



Developments in implicit leadership theory and cognitive science: Applications to improving measurement and understanding alternatives to hierarchical leadership

Sara J. Shondrick, Jessica E. Dinh, Robert G. Lord *

University of Akron, USA

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ABSTRACT

After reviewing key findings regarding leadership categorization theory, we develop new perspectives regarding the design of behavioral measures of leadership and the implications of shared leadership and complex adaptive leadership conceptualizations of leadership. In particular, by applying recent developments in cognitive science, we explain how an understanding of symbolic, connectionist, and embodied representations of knowledge can benefit behavioral measures of leadership. Additionally, we address some practical issues associated with the measurement of leadership and argue that ratings which tap episodic memory at the event level may be more meaningful than ratings based on semantic memory. Finally, we discuss how notions of shared leadership and of leaders as catalysts for complexity can create unique complications for leadership perceptions, coordinated behavior within a group, and the measurement of leadership.

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Early research on leadership categorization theory (Eden & Leviatan, 1975) emerged 35 years ago in response to developments in social cognitive theory. The central assumption of this theory was that an important component of leadership perceptions and behavioral ratings is provided by the knowledge structures held by perceivers. This idea was elaborated by viewing perceiver knowledge structures as social categories that allowed for the classification of individuals into leader or non-leader categories. Such categorization then guided both the encoding and retrieval of leader-relevant information such as behavioral descriptions (Lord, Foti, & De Vader, 1984). Of central importance to this theory is the role of *implicit leadership theories* (ILTs; see Table 1), which are representations unconsciously held by followers that help distinguish “leaders” from “non-leaders” (Shondrick & Lord, 2010).

Since leadership categorization theory was developed, numerous aspects of social cognitive theory (Fiske & Taylor, 2008) and more general advances in the cognitive sciences have been applied to leadership research. This work has advanced our understanding of the cognitive processes underlying leaders' and followers' perceptions, interpretations, and sensemaking in response to both leadership and followership behaviors (Shamir, 2007; Shondrick & Lord, 2010). Additionally, leadership theories have also advanced beyond an emphasis on the hierarchical effects associated with the centralized control by leaders. Modern views have instead conceptualized leadership as being co-determined by leaders and followers (Shamir, 2007), as being shared among a group (Carson, Tesluk, & Marrone, 2007; Day, 2000; Pearce, 2004), as guiding the emergence of bottom-up organizational structures and practices (e.g., Marion & Uhl-Bien, 2001; Uhl-Bien & Marion, 2009), and as being intricately tied to social networks (Balkundi & Kilduff, 2005). These advances create unique complications for leadership research. Questions such as how ILTs and leadership perception are affected when multiple individuals are associated with temporary leadership roles or the resulting implications for how leadership should be measured are particularly important issues to consider.

Given these developments, our aim is to offer a synthesis of leadership perception theory and developments in understanding social cognitions. This synthesis extends our current understanding of leadership categorization theory to more dynamic

* Corresponding author. Department of Psychology, University of Akron, Akron, OH 44325-4301, USA. Tel.: +1 330 972 7018.
E-mail addresses: sjs34@uakron.edu (S.J. Shondrick), jd62@uakron.edu (J.E. Dinh), rlord@uakron.edu (R.G. Lord).

Table 1

Key findings from previous research on leadership categorization theory and social cognition.

Focus	Previous findings	Key reference(s)
Categorization and dynamic processes	Leader categories are defined by traits and leader characteristics and stored as ILTs ILTs help access categorical knowledge about leadership in semantic memory, which facilitates sensemaking but interferes with accurate behavioral ratings Leadership perceptions resist change. Perceptions often change in a discontinuous rather than a linear manner	Hogan et al. (1990), Lord et al. (1986), Offermann et al. (1994) Foti and Lord (1987), Lord et al. (1984) Foti et al. (2008), Hanges et al. (1997)
Generalizability	ILT content is similar cross-culturally, although individual variations exist	Den Hartog et al. (1999), Gerstner and Day (1994)
Development of ILT	Early relationships with caregivers influence development of leader prototypes The quality of the caregiver relationship influences relational schemas and the quality of later leader–follower relationships ILTs may reflect an individual's personality structure	Keller (1999, 2003), Popper and Amit (2009) Hazan and Shaver (1987), Keller (2003), Popper et al. (2000) Keller (1999)
Symbolic representation	Representations of leaders are stored abstractly in long-term memory and category structures are learned and change slowly	Lord et al. (1984)
Connectionist theory and the variable approach	Leadership is inferred when recurrent networks of prototypical qualities are activated <i>Patterns</i> of individual features and traits affect leadership perceptions and emergence	Lord, Brown, and Harvey (2001), Lord, Brown, Harvey, and Hall (2001) Foti and Hauenstein (2007), Smith and Foti (1998)
ILT consolidation and access to memory	Connectionist models of prototypes and constraints explain the flexibility in prototype generation and the biasing effects of leader race and gender A resonance process, likely due to patterns of input activation, activates memory stores and makes revisions to ILTs possible	Hanges et al. (2000), Rosette et al. (2008), Scott and Brown (2006) Medvedeff and Lord (2007)
Embodied effects	ILTs have an embodied component that allows affective, perceptual, and motor structures to influence leadership perceptions Emotional contagion from leader to follower affects leadership perceptions	Giessner and Schubert (2007), Lord and Shondrick (in press)
Attribution theory	Group outcomes tend to be attributed to leadership rather than to external influences <i>Causal attributions</i> depend on both the perceptual salience of relevant information and on explicit reasoning; dispositional attributions can activate ILTs	Bono and Ilies (2006), Cherulnik et al. (2001) Meindl, Ehrlich, and Dukerich (1985) Ensari and Murphy (2003), Phillips and Lord (1982)
Implicit follower theory	Perceiver's implicit beliefs of how followers are expected to behave influences leader–follower interactions, perceptions, and the memories that are formed	Uhl-Bien and Pillai (2007) Shondrick and Lord (2010), Uhl-Bien and Pillai (2007)
	Follower categorization is inferred based on group performance, characteristics, and behaviors	Lord and Maher (1991)

situations where leadership is transitory and is shared among a group of individuals rather than being more stable and hierarchical. Leader categorization theory can help one understand hierarchical relations, but because social categories structure one's perceptions (Lord & Maher, 1991) and behavior (Wofford & Goodwin, 1994), they may produce a cognitive inertia that inhibits more collaborative leadership approaches. Further, because leadership behavior tends to be assimilated with relevant knowledge structures, researchers need to carefully consider the implications of changing leadership patterns for behavioral measurement. For example, will perceivers effectively use multiple social categories to encode the changing behavior of a specific individual, or will they use only one category, perhaps missing or distorting behaviors associated with alternate roles?

To achieve this purpose and to help our readers navigate through these ideas, we have partitioned this paper into three sections. First, we will begin by briefly highlighting the seminal findings that have advanced our understanding of leadership categorization theory and the pivotal role of ILTs in shaping followers' perceptions and attributions regarding their leaders. As we do this, we will also identify three different underlying models regarding the representation of knowledge about leadership, including those considering ILTs as the result of symbolic processes (Lord et al., 1984), connectionist mechanisms (Hanges, Lord, & Dickson, 2000; Lord, Brown, Harvey, & Hall, 2001), and embodied cognitions (Giessner & Schubert, 2007; Lord & Shondrick, in press).

Our second goal is to focus on the measurement of leadership in organizations. The widespread importance of early research on ILTs derived from its ability to identify and explain problems associated with typical behavioral questionnaires (Eden & Leviatan, 1975; Staw, 1975). Such instruments are still the predominant methodology used in the study of leadership (Hunter, Bedell-Avers, & Mumford, 2007), and although some solutions to problems associated with ILTs have been proposed (Baltes & Parker, 2000; Martell & Evans, 2005), these techniques are not widely used. Moreover, problems have been identified which are associated with affective biases in leadership measures (Brown & Keeping, 2005), and the tendency for perceivers to rely on *on-line judgment processes* (encoding information in terms of a meaningful holistic summary such as liking or effectiveness of a leader, which then guides subsequent judgments) rather than memory-based processing which encodes and later retrieves specific behavioral elements as a basis for judgments (Hastie & Park, 1986). Our review summarizes these developments and emphasizes techniques which attempt to circumvent these methodical issues. In particular, we will discuss the implications associated with utilizing *semantic* versus *episodic* memory, and the methodological advantages of analyzing leader–follower interactions at an event-based level (specific moment-by-moment interactions) in comparison to traditional retrospective descriptions of typical leadership behavior.

Finally, rather than just taking a retrospective view of the leadership field, we consider the implications of newer conceptualizations of leadership as being a more collaborative, team-based process or as a catalyst for increasing organizational

complexity. Considerable strides have been made in our understanding of ILTs in the context of more traditional forms of leadership that involve the interaction between a single leader and followers. However, we extend this perspective to consider a more collective form of leadership — one which spontaneously emerges among a number of different individuals and where the relationship between leaders and followers is less hierarchical, more dynamic, and changes at different points in time.

Shared leadership in particular, has been defined as a process that results from the dynamic interactive influence among a group of members who are pursuing similar group or organizational goals (Morgeson, 2005; Pearce, 2004; Pearce & Conger, 2003). When leadership is shared, an individual's role may repeatedly shift from leader to follower or follower to leader, as new events are encountered which require the unique expertise of team members (Friedrich, Vessey, Schuelke, Ruark, & Mumford, 2009). When these changes occur frequently, leadership may be more appropriately conceptualized as an emergent property of a team (or system) rather than at the individual level of analysis (Day, 2000). *Complexity leadership theory* has extended these ideas to consider how leadership processes can operate in complex systems, where adaptive responses can develop from bottom-up emergent processes (Uhl-Bien, Marion, & McKelvey, 2007) and where leaders are part of diverse networks of interacting individuals (Balkundi & Kilduff, 2005; Hooijberg, Hunt, & Dodge, 1997). From these more recent perspectives, dynamic, distributed, and diffuse leadership activities not only complicate the use of ILTs in guiding the perceptions and behavior of organizational members, they create challenging difficulties for leadership researchers who rely on retrospective questionnaires to capture leadership processes. Specifically, typical ILTs (and most current leadership measures) reflect the assumption that leadership is portrayed by a single individual operating in a stable hierarchical structure; they are not geared to assessing more micro-level leadership events or the collaboration of multiple individuals in leadership processes. Leadership researchers need to consider the extent to which ILTs apply to shared leadership, complexity leadership, or leadership networks and how leadership categorization (or follower categorization) processes could be affected by dynamic instances of collective leadership.

