Abstract

In this research, we develop a framework for understanding the emergence of transactive memory systems (TMS) in project-based teams characterized by different levels of group-level positive affectivity (PA) and negative affectivity (NA). With a focus on enhancing understanding of the means of transmission, we test the mediating role played by group-level psychological safety (PS) in the relationship between team affectivity and TMS. From a sample of 107 software implementation project teams, in a lagged field study we find support for a mediated model in which high group NA, but not group PA, promotes environments psychologically unsafe for interpersonal risk-taking (low PS), and which are negatively associated with TMS. This study extends prior research on the differential effects of PA and NA, by contributing to the limited research on group affectivity, environmental antecedents of TMS, and the mediating role of psychological safety for predicting group-level transactive processes and structures.

Keywords: transactive memory systems, team affectivity, group-level psychological safety, TMS antecedents, field study, lagged design

MEDIATING EFFECTS OF PSYCHOLOGICAL SAFETY IN THE RELATIONSHIP BETWEEN TEAM AFFECTIVITY AND TRANSACTIVE MEMORY SYSTEMS

Increasing pressure on under-resourced project-based teams requires development and integration of specialized expertise, mutual trusting relationships, and effective coordination routines. Research on transactive memory systems (TMS), a set of structures and processes that provides teams with an effective means to manage scarce resources (Faraj & Sproull, 2000), suggests that teams cope with resource constraints by dividing and sharing responsibilities for expertise and tasks (Ren & Argote, 2011). A central theme underlying this research has been the role of learning (e.g. Lewis, Lange & Gillis, 2005). Specifically, transactive memory is believed to develop as group members learn about one another's expertise (Lewis, 2003; Wegner, 1987) and subsequently use this knowledge to develop expertise at the group level that is specialized, credible and well- coordinated (Lewis, 2003). Although previous research has highlighted a number of learning-oriented factors that contribute to the development of TMS such as intimacy (Wegner, 1987), communication frequency (Lewis, 2004), prior learning (Lewis et al., 2005), familiarity (Lewis, 2004), and social network connections (Lee, Bachrach & Lewis, 2014), factors known to hinder learning such as unfavorable perceptions of risk and threat (Edmondson, 1999) have received less attention. As such, the purpose of the current study is to contribute to transactive memory theory by examining TMS development through the lens of interpersonal risk-taking and learning in teams.

For example, establishing the architecture central to a TMS is fraught with a number of potentially risky interpersonal behaviors such as admitting information deficiencies, declaring expertise, justifying or defending expertise when challenged, and admitting lack of desire to accept responsibility for a particular expertise domain (Hollingshead, 1998). Although TMS depends on willingness to engage in potentially risky behaviors (Larsen & Augustine, 2008), factors encouraging or discouraging these behaviors have been largely overlooked in the transactive memory literature. In particular, sensitivity to and perceptions of interpersonal threat or risk are likely to influence acceptance of risks associated with TMS. As such, we propose that teams' willingness to engage in these potentially risky behaviors may be largely determined by the team's dispositional affectivity.

Affectivity has been explicitly recognized as a critical stimulus in group environments (Hackman 1992). In particular, positive and negative affectivity are differentially associated with the direction, duration and intensity with which personal resources (e.g. time, attention, and energy) are invested in social contexts (Carver & Scheier, 1990). While positive affectivity reflects the tendency to be energetic, cheerful, and optimistic (Barsade & Gibson, 1998; Watson et al., 1998), negative affectivity increases the tendency to notice and ruminate over unfavorable information regarding ones' self and others (Watson, Clark, & Tellegen, 1988). These differences are likely to have an influence on the extent to which group environments are perceived as discouraging or encouraging (Edmondson & Lei, 2013) TMS-enhancing behaviors.

With this focus, we seek to contribute to the literature by deepening understanding of the antecedents leading to TMS. First, although TMS may improve team performance (e.g., Austin, 2003; Lewis, 2003; Lewis, 2004; Liang, Moreland, & Argote, 1995; Moreland, 1999; Moreland, Argote, & Krishnan, 1996, 1998; Moreland & Myaskovsky, 2000; Zhang, Hempel, Han, & Tjosvold, 2007), very little research has explored antecedents of TMS. The current study contributes by developing a connection between team affectivity and TMS. Second, we also seek to deepen understanding of the drivers of this association by examining the role played by psychological safety as a mediator. Specifically, as shown in Figure 1, we propose that differences between high/low team-level dispositional positive and negative affectivity lead to team-level perceptions of psychological safety and TMS.

We begin with a review of our primary theoretical framework, transactive memory theory. This is followed by hypothesis development and a brief overview of multi-level theory. Understanding multi-level theory is an essential precursor to our methods section, as it provides the foundation necessary to understand the process through which our focal constructs, which are typically treated at the individual and dyadic levels of analysis, emerge to form team-level constructs. We then provide methods, results, discussion and implications.

Insert Figure 1 about here

BACKGROUND AND THEORETICAL DEVELOPMENT

Transactive Memory Theory

According to TM theory, transactive memory is present at the individual and dyadic levels of analysis, but often forms a meaningful phenomenon at the group level via compositional processes. At the individual level, *transactive memory* refers to "…memory that is influenced by knowledge of the memory system of another person" (Lewis, 2003 p. 587). Transactive memory has roots in information processing---a multi-stage operation consisting of phases such as attention (e.g. information must first be perceived/recognized in order to be processed), encoding (e.g. perceived information must be labelled and properly organized to facilitate its retention), storage (e.g. once organized, information must be preserved for future use), retrieval (e.g. stored information is cued using the previously employed organizing scheme) and application (e.g. only retrieved information is available to be brought to bear on cognitive tasks) (Ellis, 2006; Faraj & Sproull, 2000). Due to limits on individual cognitive processing

(Wegner, 1987), group members are compelled to rely on other members to share the burden of processing information for the performance of collective tasks and achievement of shared goals (Ren & Argote, 2011). A *transactive memory system* (*TMS*) begins to emerge as two or more individuals coordinate their respective TMs (Lewis, 2003).

Transactions refer to the interpersonal interactions and communications necessary to coordinate individual TMs and to cooperatively process information. For example, transactive retrieval occurs when an information seeker provides cues that reminds a target of what she was wearing or what they were both eating the day that she likely encoded and stored a needed piece of information. As these transactions become more regular and predictable, individual TMs begin to converge to form a shared cognitive directory of the tasks, expertise and people (as well as the linkages among them) needed to accomplish group objectives (Brandon & Hollingshead, 2001). In this way, a TMS is a compositional emergent construct consisting of two or more TMs and the set of transactive processes that facilitate memory coordination (Lewis & Herndon, 2011).

TMS and Learning

Wegner (1987) argued that TMS is supported by three primary processes: (a) *directory updating* requires members to develop a shared cognitive directory composed of members' individual and collective learning regarding who knows what; (b) *information allocation* occurs when expertise is passed to one member based on what another member has learned about the target's willingness and ability to store it; (c) *retrieval coordination* is facilitated by members' understanding of the location, accessibility, and value of the expertise held by another (Borgatti & Cross, 2003).

