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Abstract

As teams have become an increasingly necessary component of organizational structure, organizations have turned to team development interventions in hopes of facilitating performance gains in their teams. However, it is critical to understand that team development interventions are not “one size fits all.” This review provides a close examination of the two most prevalent intervention approaches, team training and team building, in order to highlight their contributions to improving teams when designed according to team development science.

Keywords

team training, team building, team development, team effectiveness, team development interventions

Teams matter in our lives. They matter in our hospitals, in our skies, in our offices, in our sports arenas, and in daily social interactions. We depend on teams to tackle difficult, complex, and dynamic tasks. But how can we develop these teams? How can we ensure they will perform well consistently? This article is motivated by these issues, and the good news is that there is a science behind the development of effective teams. However, the science must be applied—and applied correctly—in order for teams to be developed successfully. The following examples highlight why this science is so necessary.

In 2008, a supervisor was not happy with his sales team's productivity, so he implemented a team building exercise of his own invention. He assembled his sales team and asked one member to lie on his back; then the supervisor proceeded to slowly pour water over that team member's face, saying to the group, “You saw how hard Chad fought for air right there. I want you to fight that hard to make sales” (Vick, 2008). Needless to say, this incident did not have the desired effect and eventually led to a lawsuit and the company becoming labeled “the waterboarding company.”

In a very different team situation, in 2009, US Airways Flight 1549 was forced to land in the Hudson River after the plane's engines failed due to geese striking them. What could have been a disastrous event ended safely, with everyone on board surviving the incident. According to the National Transportation Safety Board (NTSB), this outcome was credited to the fast actions of the pilot and his crew members. The NTSB also noted that the ability to perform these duties was due in significant part to their training in Crew Resource Management (Salas, Burke, Bowers, & Wilson, 2001)—a training program designed to train critical team skills in airline crews (NTSB, 2010).

Why were the results of these two different approaches to developing effective teams so different? One notable difference is that not all team development interventions are created equal. Crew Resource Management team training is an evidence-based, systematically designed intervention, whereas the “waterboarding” exercise was a poorly developed concept that had no linkage to actual team needs. Although this is an extreme example, inappropriate interventions are prevalent as the use of team-based organizations grows.

Over the years, well-designed team developmental interventions have become recognized as being important in fostering effective teams (Cannon-Bowers & Bowers, 2010). Because no team is perfect, team-based organizations view interventions as critical for effective team functioning. As these interventions have increased in prevalence, the science behind understanding how they should be designed, developed, implemented, and evaluated has expanded rapidly. However, this science is not always leveraged to guide these efforts. While several reviews of team development intervention science cover specific strategies (e.g., Klein et al., 2009), our goal is to highlight how team development interventions are not all equal in terms of their purpose, design, and actual effects on outcomes. This review provides a more holistic picture of the science regarding both team building and team training and future research needs.

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The Science of Team Development Interventions

Teams and their functioning in the workplace have been investigated since the 1920s; however, the modern pressures of a global economy have increased the need for organizations to optimize their teams. From NASA to medicine to emergency management, high-performing teams have become much sought after, especially following disasters involving team performance breakdowns, such as the Challenger explosion (Vaughan, 1996). But what defines an effective team? Effective teams are those that obtain a specified level of team performance, such as launching a space shuttle without any incidents or developing solutions to stop oil leaks. Team performance is conceptualized as a multilevel process that results from team members engaging to accomplish individual and team-level taskwork and teamwork (Kozlowski & Klein, 2000).

Whereas taskwork involves performing the actual team task, teamwork is the enacting of team-level attitudes, behaviors, and cognitions that affect how teams perform their tasks (Salas, Cooke, & Rosen, 2008; see Table 1). These attitudes, behaviors, and cognitions are an important component of team effectiveness and are often the targets of team development interventions. Therefore, these aspects of teamwork should also be considered as desired outcomes to team development interventions.