Therefore, we begin by reviewing the origins of ILTs, discuss how leader categorization guides perceptions, and we highlight other seminal findings pertaining to leadership categorization theory. Then, we review research on the measurement of leadership behaviors and some of the issues associated with contaminating factors that cue ILT retrieval. Based on this past work, we offer suggestions aimed at improving leadership measures by focusing on event-level evaluations rather than overall trait-based judgments. This level may be better suited to capturing the dynamic changes associated with shared, collaborative leadership. Finally, we address issues related to emerging trends in the leadership field by coming full circle to connect both measurement and application of ILTs to theories of shared, complex, and distributed leadership.

1. Implicit theories and leadership

1.1. Social cognitions and ILTs

As briefly mentioned, research on ILTs and their implications for leadership perception has been based on the developing field of social cognition over the past 35 years. According to Fiske and Taylor (1984, 2008), information is represented abstractly in *schemas*, which are cognitive categories that people use to represent the prototypical characteristics of a wide range of categories, such as types of animals, events, cars, emotions, and people. In fact, although different types of schemas have been identified (e.g., schemas for different roles and behavioral scripts for different events), they all influence social cognition and person perception by shaping an individual's perception, interpretation, and memory of a social stimuli based on its categorical membership (Fiske & Taylor, 1984). For instance, followers have schemas (e.g., ILTs, which can be thought of as schemas for leaders) which help guide perceptions and the active construal of others by providing a set of generic assumptions and beliefs as what to expect and how to respond in an adaptive manner to various individuals (Brown, Scott, & Lewis, 2004; Fiske & Taylor, 1984, 2008). Reliance on these schemas helps perceivers simplify social processes so that they can allocate scarce attentional resources to other issues, such as solving problems or coordinating activity within a team. They do this by substituting the reliance on general knowledge for detailed, effortful encoding of the unique elements associated with a specific individual and a particular point in time. The use of such implicit theories also helps perceivers encode and update general information about specific others, form appropriate behavioral expectations and emotional reactions, and coordinate effectively with other individuals such as their leader or follower. In sum, these extensions of social cognitive research to the leadership domain have provided the basis for leadership categorization theory.

1.2. Recognition of leadership and leadership categorization theory

1.2.1. Leadership categorization theory

According to leadership categorization theory, followers have schemas of what a prototypical leader should be. Foremost, this enables individuals to distinguish leaders from non-leaders and make sense of a leader's behavior by assimilating their specific experience with general knowledge about leadership. These ILTs are learned from experience (Lord, Foti, & Phillips, 1982; Lord & Maher, 1991; Lord et al., 1984) and are subsequently used during information processing so that different individuals who resemble a perceiver's expectations for leadership can all be classified as leaders and treated equivalently. Thus, at its heart, categorization is a pattern-matching process in which sufficiently good matches of social target's behaviors or characteristics to a pattern (prototype) which defines a category for perceivers, results in: a) a classification as a leader and b) a pattern-completion process through which unobserved but prototypical traits or behaviors are also associated with the categorized individual. Importantly, this process allows perceivers to access ILTs containing general knowledge about leaders, which can then guide (and

bias) social sensemaking, behavioral expectations, and memory in a way that simplifies social perceptual processes and frees limited resources for other issues such as problem-solving and coordination.

Although this process can be very adaptive in terms of making team interactions more predictable and more sensible, and thereby freeing much needed resources, this pattern-matching process can also lead to negative consequences for researchers interested in measuring leadership behavior. This is because followers might “remember” prototypical traits and behaviors that are commonly associated with leadership, even if the newly labeled leader did not actually demonstrate these characteristics (Lord et al., 1984). For instance, leaders can be wrongly credited for a team's performance by perceivers because ILTs can include beliefs that leaders are the sole determinant of good performance (which is often a mistaken inference; Brown et al., 2004). As we will discuss, this process not only biases ratings of specific leader behaviors, it can also produce a more aggregate effect on the factor structure of a measurement instrument. This has been shown in several studies in which perceivers rate a leader whom they know very little about, yet their ratings exhibit a factor structure that is highly similar to that found when subordinates rate a familiar leader (Eden & Leviatan, 1975; Rush, Thomas, & Lord, 1977; Weiss & Adler, 1981). This research, along with the effects of performance cues which are discussed later, suggest that the construct assessed by typical leader behavioral measures may not directly assess leader behaviors, and it also calls into question the validity indicated by correlating these ratings with performance. Thus, categorization theory is not just a theory about leadership perception; it also explains many other aspects of social information processing in the leadership domain.

According to leadership categorization theory, the concept of a leader is not a unitary construct. Rather, followers often possess multiple, contextually-based schemas of leaders (Lord et al., 1984, 1982). In other words, although recognizing someone as a leader ultimately depends on the match between a target's features and the follower's mental representation of a leader (also referred to as a prototype) (Lord & Maher, 1991; Lord et al., 1984), there is nevertheless a wide array of “typical leaders” held within ILTs. Consistent with Rosch's theory of categorization, these leader categories are organized in a hierarchical structure with three distinct hierarchical levels that differ based on their level of abstraction (Lord et al., 1984, 1982). Prototypic representations of leaders at the *superordinate level* are the most inclusive and abstract, containing generalized information such as the difference between a leader and a non-leader. Below that, *basic-level* representations are more specific categories which are perhaps the most useful because they contain contextual information, which can alter what is required to be seen as a leader. Contextualized prototypes enable followers to distinguish among different types of leaders, such as political leaders or religious leaders (Brown et al., 2004), and yet still see them as reflecting the superordinate leadership category. To illustrate, Solano (2006) found that depending on the context, followers preferred different types of leaders. Under civilian contexts, people preferred democratic behavior and leadership characteristics that focused on the well-being of the individual, whereas under military contexts, people favored characteristics that were autocratic or were self-focused (Solano, 2006). Finally, at a *subordinate level*, prototypes may contain distinct types of leaders within specific contexts, such as a female as compared to a male business leader or a higher-level compared to a lower-level business leader. Therefore, not only do followers possess multiple representations of a leader, but these prototypes are contextually sensitive, becoming more or less salient under different contexts, and implying different patterns of behaviors or characteristics (see also Lord et al., 1984).

This *recognition-based approach* to leadership perceptions, in which perceivers automatically compare a target individual to an ILT, parallels the mechanisms underlying general object recognition processes (for a review see Smith & Medin, 1981). In both instances, perceivers compare targets (e.g., a potential leader) to pre-existing categories such that when an alignment occurs, targets are recognized as being instances of a category and are reacted to accordingly. Importantly, the categorization of leaders (and other targets) operates on an ill-defined fuzzy set (Fiske & Taylor, 1984; Rosch, 1978) such that the presence or absence of any one schema-consistent feature does not necessarily result in the exclusion of an individual from being labeled as a leader. Instead, such inconsistencies may result in the individual being labeled as a leader, but with a reduced degree of fit. Thus, the boundaries of schemas can be unclear, with several instances (or specific examples) of the leader category having an imperfect fit. However, the center (i.e., the prototype) is well-defined. In essence, category members (and types of leadership categories) exhibit a “family resemblance” structure rather than sharing identical patterns of attributes. For example, several business leaders may each have some unique attributes, but they all can be easily recognized as business leaders because they are similar to a business leader prototype.

The emphasis on prototypes as defining leadership categories is consistent with trait research in leadership, which has consistently identified several traits as being associated with leadership perceptions or the emergence of an individual as a leader in group situations (Judge, Bono, Ilies, & Gerhardt, 2002; Lord, de Vader, & Alliger, 1986). For instance, Offermann, Kennedy, and Wirtz (1994) have identified eight distinct trait-like factors that define ILTs (i.e., sensitivity, dedication, tyranny, charisma, attractiveness, intelligence, strength, and masculinity) that are consistently identified regardless of the gender of a perceiver or the stimuli presented. Furthermore, Epitropaki and Martin (2004) replicated six of these factors and found that ILTs were stable across a one-year time period and across different employee groups. Other studies suggest that factors such as dominance, ambition, empathy, likeability, and independence are also intimately tied to leadership perceptions (Hogan, Raskin, & Fazzini, 1990; Judge, Colbert, & Ilies, 2004; Morrow & Stern, 1990). In sum, patterns of traits can simplify reality by imposing structure on a somewhat ambiguous social world, as leader categorization theory implies. However, one might suspect that because of unique experiences and motivation, different perceivers may structure their social world slightly differently and need not have the same perceptions of a specific individual (Engle & Lord, 1997). Consequently, whether the content of ILTs is universal and whether leadership perception is similar across different cultures and individuals has also been a focal interest over the past few decades.

1.2.2. Variability in ILTs

Leader categorization has recognizable consequences on the behaviors of both leaders and followers (Shondrick & Lord, 2010) and on performance outcomes (Ayman & Chemers, 1983). Although several cross-cultural similarities in leadership prototypes have been identified (Den Hartog, House, Hanges, Ruiz-Quintanilla, & Dorfman, 1999), ILTs are social constructs that are largely shaped by an individual's past interactions and unique personal experiences and may thus show some cross-cultural variability (Brown et al., 2004; Fiske & Taylor, 1984). The GLOBE project headed by Robert House has examined ILTs in 60 cultures from diverse regions of the globe, and has generally found that several attributes related to ILTs are in fact universally endorsed across cultures (Den Hartog et al., 1999; House et al., 1999). However, because these researchers gathered ratings of ideal leaders rather than typical leaders, the attributes may be more generalizable across cultures as they are less sensitive to situational cues (Shondrick & Lord, 2010). In another widely cited study examining cross-cultural differences in ILTs, Gerstner and Day (1994) had respondents from eight different countries evaluate 59 attributes previously identified as being characteristic of a leader. Arriving at different conclusions, they found that the prototypicality of specific attributes varied across cultures. Overall, cross-cultural research on ILTs indicates that while some features in ILT are shared cross-culturally, there are also important differences across cultures.