Borgatti and Cross (2003) highlight a number of learning-oriented correlates of transactive processing. In a study of information scientists and genomic researchers, awareness, value and accessibility were significantly related to dyadic transactive searching, but the cost of dyadic transactive search was not. In explaining this non-finding, the authors drew on the concept of psychological safety, arguing that: "…cost functions as a characteristic of a group as a whole, affecting whether or how often people seek information from others in general, rather than as a determinant of who is sought out" (Borgatti & Cross, 2003, p. 441).

Yuan and colleagues (2010) challenged some of the implicit assumptions of TM theory by arguing that awareness of another's expertise is not enough to facilitate transactive retrieval. Instead, they argued that one must also learn how best to access one's expertise in order to successfully retrieve it. That is, members may have knowledge of which members possess what expertise; however members may vary in their perceived or actual ability to access this knowledge when needed. We agree with these authors, and seek to contribute to TM theory by exploring perceptions of interpersonal risk-taking and safety as necessary precursors for TMS-related learning.

Consistent with this aim, Hollingshead (1998) placed emphasis on self-disclosure as a means of learning about others' expertise as well as of establishing one's own expertise in the minds of other group members. Members may initially infer expertise credibility based on stereotypes, prior experience, or formal education. However, because these assumptions may be erroneous, they may lead to suboptimal task and expertise assignments if left unchecked. To refine their initial inferences, Hollingshead (1998) argued that members must establish their expertise through actions such as asserting one's expertise, elaborating one's background and experience, declaring insufficient knowledge in a particular domain, challenging or questioning the expertise of another, or demonstrating expertise by correctly addressing others' inquiries

(Hollingshead, 1998).

Thus, when TMS is underdeveloped, members may have little basis on which to make task and expertise assignments; in the absence of tangible evidence and personal experience, members may make task and expertise assignments arbitrarily, or on "…the basis of such irrelevant cues as appearance or demeanor…" (Moreland, 1999, p. 5). Moreover, groups may allow members to take responsibility for whatever assignments they like best, rather than on the basis of qualification (Moreland, 1999; Weingart, 1992). This may result in pairing people with tasks and expertise for which they are unqualified or poorly suited to maintain. As a result, the refinement and effective operation of TMS depends on an ongoing process of learning and modifications to existing TMS structures and processes (Lewis et al., 2005). We expect these processes to be accompanied with interpersonal risks that members will be disinclined to accept.

Psychological Safety

In the context of teams, psychological safety (PS) refers to team members' assessment that the team's environment is safe for interpersonal risk-taking (Edmondson, 1999). PS influences willingness to engage in potentially threatening behaviors, such as many of those associated with creativity and learning in groups. Edmonson describes group level learning as "…an ongoing process of reflection and action, characterized by asking questions, seeking feedback, experimenting, reflecting on results, and discussing errors or unexpected outcomes of actions" (Edmonson, 1999, p. 353). Edmondson (1999) noted that "…asking for help, admitting errors, and seeking feedback exemplify the kinds of behaviors that pose a threat to face (Brown, 1990), and thus people in organizations are often reluctant to disclose their errors (Michael, 1976) or are unwilling to ask for help (Lee, 1997), even when doing so would provide benefits for the team or organization…" (Edmondson, 1999, p. 352). Thus, when PS is low, members will be reluctant to experiment (Lee, Edmondson, Thomke & Worline, 2004), less creative (Gilson & Shalley, 2004), fearful of correction, and/or reticent to personally engage (Kahn, 1990). We expect these factors to have an adverse impact on the refinement of a group's shared memory structures and processes.

Psychological Safety and TMS

Group members' perceptions regarding interpersonal risk-taking should impact TMS for a number of reasons. First, in order for a team to uncover gaps and make corrections in their coverage of expertise domains (TMS structure) and patterns of expertise coordination (TMS processes), they must feel safe to question assumptions and discuss issues in an open and honest way (Edmonson, 1999). This is especially important given that initial task and expertise responsibilities are likely to be suboptimal and in need of renegotiation and realignment. For example, it may be assumed that David has expertise in domain X because he studied under Sara, a recognized expert in domain X. However, if David makes a mistake that is uncharacteristic of someone with expertise in domain X, then David's assignment as the team's domain X expert will come into question. The situation may become problematic if it becomes apparent that no one on the team has sufficient expertise to readily assume responsibility for domain X. As such, teams often need to experiment with different and sometimes creative combinations of tasks, expertise and role assignments in order to achieve the most equitable and optimal division of cognitive labor.

Such behaviors make the refinement and operation of TMS akin to the learning and creativity often associated with PS. For example, Kark and Carmeli (2009) found associations between PS and involvement in creative work processes. They argued that PS supports creative work engagement by helping to reduce defensiveness and anxiety related to learning. These authors contend that "…when individuals encounter new ideas and information that disconfirm their prior knowledge, expectations, or hopes, they may experience a sense of anxiety that will hinder their ability to learn" (Kark & Carmeli, 2009, p. 788).

In the context of TMS, disconfirming information may emerge when a member seeks expertise from a member mistakenly perceived to be an expert or when a member rejects a request to serve as an expert in a particular domain. Such instances may be common when TMS is underdeveloped as members seek and assign expertise responsibilities on the basis of erroneous or superficial information such as gender stereotypes (Hollingshead & Fraidin, 2003). Such information, when revealed to be erroneous, may be embarrassing or insulting to one or both parties. PS may embolden individuals to challenge preconceived notions and assumptions about who potentially or actually knows what.

Gilson and Shalley (2004) linked PS to creative problem solving processes in which "…ideas are sought outside one's field of expertise, ideas are combined from multiple sources, and new alternatives examined" (p. 460). This is consistent with TM theory, which suggests that in an effort to validate, correct and converge their individual TMs that groups may experiment with different combinations of tasks, expertise and people until optimal alignments are identified (Brandon & Hollingshead, 2004). For example, in a study of organizational learning among project teams operating in hospital intensive care units, Tucker, Nembhard and Edmondson (2007) reported that when staff felt comfortable asking questions and raising difficult issues, they exhibited a greater number of learning behaviors such as trial and error and collaborative problem solving.

Further, favorable PS climates may enhance the performance benefits of process innovativeness in mid-size German firms (Baer & Frese, 2003). Baer and Frese argued that PS enhances performance by encouraging employees to accept the risk of "…openly proposing new ways of working and to come up with alternative problem-solving approaches" (Baer & Frese, 2003, p. 50). For some, engaging in distributed information processing by relying largely on others to remember critical information represents a new and unfamiliar way of doing things.

