
Are Systems-Centered®¹ Teams More Collaborative, Productive and Creative?

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Abstract

Purpose—Research from numerous theories shows teams’ information sharing and discussion enhances effectiveness. Likewise, team communication structure can increase information sharing, manage conflict productively, and foster creativity. However, the lack of unifying theory hinders understanding of the disparate research findings. Agazarian aims to unify the field with her meta-theoretical, multi-level Theory of Living Human Systems (TLHS). Furthermore, her TLHS-derived Systems-Centered Training (SCT) presents an innovative structure to improve team performance. To test TLHS/SCT reliability and validity, this study compares the verbal process, productivity, and creativity of pre-existing work groups using SCT methods or Robert’s Rules of Order (RRO).

Design/methodology/approach—The verbal characteristics, information sharing, productivity, and creativity in SCT and RRO teams were compared using the System for Analyzing Verbal Interaction (SAVI), Group Productivity Scale and Work Group Inventory.

Findings—SCT teams, compared to groups using RRO, talked in ways more likely to transfer and integrate task-related information. Furthermore, SCT teams were more productive, better performing, and more creative.

Research limitations/implications—The study’s design does not permit cause-and-effect conclusions. Proposals for future research are made.

Practical implications—The results suggest SCT methods improve team communication, productivity, and creativity. Because this study examined “real-world” teams, the findings may apply to similar groups in various workplaces.

Social implications—Our ability to use differences as resources could improve society.
Originality/value—This paper suggests SCT methods offer innovative communication structures that focuses teams effectively, perhaps by minimizing off-task communications and conflict. Also, as SCT operationally defines TLHS, these results support the validity of TLHS.

Keywords—Team, Team effectiveness, Conflict management, Information sharing, Productivity, Collaboration, Creativity

Paper type—Research
Introduction

For better or worse, individuals collaborating on teams to reach organizational goals is a hallmark of the modern workplace (Katzenbach and Smith, 1993). Successful teams can bring together individuals with complementary resources, allowing for the solution of problems beyond individual effort. However, the process of fostering collaboration and productive teamwork is often difficult (Thomson and Perry, 1998; Thomson et al., 2009). The well-known groupthink phenomenon (Janis, 1982) and other factors that limit effective group functioning and creativity (Cain, 2012; DeMarco and Lister, 1985, 1999; Stasser and Titus, 1985) can have costly, even devastating, real-world consequences such as President Kennedy’s Bay of Pigs invasion of Cuba (Janis, 1982), or the NASA space shuttle Challenger disaster.

In 1991, Wood and Gray pointed out a lack of conceptual clarity and the resulting practical inconsistency regarding the notions of collaboration and teamwork. In the intervening decades an enormous amount of scholarly work has been done to find unifying concepts and factors (e.g. LePine et al., 2008; Salas et al., 2005; Turner, 2001). This includes the development of “multi-level” conceptualization allowing for the definition and investigation of process and outcome variables operating throughout the organizational hierarchy simultaneously (Yammarino and Dansareau, 2009). However, recent papers still highlight that the absence of a unifying theory of organizational, team, and member collaboration hinders integrative research and practical application (Bedwell et al. 2012; Salas et al. 2005; LePine et al, 2008). For example, Salas et al. (2005) identified more than 138 explanatory models of teamwork which “…varied in their precision in explaining teamwork. All of them (with a few exceptions) treat it as a process (a sort of black box) variable” (p. 558) and said that “The study of teamwork has been fragmented through the years, and the findings are generally unable to be used practically”
LePine et al. (2008) echoed: “…scholars have been studying concepts that are not clearly defined or differentiated from other similar concepts” and thus “…research …has not accumulated in a very consistent manner, and, as a result, scholars have not been able to offer many clear recommendations to managers regarding ways to improve the functioning and effectiveness of teams in their organizations” (p. 274). Most recently, Bedwell et al. (2012) identified “…the general lack of understanding as to what conceptually and practically constitutes collaboration…” as a basic impediment to effective scientific and practical work on teams. Once again, Bedwell et al. (2012) called for the development of a related theoretical framework and stipulated that it must simultaneously be both parsimonious and comprehensive, “explicitly apply to various levels of analysis…,” “…provide some explanation regarding the fundamental processes inherent in collaboration”, and define collaboration “…as a process rather than a structure or an outcome…as a particular process used to achieve outcomes…” (p.129).

Despite the overall fragmentation and major conceptual limitations in the field, some researchers have identified factors essential to collaboration and productivity, as they define them. Working with an “sociometric data” approach, Pentland (2012) has found energetic, engaged, exploratory “…patterns of communication to be the most important predictor of a team’s success…as significant as all the other factors—individual intelligence, personality, skill, and the substance of discussions—combined” (p. 62). Working from an “information sharing” point-of-view, others have also shown that collaborative information sharing positively affects the productivity and creativity of teams, and that subsequent discussion of shared information “…expands knowledge and experience resources available to team members, improves the analysis of the problem, and allows better assessment of the usefulness of potential solutions” (Drach-Zahavy and Somech, 2001, p. 112; Argyris, 1993; Bunderson and Boumgarden, 2010;
Larson et al., 1998; Mesmer-Magnus and DeChurch, 2009; Pearce and Ravlin, 1987; West and Anderson, 1996). Relatedly, Stasser and Titus (1985) have demonstrated one of the enduring paradoxes of work groups--that the more teams need members’ information to solve problems, the less likely members are to contribute that information spontaneously (Reimer, et al., 2010; Stasser and Stewart, 1992; Stasser and Titus, 1987; Steinel et al., 2010).

Leadership intervention influencing team communication structure can positively affect collaborative information sharing and team discussion (Bavelas, 1968; Larson et al., 1998). Participative styles of leadership and communication structure, which encourage member contributions and actively involve team members in decision-making, can enhance decisions, proactive behavior, and productivity (Agazarian and Philibossian 1998; Baer and Frese, 2003; Erkutlu, 2012; Hung et al., 2006; Larson et al., 1998; Pentland, 2012).