1.2.3. Development of ILTs

Recent investigations have also focused on the extent to which other social factors, such as past relationships and direct interactions with close others (Keller, 1999, 2003), are important determinants of leader categories. Keller (1999) for instance, suggests that past role models (e.g., parents or caregivers) can have a significant influence on ILTs by providing individuals with an early cognitive framework for authority figures through social-learning processes. She posited that through experience and interpersonal interactions, the characteristics and qualities associated with a primary caregiver become internalized creating an individual's image of an ideal leader. Consistent with this view, it has been generally found that followers who perceive their parents as tyrannical (e.g., manipulative and power-hungry) tend to endorse similar attributes in their ILTs, whereas non-representative traits (e.g., sensitivity) were not included in their representations of an ideal leader. Conversely, individuals who described their parents as dedicated, inspiring, and dynamic were more likely to include these attributes in their ILTs than not (Keller, 1999).

Early relationships also have an important role in shaping the mental model individuals use to make sense of leader–follower interactions. For example, research on attachment theory posits that early attachment styles (e.g., secure, avoidant, and anxious styles), which develop through primary experiences with caregivers, are crucial determinants that define the relational schemas individuals use to guide future interactions with close others (Hazan & Shaver, 1987; Keller, 2003). For instance, individuals with secure attachments may internalize the belief that others are trustworthy and sensitive based on the image of their caregiver (Keller, 2003).

Although early research has focused on caregiver–child relationships, attachment theory presents two implications on understanding leadership processes. Foremost, it can offer an explanation for different leadership styles or an individual's motivation to assume a leadership role (Popper & Amit, 2009). As an example, Popper, Mayseless, and Castelnovo (2000) found that secure attachment styles are typically correlated with transformational leadership styles. Secondly, attachment theory can also offer insight as to how followers make sense of leader–follower interactions. Because both leader–follower relationships and caregiver–child relationships involve affective bonds or feelings of attachment (Keller, 2003; Popper et al., 2000), it is possible that the mere presence of affective bonds may evoke attachment dynamics that were initially formed during caregiver–child interactions. This process would allow individuals to apply previously learned behavioral scripts and interaction patterns stored in one's ILTs to current leaders or superiors, and it may explain why liking of a leader is such a central component to leadership ratings (Brown & Keeping, 2005).

As the previous paragraphs suggest, early social interactions may have a pivotal role in developing leader prototypes because they provide individuals with a model from which an ideal leader can be defined. However, it is not necessary that these models be based on external figures; rather, they can also be constructed from our understanding and awareness of our sense of self (Keller, 1999). Research on interpersonal attraction suggests for instance, that individuals have a tendency to prefer and affiliate with others who share similar attitudes and values (Berscheid, 1984). Thus, it is conceivable that an individual's self-view, along with their personal ideological preferences, can be reflected in their image of an ideal leader (Felfe & Schyns, 2006; Keller, 1999). Coinciding with this view, it has been shown that ILTs closely resemble an individual's personality structure. For example, individuals who describe themselves as being conscientious, open, and agreeable are more likely to envision their ideal leader as being sensitive and compassionate, rather than being manipulative and domineering (Keller, 1999).

As our review suggests, leadership categorization theory includes both top–down and bottom–up processing. With *top–down processing*, categorization is a schema-driven process by which our expectations for an individual drive our perceptions (e.g., previous experiences with a caregiver color one's perceptions of a manager). In contrast, *bottom–up processing* occurs when our perceptions of a leader are based on a careful assessment of that individual's behaviors and traits, thus making it a data-driven process. Typically, leadership categorization is the product of both actual traits and our expectations (Lord et al., 1982). Indeed, although the use of ILTs to guide perceptions seems universal, the content of ILTs may vary across individuals as a result of their environment (e.g., culture), interactions (e.g., parents or caregivers), exposure to specific contextual cues such as the type of leader (e.g., business versus religious or effective versus ineffective leaders), and even across time. In fact, as shown by Matthews, Lord, and Walker (1990), younger children are more likely to judge leaders based on specific actions and exemplars (e.g., parents), whereas older children (i.e., in 6th to 12th grade) more frequently base their perceptions on elaborate abstract leader prototypes.

Thus, rather than envisioning an ILT as a stable and uniform construct, ILTs may be better conceptualized as dynamic structures that can change across one's lifespan.

1.3. Symbolic and connectionist models of leadership recognition

Early conceptualizations of leadership categorization theory assumed that the knowledge contained within ILTs was symbolic in structure. *Symbolic models of knowledge* contend that knowledge is represented abstractly in terms of symbols (e.g., abstract entities such as words that designate something else). However, this assumption was later modified following researchers' dissatisfaction with symbolic models' ability to explain how ILTs are able to adjust to create new prototypes for specific situations. According to a symbolic model, this process of creating new contextually-specific ILTs should occur very slowly because symbolic representations of leaders remain invariant and static across situations. However, we know that ILTs are sensitive to context (Lord et al., 1984), culture (Gerstner & Day, 1994), the leader's gender (Heilman, Block, Martell, & Simon, 1989), race (Rosette, Leonardelli, & Phillips, 2008), and the hierarchical level (Baumgardner, Lord, & Forti, 1990). Such variability makes it more likely that some aspects of leadership categories are, in Barsalou's (1999) terms, "generated-on-the-fly," or created in the moment. Because of this shift, more recent models of leadership categorization theory argue that the knowledge held within ILTs is distributed across neuron-like networks, such that different patterns in these networks can be used to represent different leadership prototypes.

Consequently, to account for the dynamic qualities of ILTs, leadership categorization theory was refined using *connectionist models of knowledge*, in which ILTs are represented by relatively stable patterns of connections in a neural-like network (Hanges et al., 2000; Lord, Brown, & Harvey, 2001; Lord, Brown, Harvey, & Hall, 2001). These researchers posit that it is the aggregate pattern created when such networks are activated that defines leadership categories. *Connectionist networks* transfer activation and inhibition among connected units, and the amount of activation (or inhibition) received by a particular unit depends on both the strength of the weights connecting that unit to antecedent units and the degree of activation of the antecedent units. Thus, much like a predicted dependent variable in multiple regression, each unit's received activation is a weighted sum of the effects of upstream units (e.g., predictors), but the weights in a connectionist network are learned through experience rather than being created by a mathematical processes as in multiple regression. However, it should be realized that it is the entire pattern of activation in a network that is meaningful, not just the activation of a single unit.

Connectionist networks often have multiple layers. For example, in two layer networks, activation may flow directly from an input layer (e.g., stimulus properties) to an output layer (social perceptions). However, networks with hidden layers that intervene between inputs and outputs are more useful for modeling social cognitions because the hidden layer can represent the effects of knowledge structures such as schema. One specific type of network, a recurrent network, has received particular attention from researchers interested in social categories and stereotypes because such networks can learn prototypes and model stereotypes (Kunda & Thagard, 1996; Smith, 1996). In a *recurrent network*, each element in the hidden layer can activate every other element at that level. Because activation cycles back and forth among the elements in this hidden level, the pattern of activation at the hidden level is dynamically created from the associations among elements as well as from inputs and constraints from still other layers in networks. This process, which can happen very quickly (in a few hundred milliseconds), is called "settling in," and it is responsible for the pattern-completion properties of networks as well as their sensitivity to activation or inhibitory constraints from other levels (goals, context, history, etc.). Indeed, recurrent networks are often called constraint-satisfying networks (e.g., Kunda & Thagard, 1996) because they can tune the solutions created by settling-in processes to sets of momentary constraints, and thereby create a context sensitive interpretation.

Recurrent networks can demonstrate stability in the interpretations they create because the weights connecting units change slowly, providing an overall structure to perceptions that is often equated with top-down influences. These networks are also flexible because both input patterns (bottom-up stimulus effects) and constraints (activation flowing from other activating or inhibitory connections) can change from situation to situations. This dynamic flexibility allows the same cognitive structures to accommodate contextual differences and situational factors, which results in contextually-tuned prototypes that can quickly be altered based on situational anomalies (Hanges et al., 2000). For instance, a different pattern of activation may be generated when schemas for military leaders are used compared to when schemas for business leaders are used. Similarly, when members strongly identify with groups, constraints from groups may alter the prototype guiding social interactions and leadership perceptions (Hogg, 2001; Lord, Brown, & Harvey, 2001; van Knippenberg, van Knippenberg, De Cremer, & Hogg, 2004). Lord, Hanges, and Godfrey (2003) have also shown that such networks can be influenced by currently active goals. Thus, Lord and colleagues have argued that by conceptualizing prototypes as being a recurrent level in constraint-satisfying networks, we can sidestep the issue of a perceiver having to learn prototypes for all the various types of leaders they may encounter. Instead, more general prototypes, or ILTs, can be tuned to specific contexts, providing a more useful (and flexible) category structure for interpreting leadership traits and behaviors.

Recognition-based theories of leader categorization that rely on connectionist models are also consistent with recent work which has investigated how patterns of traits influence leader emergence beyond the independent effects of each trait. This recent work holds that the traditional *variable approach* (which focuses on specific individual traits of interest) should be complimented by a more contemporary *pattern approach* (Nystedt, 1997). The pattern approach, in contrast to a variable approach, assumes that the interaction or pattern across multiple variables is more meaningful and descriptive of human functioning than an examination of single variables (i.e., traits) by itself (Foti & Hauenstein, 2007; Smith & Foti, 1998). As an example, Smith and Foti (1998) found that when dominance, intelligence, and self-efficacy were examined together, the pattern created by the three variables predicted

leadership emergence across different tasks to a greater extent than the independent effects of each trait (e.g., main effects or two-way interactions in ANOVAs). Consequently, a patterned-approach may be particularly useful in understanding leadership with an implication being that conceptualizing individuals holistically, rather than as a simple aggregation of their parts, is more useful in conceptualizing the structure of ILTs. The connectionist perspective can be used to explain why patterns of traits are more important than individual traits in predicting leadership emergence because ILTs are activated when potential leaders resemble the *pattern* contained in ILTs rather than when individual traits are matched.