Second, to be effective, TMSs must be validated by group members by participating in the coordination of their own and others' TMs. Drawing on previous research (i.e. Stasser et al., 1995), Brandon and Hollingshead proposed that "…coordination requires that group members accept responsibility for certain actions, that other group members accept responsibility for other areas, and that group members implicitly know that they share the same map of these responsibilities" (Brandon & Hollingshead, 2004, p. 640). Coordination failures occur when members mistakenly assume that the responsibility for learning and remembering information has been accepted by another (Lewis, Belliveau, Herndon & Keller, 2007). Such failures are recognized when "…information possessed by a member is not utilized by the group, when members fail to retrieve information they possess, or when members fail to cue recall of information already possessed by another member" (Lewis et al., 2007, p. 165).

Third, effective TMS requires a level of transparency and engagement that is likely impacted by PS perceptions. PS promotes learning through physical, cognitive and emotional engagement. For example, Kahn (1990) linked PS to the display of personally engaging behaviors such that members experiencing high levels of PS are "…physically involved in tasks, whether alone or with others, cognitively vigilant, and empathically connected to others in the service of the work they are doing in ways that display what they think and feel…" (Kahn, 1990, p. 700). In contrast, in the absence of PS members are more likely to become personally withdrawn and increase self-defensive behaviors in which they "…hide true identity, thoughts, and feelings during role performance…” (Kahn, 1990, p. 701). Coordination errors are more likely when members have a poor understanding of the expertise possessed by overly guarded teammates.

Finally, to have an effective TMS, members assigned responsibility to maintain expertise in domains in which they are ill-equipped must feel safe to admit their deficiencies. However, admitting weakness can be embarrassing or used to demean or harm the self-esteem of the member whose expertise is in question. PS may create an environment where people are self-conscious about the risks associated with sharing potentially damaging revelations. For example, in a study of virtual communities, Zhang and colleagues (2010) reported that PS has a positive effect on community members’ intentions to continue sharing knowledge in the community. Confirming previous findings (e.g. May, Gilson, Harter, 2004), they also found that PS is driven by heightened vigilance regarding how one is perceived and judged by others. Low levels of PS hinder reallocation of expertise responsibilities to the most capable, confident and willing team members.

In sum, the social exchanges necessary for effective TMS operation such as feedback seeking, information sharing, negotiation, discussion of errors, and experimentation (Edmonson, 1999; Hollingshead, 1998) are fraught with interpersonal risks that members will be more or less willing or able to accept. However, by alleviating excessive concerns regarding the acceptability of interpersonal risk taking, psychological safety can encourage enactment of potentially risky learning-oriented behaviors (Edmondson, 1999) which support the processes and structures inherent in a functioning TMS. When PS is high, members will be more willing to reallocate expertise roles and responsibilities and experiment with new ways of processing information. In contrast, contexts characterized by low psychological safety are likely to discourage risk-taking and instead promote restricted information processing and rigid adherence to initial and oftentimes erroneous member-expertise assignments. On this basis we predict the following:

Hypothesis 1: Team PS is positively related to TMS.

Group Affectivity

While positive affectivity reflects the tendency to be energetic, cheerful, and optimistic (Barsade & Gibson, 1998; Watson et al., 1998), negative affectivity increases the tendency to overreact to and ruminate over unfavorable information regarding ones' self and others (Watson, et al., 1988). We theorize that positive and negative affectivity are differentially associated with the emergence of psychological safety through their respective influence on the extent that members are motivated to approach or avoid (Elliot & Thrash, 2002) opportunities to communicate potentially threatening information to one another (Tynan, 2005; White, Tynan, Galisnky, & Thompson, 2004). As such, we expect affectivity to influence not only how group environments are perceived, but also how group environments are created.

Negative Affectivity and Psychological Safety

There are a number of reasons why we expect NA to contribute to a group environment perceived to be psychologically unsafe by its members. First, NA has been linked to an *avoidance orientation* characterized by "…sensitivity to negative/undesirable (i.e. punishment) stimuli (present or imagined) that is accompanied by perceptual vigilance for, affective reactivity to, and a behavioral predisposition away from such stimuli" (Elliot and Thrash, 2002, p. 805). This perspective is consistent with the expectation that NA is associated with the behavioral inhibition system (BIS), a physiological mechanism that constrains actions that might lead to harmful or painful consequences (Carver & White, 1984). Because NA increases sensitivity to stimuli that is negative or unfavorable, high NA groups are likely to be characterized by the highlighting of members' shortcomings and missteps while simultaneously discounting or overlooking one another's strengths and successes. This initial negative sensitivity may be compounded by the tendency of NA to be accompanied by rumination over one's own or others' errors and shortcomings, as well as time, attention and energy spent attempting to recover from actual or potential resource losses (Hobfoll 1988, 1989; Watson & Clark, 1984). As cognitions influenced by NA are shared, stored, and coordinated by group members, a reluctance in the group to engage in learning-oriented behaviors such as admission of error or acknowledgement of a lack of understanding may emerge.

Affectivity is likely to have an impact on both risk perceptions and memory by biasing what information is noticed, encoded, stored, and retrieved from individuals' transactive memories. Research on *mood congruence* suggests that individuals will tend to more easily recall positive information while in a state of positive affect and negative information when in a state of negative affect (Blaney, 1986). Moreover, *state dependence* research suggests that individuals tend to retrieve information from memory encoded in a mood state that is consistent with their current mood (Blaney, 1986).

As such, although heightened vigilance to negative (positive) stimuli and environmental cues is likely to facilitate memory processes, NA (PA) is likely to bias memory functioning by promoting the encoding, storage and recall of negative (positive) information over positive (negative) information. For example, when presented with an equal number of negative and positive cues about the value and costs of transacting with another member, high NA may lead to disproportionate attention to the risks and expense of transacting. In the case of a previous negative transaction (e.g. a usually reliable source of information uncharacteristically provides incorrect information), NA is likely to cause selective recall and/or rumination on the error rather than the previous track record of success. We argue that this process aggregates up to the group level through the process of retrieval coordination, as group members cue each other throughout the memory retrieval process.

In addition to biased perceptions towards negativity, NA also is likely to cause members to act in ways that contribute to an environment others are likely to perceive as interpersonally threatening. When faced with negative cues, high NA is likely to lead to stronger reactions than low NA. For example, Spector and Fox (2002) argued that negative emotions increase the likelihood of avoidance of or attacks directed toward perceived sources of negative emotion. Due to their tendency to perceive and experience fear, anxiety and anger, high NAs are likely to make others feel reticent to act in ways that could potentially antagonize or prolong their negative mood states. As such, the negative perceptions and behaviors exhibited by members experiencing negative mood states may spread to infect others, and ultimately the group itself, leading to a shared experience of negative affect and an overall tendency towards avoidance (Elliot & Thrash, 2002; Kelly & Barsade, 2001).