There are many components that make up effective team performance, and at any given time, one or more of these may not be functioning effectively. For example, while handling a problem with their landing gear, a flight crew did not listen to concerns regarding the fuel level, and the plane eventually crashed because it ran out of fuel (NTSB, 1978). While not all team functioning problems have such extreme repercussions, determining how to prevent any degree of teamwork breakdown is critical.

Accordingly, the focus on the functioning of teams has led to much advancement in the science behind team development

theory and practice (Salas, Rosen, Burke, & Goodwin, 2009). This science includes the distinguishing of the necessary knowledge, skills, and attitudes required for effective team processes and performance; the development of effective performance-measurement systems that track how well teams are doing; and the establishment of team-level feedback approaches that provide teams with a diagnosis of their progress and areas of improvement. Table 2 summarizes these key contributions to the science of understanding teams and their functioning. Together, these components serve to support and supplement the major focus of the present article: team-development interventions.

There are many ways to conceptualize team development interventions, with some being more scientifically based than others (Klein et al., 2009). However, when designed appropriately, team development interventions follow a general framework of development, regardless of the specific type of strategy used (see Fig. 1). The creation of team development interventions requires integrating the tools that are used to train teams, the delivery methods that are chosen for training, the content, and the strategies that are embedded within the intervention. When in the development stage, designers must realize that each aspect of the design process is not mutually exclusive. Rather, each decision is related to other intervention-development factors. For example, when developing effective teamwork behaviors in medical teams, simulations may be the best method, because they allow for practice in a safe, simulated realistic environment.

Approaching team development interventions systematically reduces the likelihood of failure or other negative outcomes. For example, if executives at Ericsson Telecom had utilized this type of structure when they wanted to improve team reactions to stress, they may have realized that the best strategy was not to stage a hijacking (Addley, 2000). Next, we will further describe evidence behind the use of this scientific approach for the two most prominent team-development interventions: team building and team training.

Table 1. Definitions and Examples of Teamwork Factors

Factor	Definition	Examples
Attitudes	An internal state that affects the team's ability to interact together	Affective outcomes Mutual trust Cohesion Collective efficacy
Behaviors	The skills and processes necessary to accomplish teamwork	Process outcomes Backup behavior Team leadership Information exchange
Cognition	The knowledge and experiences that guide effective teamwork	Cognitive outcomes Shared mental models Transactive memory Metacognition

Table 2. Selected Sample of Scientific Contributions to Understanding Team Effectiveness

Contribution	Defining characteristics	Reference
Team knowledge, skills, attitudes	The required competencies for ensuring effective teamwork. Team knowledge refers to an understanding of what is needed to effectively perform as a team (e.g., knowledge of team roles, member expertise). Team skills refer to the observable competencies needed to perform teamwork and team tasks (e.g., adaptability, communication). Team attitudes refer to the underlying feelings and perceptions regarding teamwork (e.g., preference for teamwork, mutual trust)	Cannon-Bowers, Tannenbaum, Salas, and Volpe (1995)
Team selection methods	Select team members and leaders for required knowledge, skills, and attitudes based on team needs using personality tests, skill assessments, simulated on-the-job performance tests, interviews, etc.	Hollenbeck, DeRue, and Guzzo (2004)
Team task analysis	Methodology for determining the tasks a team performs, the teamwork behaviors required, and the knowledge, skills, and abilities necessary to perform these tasks and teamwork behaviors	Cannon-Bowers and Bowers (2010)
Team leader development	Development of team leaders in order to improve their leadership capabilities and instruct them on how to improve team functioning	Marks, Zaccaro, and Mathieu (2000)
Team performance measurement system	Theoretically based system built on models of team performance that assesses individual and team outcomes and processes. These systems are able to describe, evaluate, and diagnose team performance, and may incorporate multiple measurement approaches (e.g., observer ratings, simulations of performance, supervisor reports)	Salas, DiazGranados, et al. (2008)
Team diagnostic feedback	Feedback regarding team processes and performance that diagnoses critical errors and highlights successes; usually administered immediately after a performance period so that teams can refine their behaviors for the next performance period	Smith-Jentsch, Cannon-Bowers, Tannenbaum, and Salas (2008)

Do Team Development Interventions Work?