However, as group members introduce information to the group, conflict can emerge when alternative ideas are discussed, and research has delineated different types of conflict with differential effects on team performance (Simons and Peterson, 2000; van Woerkom and van Engen, 2009). Relationship conflict is characterized by perceptions of interpersonal discord or feelings of animosity, annoyance, or tension; Task conflict, on the other hand, occurs when team members disagree regarding ideas and decisions about how the group will achieve its goals (Simons and Peterson, 2000). Relationship conflict erodes intra-team trust and team performance over time while task conflict can enhance high-performing teams’ ability to generate productive discussion as the team decides how to best reach its goals (Jehn and Mannix, 2001; Langfred, 2007). Thus, if team members introduce different ideas and the team can actively manage and harness the resulting conflictual interaction energy to the task, team collaboration and productivity can be increased (Weingart and Jehn, 2000; Weiss and Hughes,
2005). However, mirroring the field-as-a-whole, empirical findings regarding team conflict management have been generated from numerous, sometimes conflicting theories at various levels of abstraction, comprehensiveness, parsimony and specificity. Consequently, there are numerous, poorly integrated practical methods of conflict management as well (Barrett and Cooperrider, 1991; Chen et al., 2005; Chuang et al., 2004).

Agazarian’s Theory of Living Human Systems and Systems-Centered Training

Agazarian (1997; 2001) has attempted to integrate all these different theoretical approaches under the umbrella of her comprehensive, parsimonious, multi-level, meta-theoretical Theory of Living Human Systems (TLHS). Furthermore, she and her colleagues have coupled it with the TLHS-derived Systems-Centered Training (SCT) method for group work in any field from organizational development (Agazarian and Gantt, 2005; Agazarian and Philibossian, 1998; Gant and Agazarian, 2005) to group psychotherapy (Agazarian 1997; 2001), or education (Gantt and Agazarian, 2005). While her work is well-known in the field of group psychotherapy and praised for its theoretical sophistication and clear, useful translation into practice as an organizational and team training model (National Registry, 2010), it is not widely known in other areas of organizational development and teamwork. Thus, we summarize the most relevant ideas below.

Meeting Bedwell et al.’s (2012) above criteria for a unifying theory, Agazarian’s (2001) theory statement is parsimonious, comprehensive, and multi-level: “A theory of living human systems defines a hierarchy of isomorphic systems that are energy-organizing, self-correcting, and goal-directed” (p. 134). She operationalized each construct in this theoretical statement succinctly. For example, she defined isomorphy: “Systems are similar in structure and function and different in different contexts”; and hierarchy: “Every system exists in the environment of
the system above and is the environment for the system below” (p. 134). She proposed a single principle of system process--“function”--throughout this multi-level hierarchy: “Systems-centered systems function to survive, develop and transform through the process of discriminating and integrating information” (p. 134). Translating these TLHS concepts into Systems-Centered Training practice, she operationalized function to include the unique SCT method of “functional subgrouping” (FSG) the core SCT process for discriminating and integrating information/differences. FSG is designed and hypothesized to create a “…top-down context for the members of the team” (Park and DeShon, 2010, p. 824) with a communication pattern maximizing communication and engagement from all team members to improve team effectiveness (Agazarian, 1997; Pentland, 2012). Concurrently, FSG proactively manages potential conflict over differences which might emerge during information sharing (see O’Neill et al., 2011 for FSG process details). Agazarian makes a central TLHS/SCT hypothesis that reducing noise in messages increases information transfer relevant to the organization’s goals and thus enhances its functioning; noise is defined as ambiguity, contradiction, and redundancy (Shannon and Weaver, 1964; Agazarian and Gantt, 2005). SCT has four specific methods to increase collaborative information transfer and integration, and thus enhance productivity and creativity in individual and group work: Boundarying, Vectoring, Contextualizing, and the aforementioned Functional Subgrouping.

Boundarying facilitates the transition of individuals from their personal roles outside the group to their “member” roles within the group by clarifying who does what, where and when in relation to a specified goal (Agazarian, 1997; 2001; Agazarian and Gantt, 2005; Agazarian and Philobossian, 1998). For example, boundarying regarding time, space, and role occurs when a meeting begins and ends at certain times in a specific space with group members assigned
specific roles with clear responsibility and authority for certain meeting- and goal-related tasks. Once the meeting begins, boundarying also filters the inter-member communication to reduce noise and to increase the flow of goal-related information for greater productivity.

Vectoring directs information toward a goal (Agazarian, 1997; 2001). For example, a meeting’s agenda focuses the communications and energy of the group to specific prioritized tasks during the meeting, and the “next steps” developed in the meeting direct the responsible members to accomplish certain tasks by a certain time after the meeting’s end (Agazarian and Gantt, 2005; Agazarian and Philobossian, 1998).

Contextualizing vectors member attention to different levels of the system hierarchy (Agazarian, 1997; for practical examples see Agazarian and Philobossian, 1998). According to TLHS/SCT, groups are comprised of three different hierarchical system levels: the “member,” “subgroup,” and “group-as-a-whole” levels, roughly analogous to team member, team, and organization. Contextualizing facilitates the consideration of perspectives and decisions from all three levels. As the context changes between levels, members recognize that perceptions and decisions often change as well. This helps the team reach decisions which process and integrate information from all system levels for the overall benefit of the organization’s goals whenever such information is necessary for effective decision-making (Agazarian and Gantt, 2005; Agazarian and Philobossian, 1998).

