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Measuring teamwork and team performance in collaborative work environments

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1. Introduction

The work once accomplished by individuals is now regularly performed by teams. This is due to a number of factors, including enhanced opportunities for collaboration through newly developed technologies, a need for greater levels of innovation due to increasing competition between firms, and a rise in complex tasks requiring high levels of creativity. With the recognition that teams may be especially important where creative and innovative tasks are required (Parrotta, Pozzoli, Pytlikova, 2014; Williams & O'Reilly, 1998), teams are becoming increasingly common in many organizations. This is especially true of self-managed teams, which are becoming more and more popular as organizational hierarchies collapse and individuals collaborate between different units within a firm.

Following this rise in the presence of self-managed organizational teams, the study of team-level constructs has become popular in recent years. In disciplines including organizational behavior, sociology, education, and many others, researchers are interested in evaluating the presence, emergence, and measurement of team constructs (e.g. Chen & Kanfer, 2006; DeShon, Kozlowski, Schmidt, Milner & Wiechmann, 2004; Guzzo & Dickson, 1996).

While various definitions of teams have been proposed, this paper will utilize Kozlowski and Bell's (2003) definition: teams are composed of two or more individuals who collectively hold one or more common goals, share interdependent tasks while maintaining task boundaries, and interact socially as part of a higher-level context that constrains the team. While some previous work has provided a distinction between groups and teams (e.g. Katzenbach & Smith, 1993), for the remainder of this paper, the term "team" will be used, replacing "group" or "cluster" in reviewing previous studies to maintain consistency of language.

Many team-level constructs have been evaluated in recent years. These include team communication (Adams, Galanes, & Brilhart, 2009), team problem solving (Bormann & Bormann, 1988), decision making (Napier & Gershenfeld), collaborative learning (Bransford, Brown, & Cocking, 1999; Johnson, Johnson & Smith, 2006; Springer, Stanne, & Donovan, 1999), performance and effectiveness (Chen & Kanfer, 2006; DeShon et al., 2004; Guzzo & Dickson, 1996; van Knippenberg, De Dreu, Homan, 2004; Weber & Murninghan, 2008), creativity (Chen, Campbell-Bush, Farh & Wu, 2013; Richter, van Knippenberg, Hirst, Baer, 2012), motivation (Park, Spitzmuller, DeShon, 2013), negative affectivity (van Knippenberg, Kooij-de Bode, van Ginkel, 2010), collaboration (Kuljanin, 2011), and transactive memory systems (Wegner, Giuliano & Hertel, 1985).

A transactive memory system, or TMS, first introduced by Wegner et al. (1985) to describe the behavior of couples in close relationships, has been evaluated by a number of researchers in different contexts (e.g. Hollingshead, 1998a,b, 2001; Lewis, 2003; Wegner et al., 1991). In many of these studies, three tenets of TMSs are evaluated:

specialization (differentiated expertise), credibility (trust in the knowledge of other team members), and coordination (the ability to work together smoothly), (Lewis, 2003; Liang, Moreland, & Argote, 1995).

TMS has been found to be a promising measure of teamwork (e.g. Lewis, 2013). While some scholars and practitioners may be interested in determining a team's TMS to better understand how that team functions, TMSs are also useful in their ability to predict team performance. Also referred to as team effectiveness, team performance is a team's capacity to achieve its goals and objectives (Kozlowski & Klein, 2000). Independent of the context (e.g. work, school, sports), a team's ability to achieve goals leads directly to enhanced team outcomes. The broad applicability and widespread understanding of team performance makes this a practical outcome to consider in addition to measuring TMS in and of itself.

As self-managed teams become increasingly prominent within organizations and increasingly important to completing creative and innovative tasks, how teams and their performance are evaluated must be thoroughly considered .The goal of this paper, therefore, is to propose new techniques for measuring teamwork through TMS and evaluate how TMS may be related to team performance. This is accomplished by first reviewing and evaluating the most popular previous approaches to TMS measurement and then recommending additional venues for measuring TMS that may be pursued based on the shortcomings of previous techniques.

2. Theoretical Framework

2.1 Transactive Memory Systems

Lewis (2003) describes TMSs as "the cooperative division of labor for learning, remembering, and communicating relevant team knowledge" (p. 587). While similar to shared team mental models and other constructs, a key feature of TMSs is that they emerge dynamically through compilation (Chan, 1998). That is, a team's TMS develops over time through repeated team member interactions.