We submit that these scientifically driven interventions can have a positive impact on teams when applied for their intended purposes and support this claim with the existing evidence. Specifically, we highlight results from several recent quantitative reviews of multiple studies. These results illustrate that both forms of interventions do have a positive impact

on team outcomes, albeit to differing degrees depending on the type of outcome.

Defining team building and team training

Team development intervention strategies tend to fall into one of two overarching categories, team building or team training (see Table 3). Team building originally began as a

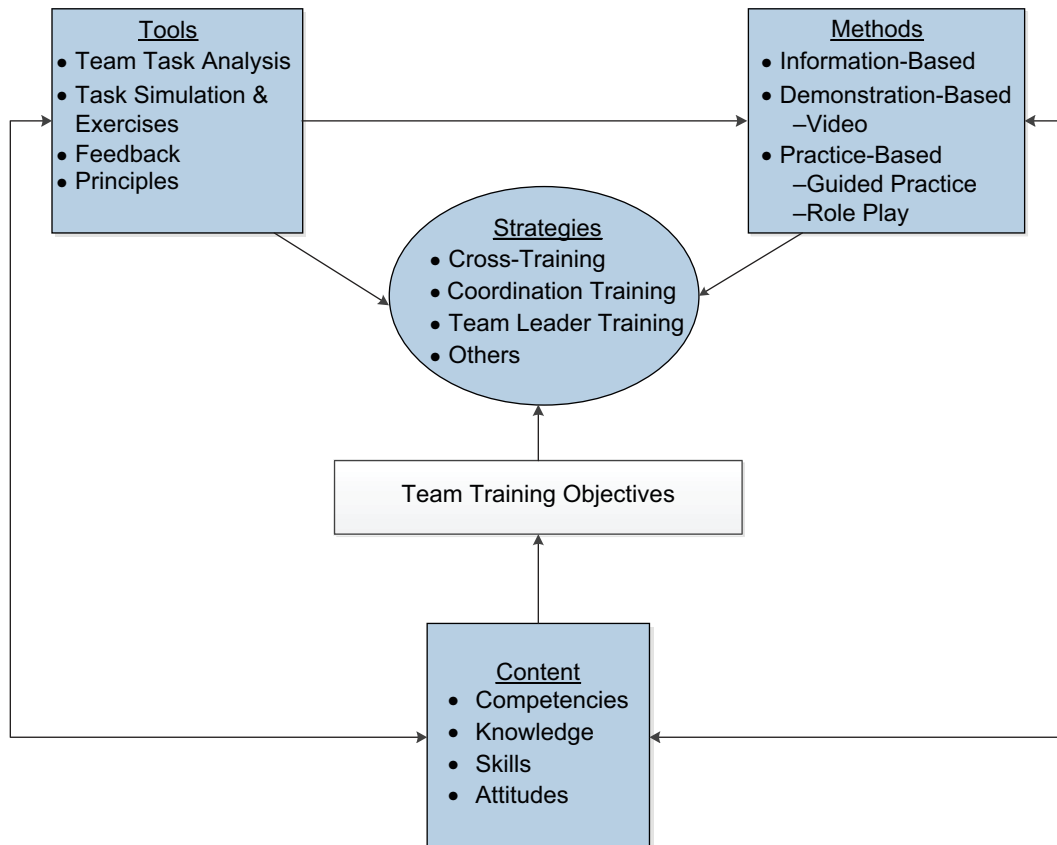


Fig. 1. Team development intervention model. Effective team development interventions start with the determination of the appropriate tools to design and implement the intervention, as well as the delivery methods that lead to the selection of the best strategies and the appropriate content to include in the intervention (adapted from Salas & Cannon-Bowers, 1997).