Functional subgrouping manages significant differences (i.e. contradictory information) between the members of the team-as-a-whole that could potentially be acted out in unproductive relationship conflict or simply excluded from group discussion (Agazarian, 1997; Agazarian and Philibossian, 1998; O’Neill, et al., 2012; Park and DeShon, 2010). When subgrouping functionally, the group is required to explore different sides of an issue sequentially in relation to
the task goals, rather than argue or otherwise express the differences in relationship conflict or avoidance of information. In this process, all members are encouraged to voice their viewpoint and the members with a similar viewpoint join together in a subgroup to discuss that overall perspective. Because each subgroup eventually has the opportunity to explore its particular point of view, all sides of the issue are introduced and discussed over the course of the meeting with the goal of integrating the differences creatively (see below and O’Neill et al., 2011, 2012). Research from other theoretical perspectives has shown that expression and consideration of “…minority opinions helps teams make quality decisions by preventing them from prematurely moving toward consensus (Nemeth & Chiles, 1988) and encourages teams to develop multiple perspectives on issues that contribute to higher quality decisions (De Dreu & West, 2001)” (Park and DeShon, 2010, p. 824).

A growing body of research has shown support for TLHS/SCT hypotheses. For example, training groups run with SCT methods have high engagement, less avoidance, less conflict, better inter-member relationships, more overall learning and goal achievement, and better group morale and more positive perceptions of leadership than groups using various other communication structures (O’Neill and Constantino, 2008; O’Neill et al., 2012). No direct comparison between SCT and any single other communication structure have been conducted previously. Research specifically examining functional subgrouping has shown that group members find it a positive experience and that it relates to better morale over time, more overall learning and more goal achievement (O’Neill et al., 2011; O’Neill et al., 2012).

In the present study, we compared the verbal characteristics, information sharing, productivity, and creativity of groups using either SCT methods or Robert’s Rules of Order (RRO; Robert, 2000) for structuring team communication.
Robert’s Rules of Order is the most widely used parliamentary procedure authority, and has been adopted by approximately 85% of organizations in the United States (Slaughter, 2005). RRO were adapted from procedures followed in the United States House of Representatives at the time of their original publication in 1876; these procedures had been adapted from those followed in the British House Of Commons. RRO specifies procedures for discussion, debate and decision in order to support the efficient and effective transaction of business in deliberative assemblies. For example, members of the group can only address the assembly after being acknowledged by the chair person; Topics for consideration by the assembly are proposed by members; Comments are directed to the chair person and not to other individuals in the group; Decisions are made democratically by majority rule after a thorough consideration of the issues raised by any dissenting members in the minority. Thus, RRO procedures safeguard minority dissent during deliberation and debate before decisions are made by majority rule. (see Robert, 2000).

As mentioned above, SCT methods, rather than being based on the traditions of parliamentary procedure and debate, are derived from Agazarian’s (1997; 2001) TLHS. Similar to RRO, SCT methods aim to facilitate the functioning of the organization and the full participation of members. The SCT leader convenes the meeting and members take assigned roles. To encourage full participation, every task-related member voice is contextualized as representing a valuable point-of-view (POV) of a subgroup of members, with information useful to the business of the group-as-a-whole. As in RRO, SCT teams often first review old business and then attend to new business proposed by group members. Discussion of the issue under deliberation continues until a consensus decision is reached or a significant, potentially conflictual difference between the members’ points-of-view emerges. Then, the unique, defining
characteristic of SCT is introduced—rather than RRO splitting into majority/minority and engaging in contentious debate with differences highlighted before making decisions by vote with majority rule, SCT uses “functional subgrouping” to achieve consensus decisions after getting balanced input from all members. The construct of system “function” (i.e., discriminating and integrating information), and the method of functional subgrouping to manage significant differences in information, are SCT’s definition of the “…fundamental processes inherent in collaboration”, the clarification of which Bedwell et al. (2012; p. 129) state is essential for “developing a unified construct definition of collaboration” (p. 129).

SCT’s functional subgrouping results in a number of “communication pattern” characteristics Pentland (2012, p. 65) has found essential in successful teams. FSG proceeds as follows. When a significant difference emerges in discussion of POV’s, the group splits itself into different subgroups containing the distinct POV’s. Subgroups contain members with a similar POV on the issue. The work of the subgroup is to explore and develop its POV. Members in the same subgroup speak to and look at each other, joining on similarities first and then deepening and expanding the subgroup’s POV by adding tolerable differences as the exploration proceeds. The subgroup works until its members feel finished or have reached the designated time limit. When the first subgroup has finished exploring, the other subgroup begins exploring its different POV. Theoretically, as the second subgroup expands and deepens its POV, similarities to the first subgroup’s POV will be discovered. This discovery of “similarities in the apparently different” (Agazarian, 2001, p. 142), results in an integration of the two subgroup POV’s into a consensus decision for the group-as-a-whole (See O’Neill et al, 2011 for more specifics on FSG technique).
To summarize, there is considerable overlap in RRO and SCT approaches to structuring team communication. RRO uses methods which would be categorized in the SCT model as “vectoring” and “boundarying” and to some extent “contextualizing”. SCT has more specific, theoretically-derived methods and techniques for work with an essential difference from RRO being the addition of functional subgrouping to further reduce the noise and increase information transfer in team communications until consensus decision is reached.

Hypotheses: 1. SCT group members will share more information than RRO group members, as measured by the Group Productivity Scale.
2. Compared to RRO groups, SCT groups will use more verbal behaviors with a higher probability of transferring and processing task-related information.
3. Compared to RRO groups, SCT groups will use fewer verbal behaviors with a lower probability of transferring and processing task-related information.
4. SCT groups will perform better than RRO groups as measured by the Work Group Inventory, specifically on the factors of shared responsibility, future focus, alignment on purpose, open communication, use of creative talent, and participative leadership (See below for factor descriptions).

Method

Subjects

Two types of teams were assessed in the present study—teams using either SCT methods or RRO methods. These two types of teams were selected to allow a comparison between groups using SCT or RRO to guide their process while being similar on other key dimensions such as number of members, length of meeting, and task, that is, being decision-making bodies. They
were also selected for analysis because they are similar on those dimensions to many other teams in industry, government and civic organization. There were two SCT teams evaluated: the Systems-Centered Training and Research Institute (SCTRI) Steering Group, and the SCTRI-Austin Board of Directors. There were two RRO teams: a City Council from a small Midwestern US city, and a Planning Commission (PC) from a large, Western US City. Meetings of these four groups had been either videotaped or audiotaped as part of their usual, ongoing procedures, and two sessions of each team were randomly selected from those made available, and then rated for the present study.