TMSs are distinct from transactive memory as the former is measured at the team level while the latter is measured at the individual level (Kozlowski, Chao, Grand, Braun, & Kuljanin, 2013). According to Kozlowski and colleagues, TMSs may be distinguished from transactive memory as TMSs involve the active process of two or more people collecting, sharing, and utilizing information. Transactive memory, on the other hand, is an individual-level variable that describes one person's knowledge of another person's knowledge ("knowledge of who knows what" or KWKW) and that person's beliefs about whether or not information that is held by others may be accessed (Richter et al., 2012).

Therefore, TMSs emerge at the team-level through the compilation of individual-level transactive memory. Kozlowski and Klein (2000) distinguish between team-level constructs that emerge via composition versus compilation. Whereas composition is based on assumptions of isomorphism, or similarity across levels of measurement, compilation describes constructs that are distinct as they emerge from the individual- to team-level. TMSs have been conceptualized as emerging through compilation. A team's

TMS may be greater than the sum of its individual parts, enabling a team to collectively access information that is not available to any one individual (Wegner et al., 1991).

As previously mentioned, TMSs are related to, but distinguishable from, other team-level constructs, including shared team mental models (Cannon-Bowers & Salas, 2001). Shared team mental models are the knowledge structures within a team that enable the team to form expectations for tasks and coordinate their activities based on these expectations. This construct has obvious ties to TMSs in that it involves the coordination of knowledge to meet team goals. A distinction between shared team mental models and TMSs is that TMSs must involve not only team knowledge and expectations (a structural component), but also the mechanisms by which that knowledge is shared within a team (a process component) (Kozlowski et al., 2913; Lewis & Herndon, 2011).

Another team-level construct that may contribute to a well-functioning TMS is functional background diversity (Richter et al., 2012). According to Richter et al., functional background diversity "reflects differences in knowledge, information, and perspective that are relevant to a team's tasks" (p. 1284). Functional background diversity contributes to knowledge specialization, one of the three tenets of TMSs identified by Liang et al. (1995). Functional background diversity, therefore, is an important precursor to the emergence of TMSs.

2.2 Measuring TMS

TMSs have been measured in both laboratory and field contexts. A summary of some of the most popular approaches to TMS measurement is provided below in Table 1. While this review does not cover every previous approach to TMS measurement, it includes the studies that have been deemed to be the most influential in this field (Ren & Argote, 2011).

[Insert Table 1 about here]

Early studies of TMS (Wegner et al., 1991; Hollingshead 1998a, 1998b, 2001; Liang et al., 1995; Moreland, 1999; Moreland & Myaskovsky, 2000; Lewis, 2003) used a variety of measurement techniques. Some used an outcome, word recall, to infer the existence of TMS in couples (Wegner et al., 1991; Hollingshead 1998a, 1998b, 2001). Results of these studies found that, in existing relationships, performance was hindered under a random assignment of expertise (Wegner et al., 1991). More precisely, existing romantic couples assigned categories for memorization recalled significantly fewer items than existing romantic couples not assigned categories. Additionally, when categories were not assigned, existing romantic couples recalled significantly more information than randomly assigned couples (Wegner et al.).

When considering the relationship between performance and the ability to communicate, existing couples recalled more words than randomly assigned couples when pairs could not communicate during learning and randomly assigned couples recalled more words than existing partners when communication during learning was permitted (Hollingshead, 1998a). This provided evidence that the ability to perform well without communication could indicate the presence of TMS. Hollingshead also evaluated how work settings impact performance (1998b). In face-to-face settings, existing couples performed better than randomly assigned couples and existing couples in a face-to-face setting outperformed existing couples in a computer conferencing condition

(Hollingshead, 1998b). According to Hollingshead, this highlighted the nonverbal cues that often accompany a strong TMS.

A major shortcoming of these studies is that TMS was inferred based on performance. In this case, word recall. It is not clear that word recall is a uniquely sufficient indicator of TMS. Additionally, a conceptual framework for TMS is not explicitly stated. It is unclear if TMS exists in a dichotomous state or if it may fall along a continuum. Later studies that evaluated TMS in small teams improved upon both the measurement and conceptualization of TMS (e.g. Liang et al., 1995; Moreland, 1999; Moreland & Myaskovsky, 2001).