Viewing leadership perception in terms of a *pattern approach* is also advantageous in explicating how significant interactions between followers and leaders may be transferred into longer lasting memory stores and re-accessed later on. This process, as detailed by Grossberg's (1999) *adaptive resonance theory* (ART), contends that human information processing relies on match-based learning processes (Carpenter & Grossberg, 1995), in which *patterns* of bottom-up inputs interact with top-down internal expectancies (e.g., leader prototypes or ILTs) to result in one of two end states: resonance or continued parallel searches within other memory stores. Whereas *resonance* occurs when top-down expectancies and afferent inputs match; continued parallel searches occur when a successful match does not occur (see Carpenter, Grossberg, & Rosen, 1991; Grossberg, 1980). Importantly, only resonance permits access to working memory and permanent memory stores, which is more likely to occur when activation patterns are amplified and maintained for longer periods of time within cognitive networks (Grossberg, 1980). Thus, working and long-term memories are created only when resonance occurs.

The importance of the framework provided by ART is that it suggests a mechanism explaining how ILTs are activated and how prototype matching occurs, as well as how prototypes are remembered and stored within leadership categories. This perspective has been recently elaborated upon by a number of leadership theorists (e.g., Medvedeff & Lord, 2007; Shondrick & Lord, 2010), who suggest that the identification and perception of a leader is fundamentally due to the matched-based learning process detailed in ART. Specifically, when individuals begin to form an impression of another person, the incoming pattern of behavioral and trait-based information is compared to schemas that it may match in a parallel search processes. If the target individual is dominant, intelligent, and strong, for example, the incoming pattern may be matched to an ILT, resulting in resonance. This results in the individual being labeled as a leader, which is a conscious interpretation available to working memory and stored in long-term memory. Through resonance, we could also expect that as newer memories and interactions are consolidated over time, an individual's ILT and conception of a leader would also change. In sum, because resonance is needed for sufficient neural network activation, we can expect that combinations or *patterns* of leadership traits, as compared to unitary traits, would have a greater probability of activating or resonating with ILTs. Consistent with a connectionist account of leadership categorization processes, this process not only leads to the conscious perception of leadership, but can also produce durable memory traces of exhibited leadership that could guide subsequent decision-making in perceivers.

It is also important to note that both ART and constraint satisfaction can operate together, as both are based on recurrent connectionist networks. ART explains the search through many potential schemas for appropriate perceptual categories, and constraint satisfaction reflects the tuning of categories to contexts. In some situations or for some perceivers who are highly vigilant (e.g., they may see the potential perceptual issue as being self-relevant), the search for the right category may be the critical issue, but for others, who are less vigilant, category definitions may be more flexible allowing numerous constraints to tune general prototypes to more useable structures. Thus, when stimulus inputs do not precisely match general ideas of what leaders should be, activating the right encoding category (through search or constraint satisfaction) may be the critical issue in leadership perception. For example, Scott and Brown (2006) have shown that agentic behavior produced by females is not often recognized as an instance of leadership, but similar behavior produced by males is easily classified as leadership. This gender bias in leadership may largely reflect a failure in the preconscious search for the right leadership category, and if so, it could perhaps be eliminated by priming that makes leadership categories for encoding information more accessible.

1.4. Embodied, embedded knowledge and ILTs

Combined with symbolic and connectionist views of knowledge, an embodied embedded view of knowledge also has substantial relevance to leadership (Lord & Shondrick, in press). Emphasizing the biological sensitivity of knowledge, rather than its abstract quality, an *embodied, embedded* view maintains that modality-specific aspects of experience contribute to the development of knowledge (Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005). Specifically, perceptual, motor, and introspective systems in the human brain are fundamental aspects of knowledge representation that are created as events occur, a process called *on-line embodiment*. These aspects of knowledge are integrated with more abstract information as memories are formed, and later on when memories are retrieved (or more accurately recreated), these embodied components are simulated in an *off-line manner* — that is, in the absence of the original stimulus. For example, memories of a leader's actions would include not just what a leader said or did, but how it made a perceiver feel, and that feeling, in turn, would depend on the ability to recreate facial expressions associated with specific emotions and perhaps auditory representations of what a leader sounded like.

The embedded aspect of knowledge pertains to effects associated with a particular context which could be a physical context, a task context, or a social relation. The critical point is that some aspects of knowledge cannot be separated from context. For example, some knowledge that emerges from a group interaction may not be retrievable by any one individual apart from that group context and it may not even be represented in abstract forms (Wheeler, 2005). An important implication of this perspective is that memories of leadership and ILTs would have an embodied, embedded component. This component may be required to make more abstract information meaningful and may be a critical component of sensemaking processes related to leadership (O'Malley, Ritchie, Lord, Gregory, & Young, 2009), which influences leadership perceptions and memory for leadership

information. We know relatively little about the nature of embodied, embedded information for ILTs, but it is certainly an area that warrants future research. Applied to perceiver processes, Lord and Shondrick (in press) show how this perspective relates to leadership perceptions and attribution theory, as well as to decision-making and behavioral generation processes used by leaders. Throughout the remainder of this review, we will point out specific areas where this perspective is likely to be relevant.

In short, perceivers use ILTs in a dynamic and integrative way that employs the use of mental categories and schemas, along with associated memories, beliefs, expectations, and embodied reactions to make rapid sense of another's intentions and behaviors. Thus far, we have provided a brief review which highlights several key features we believe are essential in understanding ILTs and leadership categorization theory. At the same time however, we acknowledge that due to the enormity of the ILT domain, our review can only offer the gist of the rich body of ILT research and findings that has accumulated over the past several decades. Consequently, to provide readers with a fuller perspective of this leadership domain, we have included in Table 1 a summary of the findings presented in this review on ILTs as well as other relevant lines of social cognitive research which are arranged according to different areas of focus. This includes general principles regarding how ILTs are created, defined, used, altered, and represented, as well as how attributions influence leadership perceptions.

As can be seen from Table 1, research on ILTs has been diverse, spanning multiple theoretical perspectives. However, as we will also see, a common (and rather problematic) thread running through ILT research is that studying ILTs highlights both the benefits and drawbacks of top-down or schema guided social perceptions. For example, the recurrent aspects of a leadership schema can cause pattern completions that produce inappropriate inferences and generalizations. As many researchers have shown, ILTs can interfere with an individual's ability to distinguish between observed and prototypical, but unobserved behaviors. This becomes problematic in leadership assessment using behavioral questionnaires (Eden & Leviatan, 1975; Staw, 1975). As the literature suggests, these findings are quite robust (Brown et al., 2004) and have been demonstrated in instances when followers appear to infer leadership based on information they had received related to the performance of an organization (i.e. performance cue effects). We examine the implications of ILT for memory, leader perception, and leader assessment in the following sections.

2. Memory and the measurement of leadership processes

As we have shown, perceivers' cognitive and emotional processes play an important role in perception of and memory for leadership. However, the dynamic and implicit nature of many of these perceiver leadership processes also presents unique complications for the behavioral measurement of leadership. Researchers have developed multiple questionnaire measures of leader behavior, which are typically given to raters in order to rate a specific leader's behaviors. These ratings are often interpreted as being indicative of the leader's behavior (Shondrick & Lord, 2010). However, these ratings also are influenced by the rater's cognitive and emotional sensemaking, as we have long known (Eden & Leviatan, 1975; Staw, 1975). Because of such effects, typical measures of leadership often more directly reflect the rater's information processing rather than the leader's actual behaviors, which is quite problematic given the central focus that applied psychology has afforded behaviors. However, these scales are still the predominant methodology used in the study of leadership (Hunter et al., 2007).

Rating distortions produced by ILTs can be explained in terms of what the raters are remembering when they make behavioral ratings. Rather than recalling actual behaviors, raters typically recall previous judgments made while the ratee was present (Hastie & Park, 1986). Such on-line integration suggests that when leadership behavior is immediately assimilated into ILTs during perceptions, raters may be more likely to recall and use the ILTs rather than actually remember specific behaviors. This reliance on ILTs may occur, in part, because perceivers are processing patterns rather than specific traits or behaviors (Foti & Hauenstein, 2007; Smith & Foti, 1998). Further, because of the mutually activating internal structure of prototypes, this process may allow pattern-completion processes to activate elements of patterns that were never actually seen (Lord, Brown, & Harvey, 2001; Lord, Brown, Harvey, & Hall, 2001). Because leadership categorization results in reduced accuracy for prototypical behaviors compared to leadership-neutral behaviors (Binning, Zaba, & Whattam, 1986; Foti & Lord, 1987; Phillips, 1984; Phillips & Lord, 1982), ratings based on general judgments may not necessarily reflect the leader's behaviors. To more accurately measure actual behavior, ratings may need to focus on explicit events that occur within a specific context.

As we shall discuss in the following section, some researchers have suggested that the accuracy of behavioral ratings is influenced by the type of memory used to create the ratings, as well as by the extent of similarities in the rater's context, processing, and mood during encoding and retrieval. This research is largely based on Tulving's (2002) conceptions that one's explicit, declarative memory can be further divided into *episodic memory*, which is a memory for events and personal experiences, and *semantic memory*, which is a memory for objects, facts, definitions of spoken words, and verbal fluency (Kandel, Kupferman, & Iverson, 2000). Although many commonly used leadership questionnaires typically reflect semantic memory, ratings based on episodic memory may be more likely to accurately reflect actual leader behavior and may be less subject to biases (Martell & Evans, 2005). In order to understand how memory may play a role in the measurement of leadership, we offer an overview of semantic and episodic memory and then discuss how memory may influence the accuracy of behavioral ratings of leadership.