The SCTRI Steering Group is the Board of Directors for SCTRI and consisted of 5 to 13 members who met by conference call. The purpose of the Steering Group meetings was to manage the business of the SCTRI organization. SCT methods were used to guide the meetings. Two 1-hour phone meetings on 10/05/1999 and 03/21/2000 were used in this study.

The SCTRI-Austin Board of Directors is the governing body for the Austin, Texas affiliate of SCTRI. It was comprised of 6 members, all of whom were female. It met monthly, in person, to manage the business of SCTRI-Austin, using SCT methods to guide the meetings. The two SCTRI-Austin Board meetings used in this study were on 10/26/2007 and 02/29/2008, each 2 hours long.

The Midwestern City Council group consisted of 8 members (7 male, 1 female) who met weekly, in person, using Robert’s Rules of Order (Robert, 2000) to guide the meetings. The meetings were open to the public and were video recorded for public reference. The two meetings used in the study were on 03/13/2006 and 04/10/2006; the rated portions of the sessions were 1.5 hours and 1 hour long respectively. Ratings were made from an audio-only tape recording.
The Western City Planning Commission group consisted of 2 female and 7 male members, and met weekly using Robert’s Rules of Order. The meetings were open to the public and recorded for public record. The sessions rated in this study were on 01/23/2008 and 05/21/2008, and the rated portions were 1.5 hours and 1 hour long, respectively.

Measures

The scales described below were chosen for rating the verbal behaviors of the SCT and RRO teams because they measure the same (or conceptually similar) process and outcome factors which Agazarian (1997; 2001) hypothesized will be positively affected in teams using SCT methods. That is, the SCT methods should increase collaborative information transfer related to the goal, thus increasing productivity and creativity, while reducing conflict. Furthermore, these factors are often assessed in team effectiveness research.

The System for Analyzing Verbal Interaction (SAVI®²; Simon and Agazarian, 1967, 2000): Teams’ verbal interactions in recorded meetings were coded using SAVI. SAVI was chosen as a primary measure because it categorizes verbal behavior in relation to the speaker, task topic, and the probability of transferring and processing information (see Figure 1). The SAVI model is based on Shannon and Weaver’s (1964) concept of noise and its inverse relationship with the transfer of information in the message. Like SCT, SAVI defines noise as ambiguity, contradiction and redundancy, and thus provided a relevant measure of outcomes of interest as per our hypotheses 1, 2, and 3—amount and quality of communication and information transfer. The range for inter-rater reliability for SAVI is 80 to 91% accord to Simon and Agazarian, (2000), and the range for ratings used in this study was 83 to 96% (Murphy, 2007).
The Group Productivity Scale (GPS; Bunderson and Sutcliffe, 2002) is a 3-item questionnaire measuring collaborative information sharing in the team, an outcome of interest as per our hypotheses 1, 2, and 3. The three items are: (1) “Information used to make key decisions was freely shared among members of the team”, (2) “Team members worked hard to keep one another up to date on their activities”, and (3) “Team members were kept ‘in the loop’ about key issues affecting the business unit.” The items are rated on a 7-point Likert scale from “Very Strongly Disagree” to “Very Strongly Agree.” This questionnaire has been shown to have strong internal consistency (Cronbach’s Alpha = 0.89) (Bunderson and Sutcliffe, 2002).

The Work Group Inventory of the Team Interaction Profile (WGI; Wilson Learning, 1985) is a 57-item survey measuring different aspects of group interaction relevant to all four of our hypotheses but particularly to hypothesis #4. The first 46 items are broken down into 8 different factors and rated on a 5-point Likert scale from “Strongly Agree” to “Strongly Disagree”: (1) alignment on purpose, (2) future focus, (3) shared responsibility, (4) task focus, (5) rapid response, (6) use of creative talent, (7) open communication, (8) participative leadership; Items 47-57 are concerned with group member satisfaction and were not used in this study. The alignment on purpose factor measures shared commitment to the group’s purpose while future focus measures the group’s attitude toward change as it relates to group decisions. Shared responsibility measures member influence within the group. Task focus taps how well the team members stay focused on tasks that produce results, and rapid response assesses the speed in which the group processes issues of concern, as well as how well the team vectors resources to team priorities and goals. Use of creative talent taps how well the group recognizes and utilizes the creativity of the group’s members while open communication measures how freely communication flows within the group. Finally, participative leadership assesses how
achieving group goals and tasks are balanced with maintaining good interpersonal relationships (Kaplan and Greenbaum, 1989). These factors have acceptable to good internal consistency (Cronbach’s Alpha: 0.68 to 0.90) with the exception of participative leadership which has a Cronbach’s Alpha of 0.52.

**Procedure**

SAVI®² (Simon and Agazarian, 2000) ratings were made by the first author and another highly trained rater for the first study, as well as one other rater for the subsequent analyses (Murphy, 2007; Murphy, 2010). These ratings were produced by reading the transcripts of group meetings. The transcripts included notes on tone of voice as SAVI ratings vary with voice tone. Ratings were made continuously across the tape-recorded meetings and each rating represents the SAVI class and category(s) of the rated segment. A new rating was given after an estimated three seconds elapsed, or when there was a SAVI category change in conversation, or when there was a change of speaker (Murphy, 2007; Simon and Agazarian, 2000). Inter-rater agreement on the first SAVI ratings (2007) were 76%, 82% and 83% respectively, when independently coded. Differences in ratings were resolved by conference.

