Mather, M., & Carstensen, L. L. (2005). Aging and motivated cognition: The positivity effect in attention and memory. *Trends in Cognitive Science*, *9*, 496–502.
McDonald, H. E., & Hirt, E. R. (1997). When expectancy meets desire: Motivational effects in reconstructive memory. *Journal of Personality and Social Psychology*, *72*, 5–23.
Michael, T., Ehlers, A. & Halligan, S. L. (2005). Enhanced priming for trauma-related material in posttraumatic stress disorder. *Emotion*, *5*, 103–112.
Mitte, K. (2008). Memory bias for threatening information in anxiety and anxiety disorders: A meta-analytic review. *Psychological Bulletin*, *134*, 886–911.
Moberly, N. J., & MacLeod, A. K. (2006). Goal pursuit, goal self-concordance, and the accessibility of autobiographical knowledge. *Memory*, *14*, 901–915.
Molden, D. C., & Higgins, E. T. (2005). Motivated thinking. In K. Holyoak & B. Morrison (Eds.), *Handbook of thinking and reasoning* (pp. 295–320). New York: Cambridge University Press.
Moray. N. (1959) Attention in dichotic listening: affective cues and the influence of instructions. *Quarterly Journal of Experimental Psychology*, *9*, 56–60.
Moskowitz, B., G., Gollwitzer, M. P., Wasel, W., & Schaal, B. (1999). Preconscious control of stereotype activation through chronic egalitarian goals. *Journal of Personality and Social Psychology*, *77*, 167–184.
Reber, A. S. (1967). Implicit learning of artificial grammars. *Journal of Verbal Learning and Verbal Behavior*, *6*, 855–863.
Reyna, V. F., & Brainerd, C. J. (1995). Fuzzy-trace theory: An interim synthesis. *Learning and Individual Differences*, *7*, 1–75.
Ross, M. (1989). The relation of implicit theories to the construction of personal histories. *Psychological Review*, *96*, 341–357.
Rushworth, M. F., Walton, M. E., Kennerley, S. W., & Bannerman, D. M. (2004). Action sets and decisions in the medial frontal cortex. *Trends in Cognitive Science*, *8*, 410–417.
Sanitioso, R., Kunda, Z., & Fong, G. T. (1990). Motivated recruitment of autobiographical memories. *Journal of Personality and Social Psychology*, *59*, 229–241.
Sedikides, C., & Green, J. D. (2009). Memory as a self-protective mechanism. *Social and Personality Psychology Compass*, *3*, 1055–1068.
Shohamy, D., & Adcock, R. A. (2010). Dopamine and adaptive memory. *Trends in Cognitive Sciences*, *14*, 464–472.
Tulving, E. (1972). Episodic and semantic memory. In E. Tulving, W. Donaldson & G. H. Bower (Eds.), *Organization of memory* (pp. 381–403). New York: Academic Press.
Tulving, E., & Thomson, D. M. (1973). Encoding specificity and retrieval processes in episodic memory. *Psychological Review*, *80*, 352–373.
Voss, J. L., & Paller, K. A. (2008). Brain substrates of implicit and explicit memory: The importance of concurrently acquired neural signals of both memory types. *Neuropsychologia*, *46*, 3021–3029.
Wheeler, M. A., Stuss, D. T., & Tulving, E. (1997). Toward a theory of episodic memory: The frontal lobes and autonoetic consciousness. *Psychological Bulletin*, *121*, 331–354.
Wolfe, J. M (1999). Inattentional amnesia. In V. Coltheart (Ed.), *Fleeting memories* (pp. 71–94). Cambridge, MA: MIT Press.
Zeigarnik, B. (1938). On finished and unfinished tasks. In W. D. Ellis (Ed.), *A source book of gestalt psychology* (1st ed., pp. 300–314). New York: Harcourt.