2.1. Types of memory

There are several different types of memories, and neurological research has found that certain brain areas show specialization in the types of memory storage that they support. *Declarative memory* involves one's explicit factual knowledge of people, places, concepts, and events. These memories are retrieved through conscious, deliberative attempts such as when raters explicitly attempt to recall critical incidents that reflect performance dimensions. Compared to other types of memories, declarative

memory tends to be very flexible and is capable of incorporating multiple types of new information over time (Kandel et al., 2000). Declarative memory can be further differentiated into semantic and episodic memories (Tulving, 2002). Although leadership measures typically rely on semantic memories, it may be valuable to find ways to encourage the use of episodic memory. This issue is discussed in subsequent sections.

2.1.1. Semantic memory

Semantic memory involves knowledge of factual information (e.g., “My supervisor oversees 30 teams of employees”) and tends to be independent of contextual information such as where the information was learned (Payne, Klin, Lampinen, Neuschatz, & Lindsay, 1999). Ratings of leadership that rely on semantic memory can be problematic because these ratings draw on the knowledge and processes that are made by categorizing an individual as a leader. Semantic knowledge is developed and expanded over time through associations in specialized memory store areas. This property allows ILTs to maintain considerable stability over time while still being able to incorporate new information. Semantic memories also can represent the conceptual relationships among different objects (such as an organization's hierarchy of power).

2.1.2. Episodic memory

In contrast, *episodic memory* involves explicit knowledge about context-dependent events which are personally experienced. Episodic memories typically include information regarding time and spatial representations (e.g., the location of the self-relevant to others at a particular time), which would seem to involve embodied perceptual structures (Hunsaker & Kesner, 2008). Leadership ratings which rely on this type of memory would entail retrieving specific examples of a time when the rater observed the ratee engaging in whatever behavior was being measured. The independence of episodic and semantic memory is supported by case studies involving amnesiac patients who are unable to recall dramatic personal experiences such as deaths in the family, and yet their semantic knowledge remains intact. Additionally, the independence of episodic and semantic memory is also evident in research addressing the age-related decline of episodic memory relative to semantic memory, and is shown by factor analytic work (Allen, Kaut, & Lord, 2008). One explanation for this independence is that episodic memories tend to be processed and stored in different areas of the brain compared to semantic memories. Episodic memories tend to be processed in the hippocampus and stored in the association areas of the prefrontal cortex rather than relying heavily on the medial temporal lobe, which is strongly associated with semantic memory (Allen et al., 2008).

Compared to semantic memory, episodic memory tends to be much more strongly tied to an individual's emotional experience during encoding (Payne et al., 1999). Neurological research supports this contention, such that episodic memory systems and emotional regulation systems converge in certain regions (Allen et al., 2008). The link between emotions and episodic memory is important because emotions influence cognition and serve as contextual cues for the retrieval of memories. Damasio's somatic marker hypothesis provides one of the most extensive models regarding how emotions influence decision-making and memory (Bechara, Damasio, Tranel, & Damasio, 2005; Damasio, 1995, 1998). According to this model, emotional reactions to external events involve an embodied, somatic response which is adaptive for decision-making as well as episodic memory formation and retrieval. Contrary to popular belief, this process can actually lead to better cognitive performance compared to when cognition is devoid of affect. Subsequently, emotional experiences that are congruent with the somatic marker may facilitate the retrieval of memories for that event, which in turn, will cue the retrieval of emotion-relevant information.

Additionally, ILTs have been found to have an affective component which may be better tapped by episodic compared to semantic memory. For instance, Naidoo, Kohari, Lord, and DuBois (2010) examined the effects of visualization procedures on ratings of experimental stimuli. Visualization made affect a more central aspect of ratings, allowed better recall of prior leadership assessments, and enhanced accurate retrieval of contextual information. All three of these effects are consistent with the interpretation that visualization enhanced access to episodic memory.

2.1.3. Retrieval effects

The linkages between emotion and memory are also demonstrated in cognitive research on transfer-appropriate memory processes. Morris, Bransford, and Franks (1977) first noted that memory retrieval is dependent not only on the level of processing utilized during encoding (with deeper-level processing typically leading to better memory performance than surface-level processing), but also on the similarity in cognitive operations that occur during encoding and retrieval. Memory performance tends to be highest when retrieval cues match encoding processes. According to this *transfer-appropriate processes* perspective, deeper-level (e.g., semantic) processing is associated with better memory performance because it is likely to be transfer-appropriate across a wide range of retrieval contexts, whereas less thorough processing strategies are likely to result in memory performance which is highly dependent on the retrieval context (Lockhart, 2002).

When encoding does not involve semantic encoding, the transfer-appropriate processing perspective implies that the relation between retrieval cues and encoding processes is likely to have a stronger effect on memory. For example, research has found that chewing gum can act as a contextual cue, with memory performance on a free-recall task being higher when participants either chewed gum or did not have gum during both encoding and retrieval, suggesting that other embodied experiences may also influence memory (Miles, Charig, & Eva, 2008). Other research using scuba divers (Godden & Baddeley, 1975) confirmed the existence of a context-dependent memory: those who had learned the list of words underwater performed better on a free-recall task when tested underwater, whereas those who had learned the list on land performed better on land. More recently, Thompson, Williams, L'Esperance, and Cornelius (2001) replicated this context-matching effect using sky divers, although they found that

memory performance was generally poor when words were learned in an extremely emotionally arousing context (i.e., skydiving).

Mood can also be an important aspect of context, and research supports both mood-dependent memory effects, in which the retrieval of emotional information is facilitated when it matches an individual's current mood, and mood-congruent effects, in which emotional information is remembered better when an individual's mood during retrieval matches the emotional context of the learned information. However, although mood can serve as a retrieval cue which facilitates memory performance, it can also lead to the creation of mood-congruent false memories (Ruci, Tomes, & Zelenski, 2009). What all this research has in common is the implication that embodied, embedded aspects of knowledge are important encoding and retrieval cues.

Interestingly, the recollection of both semantic and episodic memories involves the active retrieval of a pattern of mental representations, which may include sensory, perceptual, and conceptual patterns held in connectionist networks. Payne et al. (1999) have argued that retrieval may actually involve the re-perception of the encoded memory, which can result in the accurate recollection of information or false memories. With connectionist networks, false memories are able to arise because of pattern-completion processes or because new information constrains the network as it recreates prior patterns during remembering. This may be one reason why new performance information changes ratings of prior leadership behavior to be more consistent with performance cues, sometimes prompting observers to recall leader behaviors which did not occur. However, because episodic memories are more strongly associated with contextual cues such as emotions, specific times and locations, events, smells, visual information, and bodily movements, the re-perception of episodic memories may be more likely to activate events that have actually occurred (e.g., off-line embodiment). In contrast, semantic memories are independent of context and, therefore, do not reflect such embodied elements. Thus, semantic memories cannot effectively use embodied cues to help distinguish previously experienced from un-experienced leadership behavior. Using our semantic versus episodic memory framework and knowledge of retrieval effects, the following section will address how research on the behavioral measurement of leadership has attempted to address these issues, and will consider possible ways to enhance the accuracy of leadership measures.

2.2. Memory and the behavioral measurement of leadership processes

Applied to the measurement of leadership behaviors, the accuracy of leadership ratings is likely to be dependent not only on the rater's encoding strategies and memory systems used, but also on the similarities between retrieval cues inherent in the rating system and in the perceiver's physical and psychological environment reflecting transfer-appropriate processing (Morris et al., 1977). Constructing a valid measure of leadership behaviors appears quite complicated, in that leadership ratings on a variety of popular measures have been characterized by affective biases (Brown & Keeping, 2005) and leader-schematic, but inaccurate ratings (Binning et al., 1986; Foti & Lord, 1987; Phillips, 1984; Phillips & Lord, 1982). Only a few studies have investigated potential ways to reduce some of these biases. In the following section, we will discuss some of the current problems in leadership measurement and some of the attempts to address these issues, which are highly related to the distinctions in semantic versus episodic memory systems. Additionally, we will introduce some of the potential advantages that event-based measurement may offer, particularly in regard to leader–follower interactions.

2.2.1. Classical behavioral measurement approaches and the problems with semantic memory

Although leadership measurement is often aimed at understanding leader behaviors and traits, early research has found that ratings of leadership typically reflect the rater's cognitive and emotional processing in addition to the leader's actual behaviors (Eden & Leviatan, 1975; Staw, 1975). In particular, one of the biggest obstacles to leadership measurement involves the cognitive structures such as leadership categories that raters use to make behavioral ratings. Rather than carefully appraising behavior in an individualized way for each leader based on recalled behaviors, raters appear to retrieve prior classifications of that leader from memory and then use general leadership prototypes to guide their ratings. For instance, several studies have found that the same factor structure emerged in leadership ratings when raters rate hypothetical leaders or leaders they barely know as when they rate familiar leaders (Eden & Leviatan, 1975; Rush et al., 1977; Weiss & Adler, 1981), suggesting that raters simply applied their ILTs to make best-guesses when rating unfamiliar leaders. Consequently, these ratings should not be expected to finely discriminate among different leaders or to predict many organizational outcomes that are the result of specific types of leader behaviors (Shondrick & Lord, 2010).

This research suggests that perceivers tend to assimilate leader behaviors into their currently held ILTs and that they tend to make on-line leadership judgments during encoding rather than accurately encoding and remembering countless examples of actual leader behavior (Hastie & Park, 1986). Memory for the leader becomes intimately tied to the content of the currently active prototype, with the result being that raters retrieve the prototype rather than actual behaviors for appraisal purposes. Measures which require raters to make generalized judgments regarding the occurrence and nature of leadership behaviors are likely to draw on the retrieval of context-independent memories for that leader, which would be consistent with ILT information held in semantic memory.