Some results of these studies include that teams trained together demonstrated significantly higher levels of memory differentiation, task coordination, and task credibility than teams trained as individuals (Liang et al., 1995). Additionally, collective team training was found to lead to significantly better performance in terms of number of steps remembered and error reduction (Liang et al.). These results contribute to the theoretical conceptualization of TMS as a construct that is learned through repeated interactions among pairs or team members ("process composition", as defined by Chan, 1998).

Furthermore, teams who trained together and later completed the assembly task together outperformed teams where individuals were trained together but were then shuffled into different assembly teams (Moreland, 1999). According to Moreland, this supports the notion that generic training programs, which assume that learning in teams transfers from one team to another, are not likely to succeed. Additionally, it reinforces that idea that TMS is distinct from general teamwork skills.

While improving upon the early pairs studies of TMS, this work still leaves room for improvement. Though more measurement detail is provided (e.g. TMS falls on a continuum) it is still unclear exactly how this construct is evaluated. Additionally, while considering the presence of TMS compared to other constructs (e.g. general teamwork skills), these studies lack detailed examinations of reliability and validity.

Lewis (2003) proposed a third approach to the measurement of TMSs. Rather than measuring TMS by recall of information or ratings by evaluators, this study involved self-reported ratings of each of the three previously proposed factors underlying TMSs (Liang et al., 1985). Lewis created a 15-item scale to measure TMSs based on a specialization subscale, a credibility subscale, and a coordination subscale. Five items were created for each subscale to elicit individuals' self-reports. These items were scored using a 5-point Likert scale.

In creating this inventory, Lewis (2003) was the first author to explicitly conceptualize TMS as a second-order factor comprised of three first-order factors, with each first-order factor indicated by five items. Lewis was also the first author to provide specific item detail (e.g. the 15 item inventory), removing the "black box" of TMS measurement and enabling future researchers to compare findings by utilizing the same scale. Findings of this study indicated that the proposed scale was a valid measure of TMS as evidenced by measures of convergent, discriminant, and criterion validity. Reliability studies were also conducted to demonstrate the utility of this measure.

Despite these contributions, Lewis's study (2003) is not without shortcomings. First, it is not clear that aggregating individual ratings to the team level sufficiently measures TMS. Important information may be lost in this aggregation, as differences between team members are included in measurement results as error rather than as useful information that would help define the TMS of the team.

Additional shortcomings of the previous approaches to TMS measurement outlined in this review relate to the generalizability of the TMS measures obtained under these various approaches. First, the samples used in the outlined studies are not nationally representative. This impacts the external validity and generalizability of the TMS measures obtained under these various approaches. Second, teams in the workplace are not randomly assigned, as was the case in these studies. In failing to account for the non-random sorting of employees in organizational settings, the estimated effect of TMS on team performance or other outcomes of interest will be biased.

3. Proposed Measurement Techniques

Although the scale proposed by Lewis (2003) appears to hold promise for evaluating teamwork and predicting performance, other measurement models may exist that could enhance the way TMS and teamwork are conceptualized, measured, and related to performance outcomes. These techniques include dispersion models (Chan, 1998) and social network models (Wasserman & Faust, 1994).

3.1 Dispersion Models

Chan (1998) outlines a systematic framework for both developing new theories of teamwork and specifying relationships within teams. This framework includes five forms of team composition: additive, direct consensus, referent-shift consensus, process, and dispersion. Under a dispersion model, within-team variance serves as an operationalization of the construct of interest. In this case, within-team variance would function as a representation of a team's TMS.

According to Chan, dispersion is a team-level characteristic where low team agreement leads to low levels of the construct of interest. Considering Lewis's (2003) TMS inventory, if a team where to have high levels of agreement on specialization, credibility, and coordination items, that would be evidence of a well-functioning TMS. While Lewis reports within-team agreement of between 0.7 and 0.9, it should be noted that these levels are quite high and are rarely noticed in social science research (McCoach, 2006). I believe that in many other settings, within-team variance would be significantly higher and within-team agreement significantly lower. In this case, a dispersion model would be an interesting venue for evaluating how differences in within-team agreement impact TMS and how this may, in turn, impact team performance.

A small-scale pilot study of 20 student teams used Lewis's (2003) TMS inventory and found a correlation of -0.56 between within-team variance and team performance (p=0.09) (King, 2016). These findings mean that, for teams with greater levels of within-team variance, performance is predicted to be significantly lower than for teams with minimal within-team variance. Interestingly, the same study found no statistically or practically significant correlation between TMS and team performance (r=0.02, p=0.95). These are interesting preliminary finding that could be further evaluated in future studies.