Group sessions were also rated by trained independent raters on the Group Productivity Scale and the Work Group Inventory of the Team Interaction Profile (Bunderson and Sutcliff, 2002; Wilson Learning, 1985). These two measures were designed with the intention of having team members complete them after a meeting. However, in this study, the raters listened to the meeting recordings and completed the questionnaires as if they were team members present during the meeting.

Three pairs of undergraduate psychology research assistants were trained by a psychology graduate student to make the GPS and WGI ratings. Training involved having the
research assistants practice GPS and WGI ratings on tapes of other meetings of the same groups used in this study. The practice ratings were not used as data in the analyses. For the official rating sessions, two of the six undergraduates rated each session, and if their ratings were off by more than 2 points on any one item, these discrepancies were discussed and resolved via conference. In order to obtain a more comprehensive assessment of the meetings, GPS and WGI ratings were completed at intervals across each session instead of simply once at the end. Our raters completed the GPS at 15-minute intervals throughout the entire length of every session. For analysis purposes, ratings of the first 15-minute period were discarded because tape recordings began somewhat prior to the meeting and this period typically focused on introductions and socializing rather than task-related behaviors occurring once the meetings officially commenced. WGI ratings were made once at the midway point of the session and once at the end of each session, with the rationale that more frequent ratings would capture the dynamics of the meetings more accurately. The average of these two ratings was then used to compute the eight different factor scores mentioned above. T-tests comparing ratings across raters for the GPS and WGI showed no significant differences across raters (all p’s > .218 and .637 respectively). For the GPS and WGI, raters were aware that the respective Likert scales were keyed in opposite directions and took this into account in their ratings. Inter-rater agreement was calculated as the percentage of occasions where raters agreed perfectly or raters’ scores fell within one point of each other. These percentages were high for both measures (GPS %agreement = .88; WGI %agreement = .99) suggesting adequate inter-rater agreement.

Results

Data analysis
The repeated measures nature of the data required that session and its interaction with group type (SCT or RRO) be included in all analyses. Further, related scales were analyzed using multivariate analysis of variance (MANOVA) to control for the dependent or correlated nature of the factor scores within each outcome. We conducted univariate follow-up tests to probe the individual outcomes where the overall multivariate test was significant. Effect sizes were calculated as Cohen’s d using the RRO condition as the reference group (Keppel and Wickens, 2004, p. 91). Statistical analysis was adjusted to account for the fact that the Likert scale end-point markers (Strongly Agree and Strongly Disagree) were reversed for the GPS and WGI.

**Group Productivity Scale:** The GPS served as an index of collaborative group information sharing and we hypothesized that the SCT condition would be higher at all time points on this scale. The MANOVA analyzing the GPS scores from the 15-30 minute, 30-45 minute, and 45-60 minute intervals indicated a significant main effect of SCT condition, Wilk’s Lambda = .4, F(3, 9) = 4.5, p = .03, as well as a significant main effect of session, Wilk’s Lambda = .31, F(3, 9) = 6.82, p = .01. Consistent with hypotheses, univariate follow-up tests indicated that the SCT condition was significantly higher at the 15-30 minute (p = .01) and 45-60 minute (p = .02) intervals (see Table 1). Similarly, the SCT condition was marginally significantly higher at the 30-45 minute interval, (p = .07). The main effect of session indicated that scores were higher at session 2 compared with session 1 for both conditions.

**System for Analyzing Verbal Interaction:** As described above, the SAVI system allows researchers to classify verbal behaviors into 3 general classes of increasing likelihood of transferring task-related information: Low Probability (LP), Contingent Probability (CP), High Probability (HP). We hypothesized that groups using SCT methods would have significantly higher levels of HP behaviors and significantly lower levels of LP behaviors compared to RRO
groups. The multivariate main effect of group type was significant, Wilk’s Lambda = .22, F(3, 10) = 11.97, p = .001, as well as the interaction between condition and session, Wilk’s Lambda = .43, F(3, 10) = 4.37, p = .03. Follow-up univariate analyses showed a main effect of SCT methods on HP behaviors at both sessions, (p’s < .01), though the difference was smaller at session 2. Groups using SCT methods displayed significantly more HP behaviors at both sessions compared with groups using other methods (see Table 2). Contrary to hypotheses, SCT groups did not show lower levels of LP behaviors at either session (all p’s > .15), however the effect size at session 2 was large (d = -0.9) indicating the SCT condition engaged in fewer LP behaviors at session 2 compared with the RRO condition. The significant condition by session interaction is due to the significant increase in HP behaviors in the RRO groups at session 2.

**Work Group Inventory:** The WGI consists of eight factors each rating a different facet of team interactions with higher scores indicating poorer team interactions. We hypothesized that the SCT groups would be significantly different on 6 of the 8 factors, specifically that SCT groups would exhibit better scores on factors tapping shared responsibility, future focus, alignment on purpose, open communication, use of creative talent, and participative leadership. Entering all 8 factor scores into the MANOVA, the main effect of SCT was significant, Wilk’s Lambda = .18, F(8, 7) = 4.08, p = .04. Session and its interaction with condition was not significant (p’s > .61). Univariate follow-up tests indicated significant differences in the hypothesized direction on 3 of the 8 factor scores (all p’s < .01): task focus, rapid response, and use of creative talent (see Table 3). Effect sizes indicated these differences were large at both sessions and in favor of better performance in the SCT condition. Additionally, there was a marginally significant effect of condition on participative leadership (p = .06), again with a large effect size.

**Discussion**
Numerous authors have called for the development of a unifying theory that would facilitate the development of team/organization management practices and research (Bedwell et al., 2012; LePine et al., 2008; Salas et al., 2005; Turner, 2001; Wood and Gray, 1991; Yammarino and Dansareau, 2009). Agazarian has attempted to do so with her TLHS while meeting commonly accepted standards for scientific theories (Bedwell et al., 2012). She has theorized that the central process in any organization is “function”, that is, discriminating and integrating information/differences in order to survive, develop, and transform. She has operationalized TLHS with her systems-centered methods. These are theoretically-derived structures for communication to enhance the transfer of information while reducing noise and improving collaborative group and member functioning (Agazarian, 1997; Agazarian and Gantt, 2005; Shannon and Weaver, 1964).