While high NA is generally associated with feelings such as guilt, fear, and anxiety, low NA is associated with feelings of serenity and calmness (Kaplan, Bradley, Luchman, & Haynes, 2009; Watson et al., 1988). As such, low NA groups are likely to be perceived as less punitive and more forgiving than high NA groups. Moreover, low NA groups are likely to have a greater composition of members with lower social anxiety and or fear of failure. This suggests that NA not only contributes to collective perceptions of the environment as being psychologically unsafe, but NA also compels members, through their persistently negative mood states, to create a psychologically unsafe environment for others. Thus, we expect team NA to be associated with avoidance of interpersonal risk-taking, as the costs of such behaviors are likely to be perceived as outweighing their benefits, leading to the following:

Hypothesis 2a: Team NA is negatively related to team PS.

Positive Affectivity and Psychological Safety

While NA is closely linked to a tendency towards unfavorable perceptions and avoidance, PA is more closely linked to an *approach orientation* characterized by "…sensitivity to positive/desirable (i.e. reward) stimuli (present or imagined) that is accompanied by perceptual vigilance for, affective reactivity to, and a behavioral predisposition toward such stimuli" (Elliot & Thrash, 2002, p. 805). PA has been associated with the behavioral activation system (BAS), the physiological mechanism responsible for movement towards goals in the face of potential rewards (Carver & White, 1984). PA tends to be generally associated with feelings of well-being and self-esteem (Naragon & Watson, 2009), and social optimism (Watson & Clark, 1984; Tellegen, 1985). PA also contributes to more efficient processing of information (Tsai, Chi, Grandey and Fung, 2012), a broadened perceived scope of available action alternatives in interpersonal situations (Fredrickson, 1998; 2001), and enhanced interpersonal focus. High PA drives positive feelings such as "….enthusiasm, alertness, and joviality, whereas lower levels of PA are related to feelings of lethargy and sluggishness" (Kaplan et al., 2009, p. 163).

Due to selective attention towards positivity, PA is likely to facilitate the encoding, storing and retrieving of positive information about oneself and others, as well as the retrieval coordination process through which members develop shared contexts and histories for their memories. Bias towards perceiving oneself, others and situations favorably should lessen the perceived perils associated with performing potentially risky learning-oriented behaviors such as speaking up or challenging the status quo (Edmondson, 1999). PA also should increase the value team members place on the benefits of transacting with others. PA should lead to members giving one another the benefit of the doubt in potentially ambiguous situations. According to Spector and Fox (2002), positive emotions increase the probability of movement towards rewards in the face of positive cues. This suggests that people are motivated to engage in actions such as helping others that can enhance or prolong positive affective states. As such, high PA are more likely than low PA groups to be perceived as rewarding and welcoming of potentially risky interpersonal behaviors such as declaring one's expertise, giving feedback or asking for help.

In this way, PA may lead to more favorable assessments regarding the likely reactions of group members to potentially risky interpersonal behaviors. Bias towards positivity can also enable increased vulnerability and transparency in the presence of others. However, lower PA can lead to less favorable assessments of the rewards that might accompany interpersonally risky behaviors, such as declaring one's expertise or experimentation. As such, we propose the following:

Hypothesis 2b: Team PA is positively related to group PS.

Positive and Negative Affectivity and TMS; The Mediating Role of Psychological Safety

Given the importance of a psychological safe team environment for supporting TMS emergence and development, we expect NA and PA to differentially impact TMS operation, at least partially, through their influence on PS. Specifically, we posit that NA leads to unfavorable assessments regarding the safety and viability of interpersonal risk-taking, which in turn inhibits the development and maintenance of specialized, credible and well-coordinated expertise—the hallmarks of a mature TMS. Establishing one's credibility (a key TMS activity) is fraught with interpersonal risks that high NAs are likely to avoid. NA creates an environment in which members are hesitant to call attention to their own errors, weaknesses or to those of others.

Members of high NA groups are more likely to have doubt regarding the value and relevance of their own expertise, contribute to silence regarding their relevant qualifications and prior experiences.

They also are less likely to probe other members' expertise for fear of being seen as a troublemaker. This can prevent others from updating their respective cognitive directories, as well as the group's shared directory with information regarding whose expertise is most germane to which tasks. Because high NAs tend to react strongly and negatively to their own and other's mistakes and errors, they may insist on punishing those who make mistakes by stripping them of their expertise or task assignments (Spector & Fox, 2002). Similarly, High NAs may have self-doubt at the realization of their own errors (Watson & Pennebaker, 1989), leading to counterproductive behaviors such as hiding their errors and shifting blame; or admitting mistakes, but then ruminating on them. These negative actions and reactions may spread throughout the group, leading to the emergence of a shared belief that the team is unsafe for risk-taking and/or incapable of shared learning and information processing. In this way, negative affective biases hinder the development of TMS by increasing risk perceptions and subsequent reluctance to engage in the actions necessary to support transactive processing.

Further, we propose that while NA is likely to be negatively associated with TMS through PS, PA is likely to be positively associated with TMS through PS. In high PA environments, members will make more favorable assessments regarding the potential value, accessibility and benefits of coordinating their respective transactive memories (Borgatti & Cross, 2003). Moreover, high PA groups will be more alert, enthusiastic and energetic (Watson et al., 1998) and may exhibit more prosocial and proactive behaviors (Podsakoff, MacKenzie, Paine, & Bachrach, 2000). Willingness to help and learn from one another may have contagion effects that promote a shared experience of positive affect in the team (Kelly & Barsade, 2001). Moreover, PA encourages members to devote fewer resources to face-saving efforts (Tynan, 2005) and more toward the support of transactive processing and shared directory maintenance (Lewis & Herndon, 2011).

In sum, we propose a mediation model in which group level affectivity influences psychological safety which leads to the emergence of TMS. TMS is more likely to develop under favorable affective conditions (i.e. low NA or high PA) because members are more likely to feel safe sharing and seeking information, experimenting and challenging assumptions. However, under unfavorable affective conditions (i.e. high NA or low PA), TMS is less likely to develop due to psychological insecurity associated with engagement in potentially risky social exchanges inherent to TMS, leading to the following:

Hypothesis 3: Team PS mediates the relationship between team (a) negative and (b) positive affectivity and TMS.

Multi-Level Theory

Due to the nature of our primary constructs, understanding current multi-level theory (MLT) research (e.g. Fulmer & Ostroff, 2015; Kozlowski & Chao, 2012) is essential and forms the foundation of our analytical approach. We approach the focal constructs of the current study (affectivity, psychological safety and transactive memory) from an emergence perspective. Kozlowski and Klein (2000) argued that "A phenomenon is emergent when it originates in the cognition, affect, behaviors, or other characteristics of individuals, is amplified by their interactions, and manifests as a higher level, collective phenomenon" (p. 55). Emergence can be thought of as a "bottom-up process" in which lower-order phenomena manifest as higher-order compositional or compilational forms; the former are composed of "…homogeneous, linear and convergent…" lower-level elements (Kozlowski & Chao, p.338) whereas the latter are composed of elements that are "…heterogeneous, nonlinear and divergent…" (Kozlowski & Chao, p.338).