Performance cue effects (PCEs) (Lord, 1985; Lord & Maher, 1991) also seem to support an inferential rating process which relies heavily on generalized schematic information. Several studies have demonstrated that knowledge of group performance is related to ratings of group processes (Staw, 1975), including ratings of leadership. For example, Rush et al. (1977) asked participants to rate leaders using the Leader Behavior Description Questionnaire after having read scenarios which described the group as having performed well or poorly. Their results showed that ratings of leadership on all ten subscales of the measure were significantly influenced by knowledge of the group's performance, which is consistent with PCEs. Leadership ratings were inflated when the

rater was informed that the group performed well, whereas leadership ratings were deflated when the rater was told that the group performed poorly. Thus, raters appear to use group performance information as a cue for inferring leadership traits. Mitchell, Larson, and Green (1977) examined whether PCEs occur during encoding or retrieval. In their study, raters learned of a leader's group performance either before or after watching videotapes of the team interacting. In both instances, the PCE was similar in magnitude, suggesting that knowledge of group performance primarily influenced ratings during the retrieval process. Several other studies have investigated and found support for the PCE (Binning & Lord, 1980; Butterfield & Powell, 1981; Gioia & Sims, 1985; Larson, 1982; Larson, Lingle, & Scerbo, 1984; Lord, Binning, Rush, & Thomas, 1978; Mitchell et al., 1977; Rush & Beauvais, 1981; Rush, Phillips, & Lord, 1981), demonstrating that knowledge of group performance influences ratings of leaders under a number of circumstances. However, these effects only occur when sensemaking is guided by person-based rather than situational attributions (Ensari & Murphy, 2003; Murphy & Jones, 1993).

2.2.2. Rating errors, type of judgment, and signal detection theory

Several researchers have examined the decision processes involved with recognition memory when a rater tries to determine whether a previous behavior has occurred. Tulving (1985) has argued that the type of information that raters provide can help determine the type of memory they used to make ratings. Semantic memory is associated with memory judgments based on what a rater simply "knows." These so-called *know judgments* are a type of memory involving feelings of familiarity in the absence of any specific conscious experience which can be relived. Thus, know judgments are likely to be devoid of any embodied cognitions. In contrast, episodic memory is associated with memory judgments based on what a rater "remembers." *Remember judgments* involve conscious recollections of previous personal events in which the rater mentally relives the experience with an image of the self in relation to a time and place. Remember judgments seem much more equipped to process embodied cognitions because they rely on perceptual, spatial, emotional, and perhaps proprioceptive knowledge. By encouraging raters to rely on remember judgments and to discount know judgments, researchers can eliminate the biasing effects of knowledge of group performance, as we will discuss below.

Martell and colleagues have attempted to investigate the mechanisms by which decision processes can distort ratings using *signal detection theory*, which is a theory that helps specify how one can separate true signals (e.g., behaviors which actually occurred) from background noise (e.g., leadership behaviors which seem familiar but did not actually occur). In leadership ratings, we suggest that background noise comes from schemas used by semantic memory. Martell and Guzzo (1991) used measures of *memory sensitivity* (a measure of a rater's ability to distinguish between behaviors that were previously observed compared to similar behaviors which were not observed) and *response bias* (a measure of the stringency or liberalness of the decision criteria used) that are based on signal detection theory. Using these parameters, they determined that the distorted ratings were explained by raters adjusting their decision criteria based on their expectations rather than by false memories. Martell and Willis (1993) replicated these findings and also demonstrated that rater's response bias completely mediated the relationship between PCEs and ratings. Martell and DeSmet (2001) also found that gender biases influence leadership ratings through the response bias rather than the memory sensitivity parameter. Complementing this leadership research, Gardiner, Ramponi, and Richardson-Klavehn (2002) analyzed 86 studies that tested recognition memory based on guesses, know judgments, and remember judgments using signal detection theory and concluded that knowing and remembering represent distinct memory sources, although these judgments do not seem to merely reflect different response criterion.

Thus, a considerable amount of research seems to suggest that the distorting effects of expectations appear to depend on the decision criteria that raters adopt during retrieval rather than the strength or accuracy of a memory during storage. Raters may retrieve both know and remember judgments, and may incorporate both types of information into their ratings when they have lenient decision criteria. This may cause them to be more likely to rate individuals higher on leadership behaviors which were unseen but are consistent with similar behaviors, reflecting the gap-filling effect discussed earlier. However, when raters adopt a more stringent decision criterion, they may only use remember judgments as a basis for their ratings, which may reduce the likelihood of gap-filling or false memory effects.

2.2.3. Rating distortion and episodic memory

Martell and Evans (2005) reasoned that performance cue biases are produced by a heightened feeling of familiarity for behaviorally-consistent items, which causes raters to apply a more liberal decision criterion to schematic items. Given this assumption, they investigated whether raters could be trained to monitor the sources of their memories, expecting that remember judgments, unlike know judgments, would not be influenced by performance expectations. After observing a videotape of a group building a bridge, participants in the training condition were trained regarding the differences and similarities between know and remember judgments and then were instructed to indicate "yes" on a behavioral checklist only if the corresponding behaviors were recognized on the basis of a remember judgment for each item. As expected, the source-monitoring training completely eliminated the performance-based response bias, but it did not enhance memory sensitivity.

Baltes' research has also sought to eliminate PCEs through rater training. In Baltes and Parker's (2000) study, participants engaged in halo error training and a structured free-recall intervention before making their ratings. Raters then used the behaviors retrieved during the recall task to complete a behavioral checklist. The halo error training and the structured free-recall task succeeded in mostly eliminating the distorting effects of knowledge of group performance, again operating through the response bias parameter. Additionally, Baltes, Bauer, and Frensch (2007) used the structured free-recall intervention to reduce the effects of racial stereotypes on ratings of managers. Again, this intervention worked by reducing the response bias parameter, which thus modified the strength threshold for retrieving behaviors from memory. An unstructured recall task, in comparison, did not reduce

the effects of racial stereotypes on ratings. In short, there is a convergence of evidence that expectations distort leadership ratings through by changing the stringency of criteria for responses, as reflected in the response bias parameter in signal detection theory. Moreover, a variety of training techniques can eliminate such biases, and may be best understood as shifting the basis for judgments from semantic to episodic memory.

Recently, [Shondrick and Lord \(2010\)](#) proposed that behavioral measurements that increase rater's reliance on episodic memory can, under certain conditions, increase rating accuracy compared to the typical measurements which seem to capitalize on the effects of semantic memory. In order to increase behavioral accuracy, processes during both encoding and retrieval need to emphasize episodic memory. Thus, rather than focusing just on reducing response biases, researchers should also focus on enhancing the memory sensitivity parameter. Some research on memory suggests that the emotional component of memories is related to the memory's accuracy and may enhance memory sensitivity. For instance, emotion appears to increase the attention given to events during encoding. More accurate episodic memories are found for emotionally arousing events ([Allen et al., 2008](#)) and for individuals who react more emotionally ([Lord, Hall, Schlauch, Chang, & Allen, 2003](#)). Additionally, flashbulb memories, which involve long-lasting, vivid, and detailed autobiographical accounts of the circumstances in which people first heard about a monumental public event, appear to be formed when an event elicits a high degree of emotional arousal ([Finkenauer et al., 1998](#)). The capacity to recreate these embodied reactions during retrieval may be a critical aspect of memory sensitivity.

However, emotion does not necessarily increase memory accuracy. For instance, [Phelps and Sharot \(2008\)](#) argued that emotions appear to affect memory for extreme events by intensifying the subjective vividness of the memory. Thus, although memory for the occurrence of the event may be more accurate, the details associated with one's subjective experience are likely to be biased by a heightened subjective sense of recollection. Congruent with this idea, [Talarico and Rubin \(2003\)](#) examined students' memories for their experiences on September 11, 2001, and found that students were highly confident in the accuracy of their memories, although these memories were not more accurate compared to their memories for mundane events. Thus, it is important to keep in mind that emotions do not always increase the accuracy of memories.

Still, identifying ways to increase the usage of episodic memory during encoding and retrieval may enhance memory sensitivity under certain circumstances. [DeNisi and Peters \(1996\)](#) reasoned that memory accuracy is dependent at least in part on how the information was organized during encoding. In two field studies that had raters keep diaries, raters who kept diaries had more accurate ratings compared to those in a control condition. Additionally, in a second study, keeping a critical incident diary organized by each person resulted in more accurate ratings and more positive rater reactions compared to those whose diary was organized by performance dimension. However, it is important to note that accuracy was defined in terms of the consistency between recalled behaviors and those reported in the diaries, since an absolute measure of accuracy could not be determined.

In contrast, [Naidoo et al. \(2010\)](#) recently investigated ways to facilitate the use of episodic memory at retrieval. Before rating a leader, participants in a visualization condition were asked to mentally visualize the perceptual characteristics of the leader and to imagine how they tend to feel around their leaders. In the first study, participants rated their actual work supervisor. In the second study, participants watched a videotape of a leader and then rated the leader both immediately and again a few weeks later. In both studies, visualization increased the impact of affect on ratings. Additionally, in the visualization condition in the second study, the delayed ratings were more consistent with the initial ratings, and participants' recollection of episodic memory was more accurate. Thus, this intervention seems to enhance rater's reliance on embodied, embedded cognitions tied to visual perceptions, which caused raters to retrieve a fundamentally different type of memory compared to semantic measures of leadership.

Thus, the way that information is organized during encoding and cued during retrieval can facilitate the use of episodic memories. Designing measures which are more likely to tap embodied cognitions may be one way to encourage the use of episodic knowledge and discourage the use of knowledge devoid of embodied experiences, which may be more likely to reflect prototypical than accurate memories. It is possible that the level of the leadership construct being measured within the behavioral measurement instrument can encourage the usage of episodic memories in this way. Most measures ask for behavioral ratings of how a leader typically behaves, which implies that raters aggregate perceptions across an unspecified time period comprising multiple types of events. In contrast, instruments which ground behavioral dimensions by specific events situated in specific contexts may be particularly useful in encouraging the retrieval of specific past examples of the relevant behavior and to discourage the usage of semantic memory ([Gioia & Sims, 1985](#); [Hammer, Bayazit, & Wazeter, 2009](#); [Uleman, 1991](#)).

In order to parse continuously occurring work events into distinguishable segments, several approaches could be used. [Hammer et al. \(2009\)](#) designed scale items measuring union leadership to be contextually specific to the local unions, to the union activities, and to member concern for that union in an attempt to encourage event-based ratings. However, it still was not clear whether raters used remember or know judgments in this study. Another possible way to parse events might be to organize them by emotion. Here, [Weiss and Cropanzano's \(1996\)](#) affective events theory could be applied, which maintain that work events can be characterized by distinct affective reactions that fluctuate throughout the day. Affect could be used as a cue to recall the antecedents and consequences of the event which incited the rater's affective reaction. Additionally, events might be parsed based on the event's relevance to the rater or based on changes in tasks.