The central SCT method of functional subgrouping is intended to create an engaging, trustworthy, morale-building environment which encourages members to bring their task-related information into the group. Simultaneously, functional subgrouping attempts to facilitate collaborative discrimination and integration of the information into consensus decisions while reducing unproductive conflict.

Agazarian (1997) hypothesized: "The conditions of functional subgrouping include several group dynamic variables that are directly connected to successful goal achievement. Subgroups come together around similarity, which increases cohesiveness. The task of each subgroup is clear. The working methods are simple and familiar. There is intense work energy, focused over a relatively short period of time, toward a clear goal in an environment of high cohesiveness. Thus, the probability of positive outcomes for members who join and work within functional subgrouping norms is high” (p. 46).
Our results with the Group Productivity Scale supported the hypothesis that SCT groups would be more productive than RRO groups in sharing task-related information. As mentioned above however, while information sharing has the potential for improving productivity and creativity, the group also has to discuss and integrate the information in order to do so and the GPS does not explicitly measure such team activity (Bunderson and Boumgarden, 2010; Drach-Zahavy and Somech, 2001; Larson et al. 1998).

Thus, we used SAVI (Simon and Agazarian, 1967, 2000) to evaluate our hypothesis that groups using the SCT communication structure, compared with groups using RRO, would show more collaborative verbal behaviors involved in transmitting, discriminating and integrating task-related information, that is, SAVI-rated HP verbal behaviors. These behaviors include answering questions, clarifying one’s answer with data, paraphrasing, summarizing, agreeing, building on each others’ ideas, and work jokes. We also hypothesized that SCT groups would exhibit fewer “noisy,” SAVI-rated LP verbal behaviors that hinder information transfer, discrimination, and integration.

Our results showed that SCT work groups exhibited significantly more SAVI-rated HP verbal behaviors likely to successfully communicate task-related information than RRO groups, and that the difference between these groups was large (as indexed by the effect size).

We found no statistically significant support for the hypothesis that the SCT groups would also exhibit fewer SAVI-rated LP verbal behaviors not likely to transmit or process task-related information; however, there was still a large effect size for SCT groups in the hypothesized direction. Given the large effect size, this failure to demonstrate significantly less LP behavior in SCT groups was likely due to insufficient power given the small sample sizes in this study. Taken together, these SAVI HP and LP findings suggest that SCT group members could disagree about
how to reach the team’s goals without inducing team-destructive relationship conflict. SCT teams exhibited more HP verbal behaviors consistent with positive, collaborative relationships (i.e. SAVI categories of resonating, responding, integrating), and fewer LP verbal behaviors consistent with relationship conflict (i.e. SAVI categories of fighting, obscuring, competing), and thus may be able to present and consider different solutions to task-related problems without experiencing interpersonal animosity and distress. In fact, our results are consistent with O’Neill et al. (2012) who found that the more that members of a large training group subgrouped functionally, the more they learned and reached their goals and the better their mood. Our findings are also consistent with O’Neill and Constantino (2008) who found that SCT groups had less group conflict and avoidance, as well as better member-to-member relationship quality and activity than groups using various non-SCT methods.

The Work Group Inventory evaluates team performance on 8 variables of team interaction behavior, thus adding additional dimensions to the SAVI assessment of potential for information transfer and integration in verbal behavior. Our results provided some support for the hypothesis that SCT groups would show better performance on the 8 WGI factors. Specifically, we found that SCT groups showed statistically significant, large effects in the direction of better performance on the factors of task focus, rapid response, and use of creative talent, while also showing a trend towards significance and a large effect with respect to the WGI factor of participative leadership.

The WGI rapid response factor assesses rapid, prioritized use of team resources on the team’s goal. SCT’s methods of Vectoring, Boundarying, and Functional Subgrouping are all aimed at focusing the group’s resources on the goal with minimal noise and conflict. These three methods, when combined with fourth SCT method of Contextualizing, prioritize the team’s work on the goals in the context of the group’s overall objectives and current status with respect to reaching
them. We did not hypothesize that SCT teams would perform better than RRO teams on this factor. However, in retrospect, close examination of the individual WGI items on the rapid response factor shows that the items are focused as much on the team’s vectoring resources to team priorities and goals as on the team’s speed in doing so. Our results suggest that SCT methods focus team resources more effectively than RRO methods. This may be because SCT methods minimize factors such as noisy off-task communications and team conflict that can inhibit productive activity.

Implications

Overall, our results provided some evidence of the validity of Agazarian’s TLHS as operationalized in SCT; SCT groups communicated more information, more positively, more productively, and more creatively. TLHS and SCT methods are designed to apply to all living human systems. Poor team decision-making has costly and sometimes disastrous consequences (e.g. Janis, 1982), and “successful communications patterns” (Pentland, 2012, p. 65) such as in these SCT groups result in improved outcome. Given that SCT methods are derived from a metatheory which applies to any human system no matter what the context, our results suggest that TLHS and SCT may improve team functioning and outcome whatever the type of organization. Furthermore, in that we compared the outcomes of SCT groups with groups using RRO, our findings support modifying or abandoning the use of RRO (as suggested by Pentland, 2012) in favor of SCT methods; as one major difference between RRO and SCT methods is functional subgrouping, training groups to use this method to reach consensus decisions may be particularly important. Doing so may result in more collaborative, productive and creative teams and organizations, especially as the SCT methods are operationalized behaviorally in technique modules to enhance their learning and ease of use (Agazarian, 2003). Also, in that the TLHS/SCT
model is isomorphic, hierarchical, and aimed at creating more functional norms throughout the system-as-a-whole, the SCT approach holds the promise of enhancing information sharing and processing at all organizational levels. Finally, the meta-theoretical, multi-level nature of TLHS/SCT may be useful in integrating the disparate findings in the organization and team literature, as well as in generating novel research hypotheses.