Compilation forms of emergence are reflective of divergent lower-level elements and inconsistent interaction patterns that produce asymmetric configurations and patterns at the group level (Kozlowski & Klein, 2000). Compilation approaches are particularly useful when research questions focus on understanding how the interplay of imbalanced individual-level factors drive group-level dispersion and fragmentation. Examples of compilational emergent forms include group affective variance (Kaplan, Laport & Waller, 2013), subteam PS (Roussin, MacLean & Rudolph, 2014) and transactive memory networks (Kozlowski & Chao, 2012). Moreover, group level phenomena that emerge via compilation processes often are assessed by measuring the amount of variance present among the lower-level elements (e.g. standard deviation).

In contrast, compositional emergent forms arise from equivalent characteristics and interaction patterns that foster shared attitudes, perceptions, and behaviors across members of a group. From this perspective, group level consensus emerges through bottom-up processes such as when interactions contribute to similarity (e.g. Wegner, Giuliano, Hertel, 1985) or when similarity contributes to attraction and interaction (McPherson, Smith-Lovin & Cook, 2001). Phenomena such as group affective tone (George, 1990), group PS (Edmondson, 1999) and transactive memory systems (Lewis, 2003) have been studied from the perspective of compositional emergence. These emergent forms often are assessed by evaluating means and interrater agreement (James, Demaree, & Wolf, 1984) between and among the lower-level elements (Chan, 1998).

The focus of the current study is less about fragmentation and configuration; rather, our interest lies primarily in the factors that foster the development of shared consensus and collective learning. As such, our study focuses on compositional emergence among our focal constructs. This focus is consistent with tranactive memory theory, our primary conceptual framework.

METHODS

Sample and Data Collection

We collected data from the supervisors and members of 121 enterprise resource planning (ERP) software implementation teams, as part of a larger study on team dynamics. In order to support the development of the causal inferences we seek to draw, team members completed surveys at separate points in time, T0 and T1. Specifically, team affectivity was assessed in a pre-project survey at T0. Psychological safety – our proposed mediator - and TMS were measured at T1. From the 668 members of 121 initial ERP teams, we received usable data from 590 members of 107 project teams. The demographics of the final sample were compared to that of the 14 projects and 78 team members removed due to missing or incomplete data. No statistical differences between these teams were observed.

We collected data from teams of information technology (IT) professionals engaged in the implementation of supply-chain management (SCM) ‘bolt-ons’. Bolt-ons are technology solutions designed to help firms achieve greater efficiency with more general information systems that had less than fully integrated functional capability. Bolt-ons leverage manufacturing schedule and cost data, along with data on sales seasonality, to provide information and recommendations managers can use in supplier selection, negotiation and contracting. In order for SCM bolt-on implementation to be successful, those charged with the implementation need to have a sufficient level of understanding regarding the nature of the data required by the bolt-on (i.e., where to retrieve manufacturing data and how to enable the bolt-on to digest it, where to retrieve sales data, past contracts, etc.). If the wrong source data are connected, or the wrong kind of decision made in support of the bolt-on (e.g., if the implementation team doesn't truly understand what the firm needs) significant rework on the implementation is likely to be required. Moreover, it is critical for implementation teams to be sensitive to the expectations of the client. However, since implementation teams typically have some members that know more about sales and others that know more about manufacturing, and still others that more about contracting, it is also critical for team members to be sensitive to one another's needs and expectations.

Given the significant resources associated with their deployment, and the costs associated with the projects in which they were engaged, the ERP implementation teams in the current study were formally staffed and deployed by management. The members of the project teams retain some degree of expertise specialization based on experience. But, all of the members of the teams in our sample are IT (information technology) employees – so all were 'experts', broadly, in the systems requirements necessary to engage the specifications of the projects for which they were deployed. These teams also were essentially standardized with respect to role, so that no single member, formally, retained responsibilities that were distinguishable from the other members of the team. Here, it also is critical to note that these ERP implementation teams are not standing teams in general terms. They represent a subset of the firm's IT staff, which get assigned to ERP projects, for a specified duration of time (as we note above), and which are then disbanded as new projects emerge.

The 'tasks' for which these implementation teams are responsible may be thought of as emerging in stages across the implementation cycle, with foundational aspects of the project laid down first, and subsequent project-specific elements laid over these elements in a broadly predictable sequence. The members of these teams also operate with a significant degree of functional interdependence, as all aspects of the system being deployed for the implementation to be effective at the conclusion of the project. Although all of the work being done by these teams is executed by individuals, it is executed in an integrative, interdependent way. The tasks engaged by these ERP implementation teams involve hardware and software installations, database and process integration with user interfaces, developing connections to supply chain partner systems, and the design/customization of interfaces to match users and disparate system needs.

Measures

Trait positive and negative affectivity. We assessed trait positive and negative affectivity in the pre-project survey using Watson and colleagues' Positive and Negative Affect Schedule (PANAS). As suggested in previous research (Kaplan, Bradley, Luchman, & Haynes, 2009), by varying the time period over which respondents have experienced certain emotions or feelings, this inventory can be used to measure affect either as a stable personality-like disposition (e.g. in general, past few weeks or months, etc.) or as a temporal mood (e.g. currently, this week, etc.). Thus, consistent with previous studies measuring trait affectivity (Kim, Shin, & Kim, 2013), respondents were asked to indicate to what extent in the past few weeks on a scale from 1 (very slightly or not at all) to 5 (extremely) they had experienced positive feelings and emotions (i.e. interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive and active) and negative feelings and emotions (i.e. distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery, or afraid). Consistent with the bottom-up approach mentioned earlier in the current manuscript (Kelly & Barsade, 2001), and in keeping with extant treatments of group-level trait affectivity (Kim et al., 2013), we calculated the average of team members' individual responses to the PANAS inventory . In this way, our measure of group trait affectivity is in line with additive composition models advanced by Chan (1998). The mean of group PA was 3.49 (s.d. =.69) and the mean of group NA was 2.50 (s.d. = .82). Cronbach's alphas for positive and negative affectivity were .90 and .92 respectively. Regarding PA and NA respectively, mean $r_{wg(j)}$ = .69 and .69 based on uniform null distributions, ICC(1) = .36 and .50 and ICC(2) = .75 and .84 offered support for inter-member agreement and reliability, and justified aggregation of individual scores to the team level (Bliese, 2000).

Team psychological safety. We assessed team PS in the T1 survey using Edmondson's (1999) 7-item scale. Respondents indicated on a scale ranging from 1 (strongly disagree) to 5 (strongly agree) their agreement with statements such as "It is difficult to ask other members of this team for help." The average of team member's PS scores was 2.60 (s.d. = .76). Mean $r_{wg(j)}$ = .74 based on a uniform null distribution, α = .87, ICC(1) = .46 and ICC(2) = .82 also indicated inter-member agreement and reliability, and justification for aggregation to the team level (Bliese, 2000).