2.3. Affect and ILTs

Although leadership researchers have recently recognized the importance of affect in leadership processes (e.g., [Bono & Ilies, 2006](#); [Naidoo & Lord, 2008](#)), few studies have investigated its role in ILTs. Negative affect may be an important signal that change is needed, while positive affect may signal that current leadership structures are effective ([George & Zhou, 2007](#)). In this way,

information about performance may operate through affect as well as through leadership categorization processes. Affective evaluations of others such as liking also affect the structure of popular transformational leadership measures, explaining as much variance in items loadings in CFA analyses as scales intended for behavioral constructs (Brown & Keeping, 2005). Social justice may also operate through affective processes, where interpersonal injustices may create a particularly strong and lasting effect on feelings (Bies, 2001). Moreover, the affective effects associated with leadership may or may not be conscious. For example, public embarrassment by one's superior may evoke strong emotions such as hatred (Fitness, 2000) which are surely conscious, but more subtle responses to leaders such as facial mimicry (Cherulnik, Donley, Wiewel, & Miller, 2001) may be largely automatic. Consequently, while some affective responses may be encoded symbolically, and are therefore readily assessable in event-related episodic memory, other responses may be stored in embodied representations (Lord & Shondrick, in press) and would not be reportable on typical leadership questionnaires. Practically, this is one area where subjects' reports of leadership processes need to be combined with alternative forms of measurement to gain a full understanding of ILTs.

To summarize, research on leadership measurement has encountered several problems which threaten to reduce the construct validity of many popular behavioral rating scales, particularly when the objective of such scales is to predict performance. However, many of these biases may be reduced by encouraging raters to rely on episodic *remember judgments* rather than on the prototypical information held in semantic memory. Table 2 summarizes key findings described in this section, including general information regarding how different types of memories influence information processing and how false memories are created. Table 2 also indicates how this research is applicable to leadership measurement, identifying problems associated with generalized leadership assessments, the effects of performance information on ratings, as well as how accurate memories may be enhanced by certain measurement techniques. Although our discussion so far has focused on classical notions of leadership as occurring within one sole person, the following section discusses how contemporary notions of shared leadership create complications for the dynamic processes involved in leadership, including its measurement.

3. Alternatives to hierarchical leadership

The common theme in the leadership literature reviewed this far has been the focus on a single leader as he or she interacted with subordinates. However, Day (2000) emphasized the need to study leadership as a process that could be engaged in by many individuals, rather than just the actions of a particular leader. This orientation has been echoed by many individuals who focus on collaborative, team-based leadership (Friedrich et al., 2009; Klein, Ziegert, Knight, & Xiao, 2006; Morgeson, 2005; Pearce, 2004), as well as by complexity leadership theorists (Marion & Uhl-Bien, 2001; Uhl-Bien & Marion, 2009). The key idea in these approaches is that different individuals assume leadership at different times, ideally when their expertise affords them a unique perspective that has the potential to make a distinctive contribution to the group or organization (Friedrich et al., 2009). However, such flexible role systems may also require more complex self-schema on the part of leaders, who need to be able to exert leadership at some times but focus on eliciting leadership from other individuals at different times (Hannah, Woolfolk, & Lord, 2009). Moreover, such leadership self-complexity needs to be coupled with an entire system that facilitates collaborative leadership as a means to optimally use the diverse expertise provided by various team or organizational members (Friedrich et al., 2009).

Shared leadership is viewed as an emergent property of groups or organizations rather than a capacity of an individual leader (Day, 2000). This form of leadership responds to recent changes on how work is performed, especially within modern organizations that are characterized by continuous innovation and a de-emphasis on stability (Barry, 2001). However, a shared,

Table 2
Key findings regarding the measurement of leadership processes.

Focus	Previous findings	Key reference(s)
Memory types and influences	Measures based on episodic (specific events) rather than semantic memory may produce less biased leadership ratings	Martell and Evans (2005)
	Episodic memory involves affective and embodied processing which cue and enhance memories of leaders	Bechara et al. (2005), Naidoo and Lord (2008)
	Intense and extreme emotional memories may bias and prevent accurate recall, whereas less intense emotions and contexts tend to facilitate retrieval processes and enhance memory accuracy	Godden and Baddeley (1975), Phelps and Sharot (2008), Talarico and Rubin (2003), Thompson et al. (2001)
Connectionist networks and reconstruction	Pattern-completion processes and changes in cognitive networks after observing behavior (e.g., PCEs) create false memories	Shondrick and Lord (2010)
Informational processing and bias	Behavior and outcomes are assimilated with ILTs as perceivers make sense of leadership, causing ratings to depend on ILTs	Eden and Leviatan (1975), Staw (1975)
	Generalized leadership assessments draw upon on-line judgments based on fit with ILTs rather than encoding specific behaviors	Hastie and Park (1986)
	Group performance information influences leadership perceptions and leader ratings (PCE) when attributions are made to leaders	Phillips and Lord (1982), Ensari and Murphy (2003)
	PCEs on leadership ratings are robust across encoding contexts, but are reduced by use of episodic (remember judgments) rather than semantic memory (know judgments)	Lord (1985), Martell and Evans (2005)
Memory enhancement techniques	Contextually-specific measurements using visualization, critical incidence reports, embodied cognition, and affective event parsing may increase accuracy in measuring leadership behavior	Shondrick and Lord (2010), Naidoo et al. (in press)

distributed leadership perspective raises several important questions for understanding the role of implicit theories in guiding leadership processes, particularly those characterized by complex, dynamic systems, and it creates substantial methodological problems for individuals attempting to measure leadership. These issues are addressed in this section.

3.1. Shared leadership and change in self-identity

In contrast to traditional forms of leadership (i.e., hierarchical leadership), shared leadership networks differ because its success largely depends upon the interdependency, cooperation, mutual respect and trust *between* members (Barry, 2001; Gronn, 2002; Marion & Uhl-Bien, 2001; Uhl-Bien & Marion, 2009). Additionally, authority is decentralized and is shared or distributed across members (Fletcher & Käufer, 2003). Therefore, at an individual level, collaborative and relational skills, accurate social perceptions, and empathy or emotional competence are likely to be critical leadership qualities. These qualities differ from those in traditional leadership prototypes, which raise the question of how easily such behaviors will result in leadership perceptions that are shared among group members, and what this change from hierarchical organization implies in terms of changed structures for self and social regulation. One possible way to address these questions is to focus on group rather than general leadership prototypes which are likely to be important guides to perception and behavior when collective identities, such as identification with one's group, are active (see van Knippenberg et al., 2004, for a detailed discussion of this process).

Shared leadership may require a more collective identity as a guide for leadership (Fletcher & Käufer, 2003). However, shared leadership networks also reflect evolving relationships (Balkundi & Kilduff, 2005) where one's focus continually shifts among various dyadic linkages in a social network, suggesting that relational identities (Ashforth, 2007; Brewer & Gardner, 1996; Lord & Brown, 2004), which focus on the self *in relation to* others, may be the critical self-regulatory structure. Examining how relational identities develop in ways that are compatible with both collective and individual identities may be an important area for future leadership research. In addressing this question, the operation of social primes from one's dyadic partner and from more general leadership processes (e.g., Lord & Brown, 2004) should be investigated. Also, the content and structure of relational ILTs needs to be assessed. Self-regulatory identity structures can develop on a dyadic level, and they may transfer from one leadership relationship to another (Ritter & Lord, 2007). Whether this reflects a unique ILT or merely a modification based on a more general connectionist representations of ILTs (Hanges et al., 2000; Lord, Brown, & Harvey, 2001; Lord, Brown, Harvey, & Hall, 2001) is worthy of future research.

3.2. Dynamic social structures and ILTs

One important issue to consider is whether ILTs and leadership perceptions are helpful in dynamic situations. Normally, social differentiation in terms of leadership perceptions creates stability and a sense of security as well as efficient social processes. However, for both cognitive and emotional reasons, leadership perceptions exhibit a cognitive inertia, changing more slowly than they should in response to changes in patterns of observed behaviors, and changing in a discontinuous manner when they do change (Foti, Knee, & Backert, 2008; Hanges et al., 1997). This pattern contrasts with the rapidly shifting patterns of leadership which may characterize shared leadership situations, and this reluctance to shift from one leader to another may limit the application of shared leadership. One way to reduce this problem may be to emphasize scripts and goal structure rather than person categories as encoding schema. This minimizes the use of leadership categories as encoding devices or general structures for assimilating information (Foti & Lord, 1987; Murphy & Jones, 1993). Such changes should cue individuals to respond to situational variables, which may be key signals indicating the need to change leadership as shown by Klein et al.'s (2006) work on trauma teams. In addition, in such situations, role relations are more complex, and individuals may have to learn and practice multiple roles (Hannah et al., 2009). Heightened sensitivity to situational cues, particularly those associated with emotions (George & Zhou, 2007) and the match of situations with one's own or other's abilities are required to know when to lead and when to follow. These factors indicate that shared leadership situations may require more of a task or event focus compared to the person focus that underlies traditional ILTs.

As we noted at the outset, leadership involves both the behavior of an individual and its appropriate perception by others, which suggests that one danger to shared leadership is that it will not be accurately perceived by others, who may lack readily available categories for encoding shared leadership behaviors. Part of the needed structure can be provided by group level conceptualizations of leadership (van Knippenberg et al., 2004). However, for shared leadership to flourish, organizational members may need to learn more general social classification systems that mesh with shared leadership. In other words, as well as training in how to exhibit shared leadership behavior, collaborative teams may need training in how to accurately *perceive* shared leadership in others, and such training may require both direct and indirect experience (Gino, Agrote, Miron-Spektor, & Todorova, 2010). Our discussion of adaptive resonance theory and social perceptions suggests that individuals who are particularly vigilant with respect to leadership may have special problems in recognizing alternative forms of leadership because they require a closer match to a prototype to activate a leadership category. This problem may be most acute for individuals who see themselves as leaders, because having a self-schema in a particular domain creates more stringent evaluative criteria (Dunning, 2003).