Strengths and Limitations

A strength of this study was our use of existing “real-world” teams for analysis, thus potentially making our findings applicable to similar teams in the business, government, and civic organizations. At the same time, this made it impossible to randomly assign team members to team condition or to otherwise control for many potentially confounding factors. For example, the relative cognitive, emotional, and social intelligence, and personal energy-level of members, or the length of team membership could all influence collaborative verbal activity and team productivity and creativity. Additional limitations include obtaining our Group Productivity Scale and Work Group Inventory scores from independent raters rather than directly from the team members themselves, as the scales were intended to be used. Also, our raters were aware that we were testing the relative benefits of SCT methods and it was obvious from the tapes and transcripts which groups were SCT and which RRO; thus, social desirability may have played a role in our positive findings for SCT groups. However, the fact that our raters were unaware of our hypotheses regarding the WGI factors, and that their ratings did not produce hypothesis-consistent findings across all 8 WGI factors argues against a uniform social desirability rater bias.

Future Research Directions

Future research might partially replicate our study by employing similar assessment measures but randomly assign naïve subjects to new teams utilizing either SCT or RRO
communication structures. Using raters blind to hypotheses and group condition would further reduce threats to validity inherent in the present study’s design. In addition, experimental manipulation of the possibly causative SCT variables is needed to determine which of the 4 SCT methods contribute most to team process and outcome, and the possible interactions between the 4 methods. Such research might determine how to alter team structure and communication to maximize information sharing, collaboration, productivity, and creativity.

The meta-theoretical nature of TLHS/SCT may also be useful in resolving apparent paradoxes in the research literature. For example, Stasser and Titus’ (1985) finding that the more a group needs particular information, the less likely its members are to provide it. One possible TLHS/SCT explanation of this is that system boundaries close to information that is too different from the system’s current organization. Perhaps members with uniquely held information do not bring it into the team because there is no apparently similar subsystem of information in the group, and thus the member might experience it as too different and risky to contribute.

Conclusion

Taken together, our results showed that SCT teams, compared to RRO teams, shared more task-relevant information and collaboratively discussed and integrated this information more, while simultaneously being more productive and creative. These results are consistent with prior research on the overall SCT approach and on functional subgrouping in particular (O’Neill and Constantino, 2008; O’Neill et al., 2011; O’Neill et al., 2012). The results also support the hypothesis that SCT methods increase positive, task-relevant member contributions to the group as well as team collaboration, productivity and creativity. However, given our quasi-experiment design, we could not determine cause and effect, and for this, more research is needed. Finally, since SCT methods are the operational definition of TLHS constructs, our results are evidence in
favor of the validity of TLHS. Taking the present findings together with prior TLHS/SCT research suggests that TLHS bears further consideration and investigation as a unifying theory for the field of organizational development and team management.
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Footnotes

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Figure Captions

Figure 1. The SAVI grid showing the various categories and subcategories for coding verbal interactions, with the category groupings by row of low, contingent, and high probability of information transfer designated metaphorically as red, yellow, and green light. Copyright © 2006 Simon and Agazarian. Reprinted with written permission of the authors.
Table 1
Group productivity scale descriptives and effect sizes

<table>
<thead>
<tr>
<th>Session 1</th>
<th>15-30 minutes</th>
<th>30-45† minutes</th>
<th>45-60 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCT</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>SCT</td>
<td>5.67 (0.38)</td>
<td>5.78 (0.19)</td>
<td>5.78 (0.19)</td>
</tr>
<tr>
<td>RRO</td>
<td>4.5 (0.62)</td>
<td>4.73 (0.98)</td>
<td>4.67 (0.97)</td>
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<tr>
<td></td>
<td>d = 2.1</td>
<td>d = 1.3</td>
<td>d = 1.3</td>
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<table>
<thead>
<tr>
<th>Session 2</th>
<th>15-30 minutes</th>
<th>30-45† minutes</th>
<th>45-60 minutes</th>
</tr>
</thead>
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<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>SCT</td>
<td>5.83 (0.43)</td>
<td>6 (0.38)</td>
<td>6.33 (0.38)</td>
</tr>
<tr>
<td>RRO</td>
<td>4.89 (0.38)</td>
<td>5.17 (0.43)</td>
<td>5.42 (0.32)</td>
</tr>
<tr>
<td></td>
<td>d = 2.7</td>
<td>d = 1.9</td>
<td>d = 2.4</td>
</tr>
</tbody>
</table>

Note. SCT = Systems Centered-Training. RRO = Robert’s Rules of Order. Main effect of group type significant: Wilk’s Lambda = .4, F(3, 9) = 4.5, p = .03; Main effect of session significant: Wilk’s Lambda = .31, F(3, 9) = 6.82, p = .01. † Univariate follow-up indicated differences were marginal for this group comparison.
Table 2
System for Analyzing Verbal Behaviors descriptives and effect sizes

<table>
<thead>
<tr>
<th></th>
<th>Low Probability (M (SD))</th>
<th>Contingent Probability (M (SD))</th>
<th>High Probability (M (SD))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session 1</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>SCT</td>
<td>52 (17.32)</td>
<td>590.5 (111.43)</td>
<td>346.5 (119.51)</td>
</tr>
<tr>
<td>RRO</td>
<td>61 (55.43)</td>
<td>585 (278.28)</td>
<td>71 (27.71)</td>
</tr>
<tr>
<td></td>
<td><em>ns</em></td>
<td><em>ns</em></td>
<td><em>d</em> = 3.2</td>
</tr>
<tr>
<td><strong>Session 2</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>SCT</td>
<td>37 (6.93)</td>
<td>453 (51.96)</td>
<td>288.5 (65.24)</td>
</tr>
<tr>
<td>RRO</td>
<td>96.5 (92.95)</td>
<td>362.5 (150.69)</td>
<td>167.5 (16.74)</td>
</tr>
<tr>
<td></td>
<td><em>ns</em></td>
<td><em>ns</em></td>
<td><em>d</em> = 2.5</td>
</tr>
</tbody>
</table>