Transactive memory systems. Finally, we measured transactive memory system (TMS) at T1 using Lewis' (2003) 15-item measure, a widely used measure in the literature (Ren & Argote, 2011). For example, in their recent review Ren and Argote (2011: 216) noted that the Lewis (2003) measure has been among the most frequently employed measures of TMS in empirical research, correlating with several alternative TMS measures that have been proposed by other researchers (e.g., Akgün, Byrne, Keskin, Lynn, & Imamoglu, 2005, Faraj & Sproull, (2000), and Michinov, Olivier-Chiron, Rusch, & Chriron, (2008). Following the protocol reported by Lewis (2003), the members of the project teams responded on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). A sample item includes, “Each team member has specialized knowledge of some aspect of our project.” Following Lewis (2003), we averaged members’ responses to form a composite TMS score with mean of 2.44 and standard deviation of 0.53. A mean $r_{wg(j)}$ = .85 based on a uniform null distribution, α = .87, ICC(1) = .36 and ICC(2) = .76 indicated acceptable inter-member agreement and reliability, and provided justification for the aggregation of individual scores (Bliese, 2000).

Control variables. Consistent with previous research showing group size to impact the maturation of TMS (Palazzolo, Serb, She, Su, & Contractor, 2006; Ren, Carley, & Argote, 2006), we control group size, operationalized as the number of members on a team. We also control gender diversity, as previous research indicates that members may use gender stereotypes to infer expertise and divide responsibilities in TMS (Hollingshead & Fraidin, 2003). Gender proportion (0 = male, 1 = female) was calculated as the percentage of female members per team.

Common Method Variance

Given the variables-in-focus in our research model, our design required data to be collected from the same source. Following Podsakoff, MacKenzie, Lee and Podsakoff (2003), we took several precautions to minimize potential methods bias. First, we assured respondents that their individual responses would be kept confidential, and any reporting of findings would be accomplished in the aggregate. Second, to minimize priming effects, data were collected at multiple points over the course of the project. In most cases, these data collections were separated by several months. Third, following Williams, Cote and Buckley (1989), we used structural equation modeling (SEM) to explore the extent that common method variance (CMV) potentially influenced our results. Using our sample’s individual-level data, we estimated two measurement models—a full measurement model and the identical model with an additional uncorrelated method factor. If the fit of the method and trait model is significantly better than the model without the method factor, then CMV is a potential issue. Fit statistics indicate that the full measurement model fit the data well (X^2= 3037.19, p = .00, CFI = .95, NFI = .93, RMSEA = .068). The addition of the methods factor resulted in minor improvement across some indices (X^2= 1337.89, p = .00, CFI = .99, NFI = .96, RMSEA = .035). The results from a X^2 difference test indicated that the difference was significant (X^2_{diff} (42) = 1699.30, p < .0001).

To determine the extent of CMV influence, we followed previous conventions (e.g. Direnzo, Greenhaus, & Weer, 2015) that use the sum of the squared loadings to index the total variance explained by the method factor. These calculations revealed that the method factor accounted for 12% of the total variance, significantly less than the 25% observed by Williams et al. (1989) and in line with a number of recent studies (e.g. Fugate, Prussia, & Kinicki, 2012; Kraimer, Shaffer, Harrison, & Ren, 2012) and considerably less than others (e.g. Baron, Franklin, & Hmieleski). This suggests that although our model benefitted from the addition of a method factor, the improvement in fit was fairly small, and that CMV is not a pervasive concern.

Analytic Strategy

In order to test the relationships between our study variables, we conducted a series of analyses. To test Hypothesis 1, we used SPSS 19.0 to run a set of hierarchical regressions testing the effects of group PS on TMS (Table 3, Model 3). To test Hypotheses 2a and 2b, we ran another series of hierarchical regression analyses, on which we regressed group PS on group PA and NA (see Table 2 Model 2). We used the PROCESS routine developed by Hayes (2012) to test for mediation in Hypothesis 3. The PROCESS procedure follows a bootstrapping-based path analytic approach (Edwards & Lambert, 2007; Preacher & Hayes, 2008), that enables assessment of direct and indirect effects of group affectivity on TMS through group PS.

RESULTS

Means, standard deviations and correlations for all study variables are presented in Table 1. As expected, PS, NA, PA and TMS were all significantly correlated. To establish discriminant validity, we followed recommendations advanced by Fornell and Larcker (1981) and computed the square root of the average variance explained by each of our focal variables. Results presented in Table 1 provide evidence of discriminant validity.

Insert Table 1 about here

Tests of Hypotheses

In Hypothesis 1, we expected group PS to be positively related to TMS. Results in Model 3 of Table 2 provide support for this prediction revealing that PS is positively related to TMS ($\beta = 0.25$, $p < .001$; $\Delta R^2 = .13$). Hypotheses 2a & 2b predicted that NA is negatively related to PS while PA would be positively related to PS. Results detailed in Model 2 of Table 3 indicate that NA was significantly, negatively related to PS ($\beta = -0.37$, $p < .001$; $\Delta R^2 = .33$) while PA was significantly, positively related to PS ($\beta = 0.34$, $p < .001$; $\Delta R^2 = .33$). These results provide support for H2a and H2b.

Insert Table 2 about here

In Hypotheses H3a and H3b, we expected PS to mediate the relationships between NA and TMS as well as the relationship between PA and TMS respectively. Results displayed in Model 2 of Table 2 show that although NA was significantly, negatively related to TMS as expected ($\beta = -.15$, $p < .01$; $\Delta R^2 = .10$), PA was not significantly related to TMS ($\beta = .11$, $p = .06$). Further, the relationship between NA and TMS loses significance when the mediator PS (which remains significant) is added to the regression (*β* = -.08, *n.s.*). According to guidelines detailed by Baron and Kenny (1986), this pattern of results is a preliminary indicator of mediation.

Insert Table 3 about here

To provide a stronger test for mediation, we used the PROCESS routine (an SPSS macro) to conduct bootstrapping path analytic significance tests for the indirect effects of group NA on TMS through mediation by PS. Using linear regression with maximum likelihood estimates, 95% bias corrected confidence intervals and 5000 bootstrap samples, we find support for the indirect relationship between group NA and TMS through PS. As depicted in Table 4, a confidence interval excluding zero revealed a significant indirect effect of NA on TMS through PS controlling for PA (coeff = -.07; CI = [-.1386, -.0188]). Expressed as a proportion in which indirect effect/total effect * 100% (Freedman, 2001; Sobel, 1982), these results suggest that PS mediates 46% of the total effect of NA on TMS. Additionally, we followed recommendations of Preacher and Kelly (2011) and calculated a kappa squared (κ^2) statistic of the simple mediation of PS on the NA-TMS relationship (without covariates). The κ^2 was .15 (95% CI = [.0664, .2572]) and can be considered in light of Preacher and Kelly's (2011) comparison of benchmarks between κ^2 and r^2, in which effect sizes of .01, .09, and .25 can be viewed as being small, medium and large. Collectively, these findings provide support for Hypothesis 3a.