These future studies should also consider a minimum threshold at which the expected relation between within-team variance and performance operates. For example, if a team is in strong agreement that they have low specialization, credibility, and coordination, it is unlikely that TMS or performance will be strong.

3.2 Social Network Analysis

A technique recently employed in evaluating TMS is social network analysis. Under social network theory, individuals are represented as nodes and their relationships to other team members are represented as ties. A social network is a map of all of the relevant ties between individuals and these ties between individuals are the variables of interest (Wasserman & Faust, 1994). In social network analysis, density is a measure of the number of ties present in a network considering the number of possible ties. Mathematically, density (Δ) is the sum of all entries in an i x j data matrix divided by the possible number of entries in that matrix (g): $\Delta = \frac{\sum_{i=1}^{g}\sum_{j=1}^{g} x_{ij}}{g(g-1)}$ (Wasserman & Faust, 1994).

A review of social network analysis literature provides ample insight to motivate the application of network analysis to TMS measurement. According to Lee, Bachrach, and Lewis (2014), the tenets underlying TMS (information diffusion, access, and integration) are conceptually similar to attributes considered under social network theory. Furthermore, Cole, Borgatti & Parker (2012) describe the ability for network analysis to facilitate the study of collaboration in teams, Guimera, Uzzi, Zpiro and Amaral (2005) discuss the tradeoffs between specialization and coordination and the importance of wellstructured teams, Chung, Khalili, Marlow, Arora, Schumock, and dl (2010) describe the contribution of both human capital and social capital to team performance, and, Krackhardt (1992) alludes to the transferability between tenets of TMS and network research (e.g. credibility and trust, interaction and coordination).

Based on the theorized similarities between social network studies and TMS measurement, I believe that network analyses of TMS hold promise for the measurement of teamwork and the prediction of team performance. The same small-scale pilot study previously referenced also evaluated the relationship between dense specialization, credibility, and coordination networks and team performance (King, 2016). This study found a correlation of 0.60 (p=0.07), early evidence of the ability for social network models to evaluate TMS and indicate team performance. Again, future research should further explore this preliminary finding.

4. Construct Validity and Relation to Performance

Validity is an important consideration in any measurement study. According to Messick (1995), validity and reliability are more than measurement principles, but social values that must be considered whenever measurement results influence judgments and decisions. Validation, therefore, must combine both scientific inquiry and rational argument in order to enable justified score interpretation and use. As a concept unifying content, substantive, structural, generalizability, external, and consequential aspects of construct validity, evaluations of validity must either include all of these aspects or a strong argument about why available evidence justifies measurement interpretation despite the exclusion of certain aspects of validity (Messick). The proposed measurement techniques, therefore, must be accompanied by a thorough consideration of their validity.

Content validity involves content relevance and representativeness of an assessment. Involving content experts in the evaluation of measurement instruments will demonstrate a consideration for content validity. Substantive validity provides theoretical rationales for observed responses. This may be considered by basing measurement instrument construction and evaluation on existing theory. External validity encompasses both convergent validity (a correspondence between measures of the same construct) and discriminant validity (distinctness between measures of different constructs). Evidence for external validity may be obtained by correlating proposed measures to previously developed and validated instruments that are: (1) theoretically similar to the construct of interest (convergent validity) and (2) theoretically distinct from the construct of interest (discriminant validity). Consequential validity involves an evaluation of intended and unintended positive and negative consequences of using the results of a measure in both the short- and long-term. This must be considered to ensure that any implications of using this measure are not driven by construct underrepresentation or construct-irrelevant variance. Finally, generalizability involves the degree to which results of a measure in one use case are able to generalize across different groups and in different settings. Generalizability may be evaluated over time by comparing the findings of an instrument across different contexts.

5. Summary and Conclusions

It is anticipated that the role of teams in organizations will only become more important in the years to come. It is, therefore, critical that techniques for measuring teamwork and team performance are valid, reliable, and broadly accepted. TMSs have been shown to be efficient measures of teamwork (Lewis, 2003). Results of a literature review reveal that there are opportunities to improve how TMS is measured, making the potential impact of future TMS analyses even more meaningful. Future research should evaluate the use of alternative measurement techniques, including dispersion models and social network analysis, which focus on individual-level rather than team-level data. The measurements obtained under these techniques could prove to be even more insightful than information gained in the past.