3.3. Measurement and shared leadership

Shared leadership may also create problems for accurate leadership measurement because these leadership activities are not as likely to be associated with the same individual as it is in more hierarchical systems. Thus, integration in terms of person structures

may not be as helpful to perceivers, and reliance on semantic memory may miss many of the crucial activities that produce creativity and adaption. Two alternative possibilities should be considered by leadership researchers. One is that in shared or complex leadership situations, people pay more attention to momentary goals than the person-focused construct of leadership as a guide to sensemaking. In fact, [Foti and Lord \(1987\)](#) showed that goals cue script-based interpretive structures that de-emphasize leadership, focusing the perceiver instead on situational constraints. This is also consistent with activation of collective identities which emphasize situational causes ([Kuhnen, Hannover, & Schubert, 2001](#)).

Another possibility is that people focus more on affectively-based structures to gain an understanding of micro-level processes ([Lord & Brown, 2004](#); [Weiss & Cropanzano, 1996](#)). Affective tone can parse events into meaningful structures, and changes in leadership structures may be one type of affective event. We have already noted that affect may facilitate encoding into episodic rather than semantic memory, and we have discussed. Using diaries that are organized around work tasks rather than people ([DeNisi & Peters, 1996](#)) may be another useful technique that should be considered by researchers interested in shared, complex leadership processes. It may also be helpful for researchers to focus on mirror neuron systems which make use of action-related motor structures in perceivers as a means of understanding others ([Fogassi & Ferrari, 2007](#)), rather than on sensemaking in terms of leadership.

Sensemaking in terms of leadership may also create an inaccurate understanding of causality when influence is shared among group or team members. Common sense ideas about leadership emphasize romanticized ([Meindl, 1995](#)) or heroic individually-oriented views of leadership ([Staw & Ross, 1980](#)), which are not likely to accurately reflect the operation of shared leadership systems. Unless research uses innovative measurement methodologies that are explicitly geared to avoid such general biases, which likely reside in semantic memory, we may develop research data on shared leadership that does not accurately reflect the underlying processes. One interesting possibility worth investigating based on the work of [Ensari and Murphy \(2003\)](#) is that by orienting raters toward situations rather than individuals as potential causes, performance cue related biases in behavioral descriptions could be avoided. [Kuhnen et al. \(2001\)](#) showed that such perceptual shifts could be produced by priming collective rather than individual identities. Thus, collective identities may not only facilitate shared leadership, they may facilitate more accurate perceptions of systemic rather than individual causes.

Assessing causality in complex systems where leaders catalyze the emergence of structure from the actions of other individuals ([Marion & Uhl-Bien, 2001](#); [Uhl-Bien & Marion, 2009](#)) may be even harder to understand and measure than shared leadership. Because these processes may be largely implicit and may not be subject to conscious memory, reliance on subordinate memories of such processes may be misleading. However, clear theories regarding how this process operates could be tested. For example, [Lord \(2008\)](#) has suggested that leaders can catalyze emergent structures by priming affective structures, regulatory focus, or identities in others through automatic and embodied processes. For example, conveying positive rather than negative emotions can elicit approach rather than avoidance goals, which in turn, changes the type of memory that is accessible ([Gray, 2001](#)), and the way motivational processes are configured. These effects could be measured using implicit measures such as word fragment completion ([Johnson & Lord, in press](#)).

To summarize, shared leadership is characterized by dynamic, deindividualized processes within a group or organization. Although much of the extant research on leadership has focused on traditional individualized approaches to leadership, shared leadership may create numerous complications for social interactions. [Table 3](#) summarizes some of the noteworthy findings within this area, such as how shared leadership differs from traditional leadership, the role of identity, leadership perception, and member roles, and some of the measurement approaches which may be particularly useful for this type of leadership.

4. Conclusions and future research

The research we reviewed shows that much progress has been made in understanding ILTs. ILTs provide a basis for categorizing leaders, and once social stimuli are categorized, perceivers are able to draw on large stores of information to make sense of others and to respond appropriately. [Epitropaki and Martin \(2005\)](#) illustrate the importance of such processes by showing that

Table 3
Key findings applicable to shared leadership and suggestions for future research.

Focus	Previous findings	Key reference(s)
Defining characteristics	Leadership is decentralized and shared by different individuals over time depending on each individual's area of expertise and task needs Cooperation and trust are important to the success of collaborative, team-based leadership	Friedrich et al. (2009) , Fletcher and Käufer (2003) , Morgeson (2005) , Pearce (2004) Barry (2001) , Gronn (2002)
Role of ILTs and self-schemas	Shared leadership may require a stronger collective and relational identity than is required for hierarchical leadership Relational ILTs can develop based on dyadic relationships, and can transfer to new relationships Emphasizing scripts, goal structures, and situational cues may facilitate shared leadership processes by de-emphasizing hierarchical, person-based leadership perceptions	Fletcher and Käufer (2003) , Lord and Brown (2004) Ritter and Lord (2007) Foti and Lord (1987) , George and Zhou (2007) , Murphy and Jones (1993)
Measurement issues	Techniques that focus at the level of events (e.g., visualization, affective, and situational cues) or prime collective identities may improve measurement accuracy	Kuhnen et al. (2001) , Naidoo et al. (in press)

agreement in ILTs between subordinates and superiors leads to better leader–member relations and more positive subordinate outcomes. Advances in how we understand social information processing also indicate that connectionist systems can dynamically adjust category prototypes to fit contexts (Foti et al., 2008), and embodied processes help us understand the role of perceptual, motor, and emotional processes related to leadership perception, empathy, sensemaking, and memory (Fogassi & Ferrari, 2007; Giessner & Schubert, 2007; O'Malley et al., 2009). This research has also been instrumental in articulating weaknesses in typical questionnaire measures of leadership and suggesting ways to overcome problems such as performance induced biases in leader behavior ratings (Martell & Evans, 2005).

Although much of the research on ILTs has used the abstract constructs provided by social cognitive and cognitive research (e.g., categorical structures, prototypes, transfer-appropriate processing, and semantic versus episodic memory), it is important to keep in mind that leadership also involves embodied processes operating in specific individuals in specific contexts who are responding to specific events. ILTs guide perceptions and semantic memory and they reflect knowledge of leadership that is aggregated across many events, but it is not clear that they provide accurate details as to what actually happened or did not happen in specific circumstances or what factors actually caused performance outcomes associated with leadership. This is particularly true for shared leadership and complex adaptive leadership.

Future research should examine the role of embodied processes in shared and complex leadership situations. As we have already mentioned, team members may have difficulty with perceiving leadership when it is not solely associated with one person or when leadership quickly shifts from person to person. Because of this, team training which is designed to enhance members' ability to identify momentary leadership may be beneficial. Specifically, one might expect that training which allows members to have direct experiences with shared leadership environments may be more effective than purely instructional or vicarious approaches because it allows the trainee to have direct experiences in conducting a task. Such findings would support the importance of embodied processes because only direct experience would allow trainees to practice the motor movements and coordinate with team members in a way necessary to complete the task. Direct experience training approaches may also provide the key learning how expertise is distributed among the team. As Friedrich et al. (2009) argued, in shared leadership environments, members need to be able to manage roles and know where expertise can be found within the team, and they also need to be able to attend to cues in the environment which signal the need to switch roles to become leaders or followers. This suggests another reason why training which uses direct experiences may be more effective than indirect approaches. Consistent with this argument, Gino et al. (2010) found that team members have better access to transactive memory (which involves memory for where knowledge is distributed within a team and how to coordinate with other members) and are more creative in terms of producing novel products (in this case, creating origami figures) when they were first exposed to direct training experiences rather than indirect training approaches or no training experiences. In their direct experience training condition, participants worked with their team to practice building origami figures, whereas in the indirect experience training condition, participants watched a video of another team producing the origami figures. Thus, future studies may seek to determine whether team training would be beneficial for shared leadership situations and whether direct experience training provides additional benefits beyond vicarious training conditions. Key issues are the enhancement of members' ability to determine where momentary leadership lies and increased coordinating with other members based on their expertise.

To build accurate behavioral theories of leadership and to understand the dynamics of rapidly changing leadership processes, leadership research may need to move beyond measurement processes that are based on ILTs and semantic memory to more context dependent, episodic memories. Understanding emotional reactions and other embodied processes of perceivers may be helpful in accessing more episodic memories, and it may also be helpful to emphasize event or situation-based encoding processes. However, it may also be necessary to develop more fine-grained measurement processes that examine social dynamics at the level of specific events rather than looking at the effects of specific persons aggregated across time (e.g., leader's behavioral tendencies). This approach may provide a more accurate understanding of how emotions relate to leadership (Weiss & Cropanzano, 1996), and it may better reveal the complex dynamics associated with shared leadership processes (e.g., Klein et al., 2006).

Future measurement-related research should seek to develop measures which reduce raters' reliance on ILTs as a basis for retrieval. For instance, research could examine whether measures based on instances of leadership focused on specific events (rather than person-focused ratings of leadership) lead to more accurate ratings. Such research could also examine whether this effect is mediated by response bias, with events-based measures leading to more stringent response criteria compared to person-based measures, consistent with previous research (e.g., Martell & DeSmet, 2001; Martell & Evans, 2005; Martell & Guzzo, 1991; Martell & Willis, 1993). Because events-based measures may be more likely to tap episodic memories for leadership, memory sensitivity may also mediate the effects of measurement type on rating accuracy. One approach might be to use a 2 × 2 study design in which the type of measure (events-based versus person-based) is crossed with a PCE manipulation in order to determine whether events-based measures are able to ameliorate some of the unfavorable consequences of knowledge of group performance. Additionally, study designs could easily examine whether raters are accessing episodic or semantic memory by asking them whether their ratings are based on general feelings of knowing or specific memories. In addition to these types of study designs, it may also be helpful to consider the possibility that both leaders and followers make use of information that is never represented internally and exists only as the dynamic outcome of reciprocally interacting individuals (Wheeler, 2005).

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