Insert Table 4 about here

DISCUSSION

A great deal is known about the consequences of TMS – perhaps most prominent among these being a consistent, positive association with team performance. For example, Ren and

Argote (2011) reported that TMS was positively associated with group performance across 76 studies. Despite empirical support for the positive effects of TMS on team performance (Ren & Argote, 2011), less research has explored antecedents of the processes and structures underlying TMS (Lewis & Herndon, 2011), particularly those factors that encourage or discourage participation in transactive processing. The purpose of the current study was to build on and extend transactive memory theory by exploring the dispositional and psychological drivers of transactive memory systems. Our results provide unique insight regarding how generalized tendencies toward negative or positive experiences impact the extent to which members evaluate their environments as being safe for accepting the inherent interpersonal risks associated with coordinated information processing. The extent that team members are willing and able to participate in the division of labor required for TMS reduces individual members' cognitive burden, and increases the collective availability of knowledge and information (Lewis, 2003; Lewis & Herndon, 2011). Further, the extent to which a team develops an effective TMS is likely predicated on members' positive or negative evaluations of the accessibility (Yuan, Carboni, Ehrlich, 2010), credibility (Hollingshead, 1998), relevance (Lewis, 2003), and costs of retrieving (Borgatti & Cross, 2003) one another's expertise.

Employing a lagged field test of intact software implementation project teams, we find support for the mediating role played by group-level PS in the relationship between group NA and TMS, but not between group PA and TMS. Although we find that PA is significantly, positively related to PS, PA was not significantly related to TMS. We also find that NA is significantly, negatively related to both PS and TMS. Finally, we find that group PS is significantly, positively associated with TMS, and mediates the relationship between group NA and TMS.

This pattern of results is consistent with extant research demonstrating different causal mechanisms associated with NA and PA (e.g. Kaplan, et al., 2009; Lyubomirsky, King, & Diener, 2005; Thoresen, Kaplan, Barsky, & de Chermont, 2003). That is, NA and PA are not opposite ends of an affective continuum. Instead, NA has its impact on outcomes through the behavioral inhibition system (e.g. avoidance orientation, bias towards risk/negativity) whereas the effects of PA are transmitted through the behavioral activation system (e.g. approach orientation, bias towards rewards/positivity). As a transmitter of affectivity, PS is likely to be more closely associated with the BAS than to the BIS. Further, since PS involves assessments of interpersonal risk (not reward), the effects of PA are not carried over to TMS through PS. In fact, PS exhibited no direct relationship with TMS. These results offer insights into the extent to which individual differences at the group level impact the extent that groups develop specialized, credible and well-coordinated expertise (Lewis, 2003) through learning and interpersonal risk-taking.

Theoretical Implications and Extensions

Given the lack of association between PA and TMS in our study, our strongest results orbit the relationship we uncover between NA and TMS. NA catalyzes selective attention toward - and strong reactivity to - negative environmental and interpersonal information. We contend that in contrast to low NA teams, high NA teams are more likely to spend a disproportionate amount of time focused on members' failings and deficiencies. NA can lead to a psychologically unsafe environment where teams are reluctant to engage in the social exchange of critical task and architectural information undergirding TMS. Members also are unlikely to feel comfortable – or even able – to ask other members for help with work-related tasks with which they have less experience or expertise; or to take risks establishing the location of expertise among their group members.

On the one hand, high NA teams are likely to be characterized by high levels of anxiety, fear and caution, while on the other by feelings of hostility and irritability. This may lead to an inward focus and skepticism of others' intentions, diminishing information exchange. It will be important for future research to disentangle the role played by the more passive aspects of NA (fear, anxiety and caution) from its more aggressive aspects (hostility, anger, and distress) and the respect impact of these elements of NA on group level PS and TMS.

Although our study was focused at the group level, our findings also provide guidance for extant research on dyadic perspectives of psychological safety and the concept of face (e.g. Tynan, 2005). For example, this research suggests that heightened threat sensitivity may diminish the ease and timeliness with which members communicate *self*- and *other*-potentially face-threatening information (Tynan, 2005). Face refers to self and others' image, whereas face saving refers to efforts to avoid harm to one's own or another's face in the presence of threatening circumstances (Tynan, 2005). Threats to face may be self- or other-focused (Tynan, 2005); self-face-threatening information includes acknowledging one's mistakes, knowledge gaps, or the need for assistance (Tynan, 2005) whereas other-face-threatening information includes giving critical feedback, highlighting mistakes, raising objections, double-checking, seeking second opinions, asking for clarification and offering dissenting opinions (Tynan, 2005).

Situations that threaten positive self-image, or esteem, are likely to trigger prompt negative affective responses intended to recover from or prevent face loss (Argyris, 1992). When faced with the need to communicate face threatening information, initiators are likely to seek to conserve resources by delaying, distorting, or avoiding unpleasant communications.

Consequently, high levels of NA in a team are likely to lead to delays, distortions or failure to deliver unfavorable information (e.g. manifestations of low PS). The withholding of critical information and open feedback limits members' ability to make accurate or complete assessments regarding which members possess the most relevant expertise for particular group tasks. Moreover, because NA diminishes the attractiveness and increases the threat associated with interpersonal interactions, it also is likely to impede the emergence of the task structures and processes central to effective TMS functioning (e.g. high levels of cognitive interdependence, trust, and coordination – Lewis and Herndon, 2011). As such, it will be important for future research to extend our group level model to lower level investigations of affectivity, PS and TM.

Practical Implications

Results from both laboratory and field research indicate that teams operating a TMS can apply more task-critical knowledge, more effectively coordinate their interactions, and perform better than groups without a TMS (e.g., Austin, 2003; Lee et al., 2014; Lewis, 2003a; Lewis, 2004; Liang et al., 1995; Moreland, 1999; Moreland et al., 1996, 1998; Moreland & Myaskovsky, 2000; Zhang et al., 2007). Managers seeking to stimulate an effective cognitive division of labor through the promotion of positive and rewarding team environments are likely to be frustrated when their efforts fail to generate an operative TMS. Instead of offering rewards and incentives to foster TMS, managers should consider reducing perceived risks associated with learning-oriented behaviors such as declaring expertise, experimentation or asking for help.

Training focused on educating managers regarding the functional distinctions between NA and PA can play an important role here. Specifically, research reveals that NA and PA, which reflect two separate continua (Kaplan, et al., 2009; Lyubomirsky et al., 2005; Thoresen et al., 2003), may help managers more effectively target their environmental shaping initiatives. Interpersonal risk-taking and learning may be motivated by reduced hostility, fear and guilt (i.e. NA) rather than the promotion of enthusiasm, excitement, and pride (i.e. PA). For example, research (Carrington, Collings, Benson, Robinson, Wood, Lehrer et al., 1980; Peters, Benson, & Porter (1977) suggests that the application of within-work mediation procedures may improve employees' subjective well-being (Diener, 2000), diminishing correlates of negative affectivity.