By implementing new techniques for measuring TMS and evaluating the relation between TMS and performance, we may obtain a better understanding for how work is accomplished in today's organizations. This understanding will encourage the identification of high performing individuals and teams and will promote team compositions, team structures, and team processes that facilitate success for individuals and organizations. This has broad implications for organizations of all types and sizes, as increased competition requires that all avenues for productivity and creativity be explored.

References

Adams, K. L., Galanes, G. J., & Brilhart, J. K. 2009. ***Communicating in groups: Applications and skills.*** New York: McGraw-Hill.

Bormann, E. G., & Bormann, N. C. 1972. ***Effective small group communication.*** Minneapolis, MN: Burgess Publishing Company.

Bransford, J.D., Brown, A.L., and Cocking, R.R. (Eds.) 1999. ***How people learn: Brain, mind, experience, and school***. Washington, D.C.: National Academy Press.

Cannon-Bowers, J. A., & Salas, E. 2001. Reflections on shared cognition. ***Journal of Organizational Behavior***, *22*(2), 195-202.

Chan, D. 1998. Functional relations among constructs in the same content domain at different levels of analysis: A typology of composition models. ***Journal of Applied Psychology***, *83*(2), 234.

Chen, G., Farh, J. L., Campbell-Bush, E. M., Wu, Z., & Wu, X. 2013. Teams as innovative systems: Multilevel motivational antecedents of innovation in R&D teams. ***Journal of Applied Psychology***, *98*(6), 1018.

Chen, G., & Kanfer, R. 2006. Toward a systems theory of motivated behavior in work teams. ***Research in Organizational Behavior***, *27*, 223-267.

DeShon, R. P., Kozlowski, S. W., Schmidt, A. M., Milner, K. R., & Wiechmann, D. 2004. A multiple-goal, multilevel model of feedback effects on the regulation of individual and team performance. ***Journal of Applied Psychology***, *89*(6), 1035.

Guzzo, R. A., & Dickson, M. W. 1996. Teams in organizations: Recent research on performance and effectiveness. ***Annual Review of Psychology***, *47*(1), 307-338.

Hollingshead, A. B. 1998a. Communication, learning, and retrieval in transactive memory systems. ***Journal of Experimental Social Psychology,*** *34*, 423–442.

Hollingshead, A. B. 1998b. Retrieval processes in transactive memory systems. ***Journal of Personality and Social Psychology,*** *74*(3), 659–671.

Hollingshead, A. B. 2001. Cognitive interdependence and convergent expectations in transactive memory. ***Journal of Personality and Social Psychology***, *81*(6), 1080.

Katzenbach, J. R., & Smith, D. K. 1993. ***The wisdom of teams: Creating the high-performance organization.*** Boston, MA: Harvard Business Press.

King, K.G. 2016. ***Measuring Transactive Memory Systems.*** Working paper, University of Maryland, College Park.

Kozlowski, S. W., Chao, G. T., Grand, J. A., Braun, M. T., & Kuljanin, G. (2013). Advancing multilevel research design capturing the dynamics of emergence. ***Organizational Research Methods.***

Kuljanin, G. 2011. ***A computational study of team collaboration and performance*** (Unpublished doctoral dissertation). Michigan State University, East Lansing.

Lee, J. Y., Bachrach, D. G., & Lewis, K. 2014. Social network ties, transactive memory, and performance in groups. ***Organization Science***, *25*(3), 951-967.

Lewis, K. 2003. Measuring transactive memory systems in the field: scale development and validation. ***Journal of Applied Psychology***, *88*(4), 587.

Lewis, K., & Herndon, B. 2011. Transactive memory systems: Current issues and future research directions. ***Organization Science***, *22*(5), 1254-1265.

Liang, D. W., Moreland, R., & Argote, L. 1995. Group versus individual training and group performance: The mediating role of transactive memory. ***Personality and Social Psychology Bulletin***, *21*(4), 384-393.

Messick, S. 1995. Validity of psychological assessment: validation of inferences from persons' responses and performances as scientific inquiry into score meaning. ***American Psychologist***, *50*(9), 741.

Moreland, R. L. 1999. Transactive memory: Learning who knows what in work groups and organizations. In L. L. Thompson, J. M. Levine, &D. M. Messick (Eds.), ***Shared cognition in organizations: The management of knowledge***. Mahwah, NJ: Erlbaum.