Note. SCT = Systems Centered-Training. RRO = Robert’s Rules of Order. *ns* = no significant difference. Main effect of SCT group: Wilk’s Lambda = .22, \(F(3, 10) = 11.97, p = .001\), group x session interaction, Wilk’s Lambda = .43, \(F(3, 10) = 4.37, p = .03\).
### Table 3
Work Group Inventory descriptive and effect sizes

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<td>M (SD)</td>
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<td>M (SD)</td>
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<td><strong>Alignment on Purpose</strong></td>
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<tr>
<td>SCT</td>
<td>12.5 (1.68)</td>
<td>14.13 (1.44)</td>
<td>10.25 (2.50)</td>
<td>14.38 (1.11)</td>
<td>6.63 (0.75)</td>
<td>21.25 (3.48)</td>
<td>8 (2.97)</td>
</tr>
<tr>
<td>RRO</td>
<td>13 (0.89)</td>
<td>13.75 (1.89)</td>
<td>11.67 (1.60)</td>
<td>16.58 (2.01)</td>
<td>8.83 (1.83)</td>
<td>28.92 (1.77)</td>
<td>10.83 (2.09)</td>
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<tr>
<td></td>
<td>ns</td>
<td>ns</td>
<td>Ns</td>
<td>d = -1.3</td>
<td>d = -1.5</td>
<td>d = -3</td>
<td>Ns</td>
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<tr>
<td><strong>Future Focus</strong></td>
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<td><strong>Shared Responsibility</strong></td>
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<td><strong>Task Focus</strong></td>
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<td><strong>Rapid Response</strong></td>
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<tr>
<td><strong>Use of Creative Talent</strong></td>
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<td><strong>Open Communication</strong></td>
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<tr>
<td><strong>Participative Leadership†</strong></td>
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<th>Session 2</th>
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<tbody>
<tr>
<td></td>
<td>M (SD)</td>
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<td>M (SD)</td>
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<td>M (SD)</td>
<td>M (SD)</td>
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<tr>
<td><strong>Alignment on Purpose</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SCT</td>
<td>11 (1.91)</td>
<td>14.13 (1.49)</td>
<td>9.25 (0.96)</td>
<td>12.88 (0.63)</td>
<td>4.38 (1.60)</td>
<td>21.13 (1.97)</td>
<td>8.63 (2.02)</td>
</tr>
<tr>
<td>RRO</td>
<td>12.75 (0.65)</td>
<td>13.25 (1.55)</td>
<td>11.75 (1.55)</td>
<td>14.75 (0.65)</td>
<td>7.25 (0.96)</td>
<td>26.38 (2.39)</td>
<td>10 (1.08)</td>
</tr>
<tr>
<td></td>
<td>ns</td>
<td>ns</td>
<td>Ns</td>
<td>d = -2.9</td>
<td>d = -2.2</td>
<td>d = -2.4</td>
<td>Ns</td>
</tr>
</tbody>
</table>

**Note.** SCT = Systems Centered-Training. RRO = Robert’s Rules of Order. *ns* = no significant difference. Main effect of group type significant: Wilk’s Lambda = .18, *F*(8, 7) = 4.08, *p* = .04 † Univariate follow-up indicated differences were marginal for this group comparison. Effect sizes reported for significant and marginal comparisons only.
### SAVI® Grid

System for Analyzing Verbal Interaction

<table>
<thead>
<tr>
<th>PERSON</th>
<th>TOPIC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REDD Light</strong></td>
<td><strong>ORIENTING</strong></td>
</tr>
<tr>
<td><strong>PERSONAL</strong></td>
<td><strong>FACTUAL</strong></td>
</tr>
<tr>
<td><strong>FIGHTING</strong></td>
<td><strong>OBSCURING</strong></td>
</tr>
<tr>
<td>- Attack/Blame</td>
<td>- Mind-reading</td>
</tr>
<tr>
<td>- Righteous question</td>
<td>- Negative or positive prediction</td>
</tr>
<tr>
<td>- Sarcasm</td>
<td>- Gossip</td>
</tr>
<tr>
<td>- Self attack/defend</td>
<td>- Joking around</td>
</tr>
<tr>
<td>- Complaint</td>
<td>- Thinking out loud</td>
</tr>
<tr>
<td><strong>YELLOW Light</strong></td>
<td><strong>INDIVIDUALIZING</strong></td>
</tr>
<tr>
<td><strong>PERSONAL INFORMATION</strong></td>
<td><strong>FACtual</strong></td>
</tr>
<tr>
<td>- Personal information current</td>
<td>- General information</td>
</tr>
<tr>
<td>- Personal information past</td>
<td>- Narrow question</td>
</tr>
<tr>
<td>- Personal opinion/explanation</td>
<td>- Broad question</td>
</tr>
<tr>
<td>- Personal question</td>
<td></td>
</tr>
<tr>
<td><strong>GREEN Light</strong></td>
<td><strong>RESPONDING</strong></td>
</tr>
<tr>
<td><strong>INNER FEELING</strong></td>
<td><strong>ANSWER QUESTION</strong></td>
</tr>
<tr>
<td>- Inner-feeling</td>
<td>- Clarify own answer (with data)</td>
</tr>
<tr>
<td>- Feeling question</td>
<td>- Paraphrase</td>
</tr>
<tr>
<td>- Answer feeling question</td>
<td>- Summarize</td>
</tr>
<tr>
<td>- Mirror inner experience</td>
<td>- Corrective feedback</td>
</tr>
<tr>
<td>- Affectionate joke</td>
<td></td>
</tr>
<tr>
<td>- Self assertion</td>
<td></td>
</tr>
</tbody>
</table>

Silence, Laughter, Noise

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