Limitations and Directions for Future Research

Although the current study has several strengths, it is important to consider limitations of our study design that impact our ability to draw definitive inferences from our results. First, our model rests on the expectation that favorable perceptions of PS support learning behaviors that stimulate specialized, credible and coordinated expertise. The value of this contribution is mitigated by the fact that we assumed (i.e., in accordance with assumptions in the TMS domain – Lewis & Herndon, 2011) the presence of learning; but did not capture actual learning behavior. It will be important for future research to explicitly capture the learning behaviors TMS researchers broadly assume account for TMS, such as help giving and seeking, expression of voice, and experimentation. Second, given conceptual similarities in the nature of the constructs we examine (i.e., both TMS and PS are cognitive emergent states), it will be important for future research to incorporate a broader set of antecedent factors. Third, we employed a lagged design that incorporated a conceptually coherent data collection, with our independent variable (group affectivity) collected prior to our mediator (PS) and dependent variable (TMS). However, as we did not incorporate a longitudinal design encompassing change over time, our data do not allow us to draw definitive causal inferences regarding the relationships between affectivity, PS and TMS. Moreover, TMS is likely subject to dynamism; the decision to engage in transactive processing with another is driven by one's momentary perceptions of the location, content, value, cost and accessibility of another's expertise. These factors are dynamic, such that once a team member learns something, gains a new skill, makes a mistake, etc., other members of the team need to transfer this learning by updating their respective cognitive directories as well as the group's overall directory. In this way, a team may have a shared understanding of "who knows what" at one moment in time, but fail to transfer learning through directory updating, leading to a subsequent divergence in group member's "shared" understanding. It will be important for future research to examine patterns of group affectivity, PS and transactive memory systems over time to evaluate these relationships. Future research also should explore variables representing both risks and rewards as potential mediators of NA and PA on TMS.

Finally, although our study adopted a compositional approach by taking individual level perceptions and aggregating them to the group level, this approach does not provide guidance regarding the impact of perceptual dispersion among members of a group. For example, consider a 4-person group in which one member is high in NA while the other 3 members are low in NA. Aggregation of these individual perceptions to the group level might suggest that the group on average is a "low-NA" group and is likely to be experienced as less threatening and subsequently better positioned to develop TMS. However, our theory suggests that due to heightened sensitivity to risk and threat, the high NA member is likely to have a less accurate and complete understanding of the content, location and accessibility of the other 3 members' expertise—a condition that can potentially retard the development of TMS. Specifically, a strong TMS could be present among the 3 low NA members, but be weak or non-existent between the high NA member and each of the 3 NA members respectively. Although such possibilities are outside of the scope of the current study, we encourage future research to account for such perceptual differences by exploring the affectivity, PS and TMS pathway from a multilevel, social network perspective. Indeed, recent research has begun to explore PS using such a lens (Roussin et al., 2014) and can provide a useful framework for extending ideas we advance in the current study.

Conclusion

Although a great deal of research has focused on the performance consequences of transactive memory systems (Lewis & Herndon, 2011; Ren & Argote, 2011), less attention has been devoted to TMS antecedents. Moreover, previous research has provided little guidance on the effects of interpersonal risk perceptions and learning on groups' TMS. Our study advances a framework that incorporates group level dispositional affectivity and PS as precursors to TMS. We demonstrate that TMS is reliant not only on the predominant theme of TMS regarding knowledge of 'who knows what', but also a willingness to be vulnerable to negative interpersonal consequences stemming from engaging in the types of behaviors that allow one to learn 'who knows what' and continuously monitor 'who may have recently learned what'. Moreover, members' experience of NA and PA influence the extent to which they evaluate and subsequently approach or avoid such interpersonal risks. Because TMS depends on members' willingness to engage in these kinds of risky exchanges, understanding the dispositional, social and psychological drivers of these patterns of information exchange contributes to our understanding of TMS antecedents.

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Table 1.

Means, Standard Deviations, and Correlations

Variable	Mean	Std Dev	1	2	3	4	5	6
1. Group Size	5.52	1.24						
2. Percent Female	0.26	0.19	0.05					
3. Positive Affect	3.49	0.69	-0.19*	0.03	0.66			
4. Negative Affect	2.50	0.82	-0.02	0.09	-0.28**	0.73		
5. Psychological Safety	2.60	0.76	-0.16	0.02	0.45***	-0.49***	0.70	
6. Transactive Memory Systems	2.44	0.53	-0.32***	-0.12	0.27**	-0.28***	0.40***	0.44

N = 107 The values on the diagonal are the square root of the average variance explained and must exceed the correlations in the corresponding row and column (Fornell & Larcker, 1981).
*(p<.05); **(p<.01); ***(p<.001)

Table 2

Hierarchical Regression Results for the Effects of Group Affect and Psychological Safety on Transactve Memory Systems

Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Group Size	-0.14*** (.04)	-0.13***(.04)	-0.11** (.04)	-0.11** (.04)
Gender	-0.30 (.26)	-0.25 (.25)	-0.32 (.24)	-0.29 (.24)
Positive Affectivity		0.11 (.07)		0.05 (.08)
Negative Affectivity		-0.15** (.06)		-0.08 (.06)
Psychological Safety			0.25*** (.06)	0.19** (.07)
ΔR^2	.12**	.10**	.13***	.05**
Adj R^2	.10	.18	.22	.22
F	6.776**	6.900***	10.907**	7.042***
df	2, 104	4, 102	3, 103	5, 101

Note: Unstandardized regression coefficients are shown with standard errors in parentheses. Listwise N = 107.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 3

Hierarchical Regression Results for the Effects of Group Affectivity on Psychological Safety

Variables	**Model 1**	**Model 2**
Group Size	-0.10 (.06)	-0.07 (.05)
Gender	0.10 (.39)	0.20 (.32)
Positive Affectivity		0.34*** (.10)
Negative Affectivity		-0.37*** (.08)
ΔR^2	.01	.33***
Adj R^2	.01	.33
F	1.319	13.946***
Df	2, 104	4, 102

Note: Unstandardized regression coefficients are shown with standard errors in parentheses. Listwise $N = 107$.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 4

Analysis of Simple Mediation Effects

	IV = Negative Affect [a]	
Model	**Point Estimate (SE)**	**95% CI**
Total Effect of IV → TMS	-.15** (.06)	
Direct Effects of IV → TMS	-.08 (.06)	
Indirect Effects of IV → PS→ TMS	**-.07 (.01)**	**-.1386, -.0188**

N = 107. Bias corrected confidence intervals (CI) are reported. 5,000 bootstrap samples. Estimates in bold have CI's that exclude zero and thus are significant.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Standard Errors(SE) reported in parentheses.

TMS = Transactive Memory System. PS = Psychological Safety. IV = Independent Variable.

[a] Controlling for Group Size, Gender, Positive Affectivity.