Moreland, R. L., & Myaskovsky, L. 2000. Exploring the performance benefits of group training: Transactive memory or improved communication?. ***Organizational Behavior and Human Decision Processes***, *82*(1), 117-133.

Napier, R. W., & Gershenfeld, M. K. 1973. ***Groups: Theory and experience.*** New York: Houghton Mifflin.

Park, G., Spitzmuller, M., & DeShon, R. P. 2013. Advancing our understanding of team motivation integrating conceptual approaches and content areas. ***Journal of Management***, *39*(5), 1339-1379.

Ren, Y., & Argote, L. (2011). Transactive memory systems 1985–2010: An integrative framework of key dimensions, antecedents, and consequences. *The Academy of Management Annals*, *5*(1), 189-229.

Richter, A. W., Hirst, G., Van Knippenberg, D., & Baer, M. 2012. Creative self-efficacy and individual creativity in team contexts: Cross-level interactions with team informational resources. ***Journal of Applied Psychology***, *97*(6), 1282.

Springer, L., Stanne, M. E., & Donovan, S. S. 1999. Effects of small-group learning on undergraduates in science, mathematics, engineering, and technology: A meta-analysis. ***Review of Educational Research,*** *96*(1), 21-51.

Van Knippenberg, D., De Dreu, C. K., & Homan, A. C. 2004. Work group diversity and group performance: an integrative model and research agenda. ***Journal of Applied Psychology*****,** *89*(6), 1008.

Wasserman, S., & Faust, K. 1994**.** ***Social network analysis: Methods and applications*** (Vol. 8). Cambridge: Cambridge University Press.

Weber, J. M., & Murnighan, J. K. 2008. Suckers or saviors? Consistent contributors in social dilemmas. ***Journal of Personality and Social Psychology*** *95*(6), 1340.

Wegner, D. M., Giuliano, T., & Hertel, P. T. 1985. Cognitive interdependence in close relationships. In ***Compatible and incompatible relationships*** (pp. 253-276). Springer New York.

Wegner, D. M. 1987. Transactive memory: A contemporary analysis of the group mind. In ***Theories of group behavior*** (pp. 185-208). Springer New York.

Wegner, D. M., Erber, R., & Raymond, P. 1991. Transactive memory in close relationships. ***Journal of Personality and Social Psychology***, *61*(6), 923.

Williams, K. Y., & O'Reilly III, C. A. 1998. Demography and diversity in organizations: A review of 40 years of research. ***Research in Organizational Behavior***, *20*, 77-140.

Table 1

Previous approaches to TMS measurement

Study	Context	Measure of TMS	Major findings	Shortcomings
Wegner et al., 1991	Laboratory, Existing pairs and randomly assigned pairs	Word recall	Performance hindered under random assignment of expertise	Word recall insufficient measure of TMS; Lack of conceptual framework; Lack of representative sample
Hollingshead, 1988a	Laboratory, Existing pairs and randomly assigned pairs	Word recall	Ability to communicate during learning does not benefit existing pairs	Word recall insufficient measure of TMS; Lack of conceptual framework; Lack of representative sample
Hollingshead, 1998b	Laboratory, Existing pairs and randomly assigned pairs	Word recall	Existing pairs outperform randomly assigned pairs in face-to-face settings; Existing pairs in face-to-face settings outperform existing pairs in computer conferencing settings	Word recall insufficient measure of TMS; Lack of conceptual framework; Lack of representative sample
Liang et al., 1995	Laboratory, Teams of students	Radio assembly time; Radio assembly accuracy; External evaluations of TMS	Teams trained together have higher levels of TMS than teams trained as individuals; Teams trained together outperformed teams trained as individuals	TMS not formally defined; No evaluation of reliability and validity; Lack of representative sample
Moreland, 1999	Laboratory, Teams of students	Radio assembly time; Radio assembly accuracy; External evaluations of TMS	Teams trained together outperform teams trained with other individuals;	TMS not formally defined; No evaluation of reliability and validity; Lack of representative sample
Lewis, 2003	Laboratory, Teams of students; Field; MBA student consulting teams; Field, High-tech teams	15-item TMS inventory	TMS scale scores have positive correlation with team performance; Proposed scale is valid measure of TMS	Individual scores aggergated to team level without proper justification; Lack of representative sample