Table 3. Descriptions and Emphases/Aims of Team Development Intervention Strategies

Strategy	Description	Emphases and Aims
Team building	A set of strategies designed to improve interpersonal relations and social interactions. Also designed to improve the achievement of results, meeting goals, and accomplishing tasks. Used to address problems occurring in teams. (Klein et al., 2009)	(a) Goal setting: emphasizes the setting of goals and objectives at both the individual and team levels (b) Interpersonal relationships: emphasizes trust development and resolving conflict (c) Role clarification: emphasizes communication among team members regarding role specification (d) Problem solving: emphasizes the identification of how to solve task-related problems and make complex decisions regarding team tasks
Team training	A set of theoretically based strategies or instructional processes, which are based on the science and practice of designing and delivering instruction to ensure understanding and enactment of appropriate team competencies. Used to address both in-performance team breakdowns and to prepare teams prior to performing. (Salas & Cannon-Bowers, 1997)	(a) To understand the team-focused knowledge, skills, and attitudes (KSAs) required for effective performance (b) To practice using these KSAs in a safe environment similar to the performance environment to enable transfer of the learned skill to the work environment (c) To provide feedback to teams regarding their ability to use the KSAs

group-process intervention designed to improve interpersonal relations and social interactions and has evolved to include the achievement of results, the meeting of goals, and the accomplishment of tasks (Dyer, 2007; Salas, Rozell, Mullen, & Driskell, 1999). Although there have been several iterations over the years, team building currently consists of four approaches: (a) goal setting, (b) interpersonal-relationship management, (c) role clarification, and (d) problem solving (Buller & Bell, 1986).

The purpose of team training is for team members to obtain, understand, and practice the knowledge, skills, and attitudes required for effective team performance. Furthermore, team training provides an opportunity for teams to practice their skills and receive feedback in order to identify teamwork deficiencies and learn skills to address these deficiencies. Many types of team training strategies aimed at targeting a range of team knowledge, skills, and attitudes exist. Table 4 highlights commonly used strategies.

Together, team building and team training constitute the majority of team development interventions implemented. Therefore, it is important to understand the influences that each has on team outcomes. This is especially true given that although both types of interventions are designed to positively affect team effectiveness, they are aimed at different needs. As can be seen in Table 5, empirical evidence supports this idea, in that each strategy accounts for differing amounts of variance in different types of outcomes.

Team building: What works

Team building has been described in the trade and popular press without being linked to peer-reviewed, researched-based findings (Dyer, 2007). However, recently there has been a surge in interest to the empirical evaluation of team building. In particular, Klein and colleagues (2009) examined the impact of team building on team outcomes for 20 studies. All four approaches of team building were found to have a moderate effect on outcomes, with goal setting and role clarification being the strongest. Furthermore, team building had the strongest impact on affective and process outcomes.

What are the implications of these findings? Teams that are experiencing negative affective issues, such as a lack of cohesion, can benefit from team building. Teams that are experiencing process issues, such as a lack of clarification in terms of understanding roles, stand to improve from team building as well. Finally, for organizations trying to decide which of the approaches to implement, goal setting and/or role clarification may provide the highest impact. Why might this be the case? Drawing upon theory, it has been noted that providing teams with clearly stated, challenging goals can enhance motivation and reduce conflict (Buller & Bell, 1986). Goal-setting team building, therefore, may motivate the team as a whole to work harder and be more effective through setting specific goals, whereas role clarification helps to set individual purposes and goals, affecting individual motivation as well.

Table 4. Purposes and Targeted Knowledge, Skills, and Attitudes of Different Team Training Strategies

Training strategy	Purpose	Targeted knowledge, skills, and attitudes (KSAs)	Sources
Cross-training	Teaches each team member the duties and responsibilities of his/her teammates	Shared knowledge of tasks & responsibilities Mutual performance monitoring Back-up behaviors	Volpe, Cannon-Bowers, Salas, and Spector (1996)
Team self-correction training	Develops team's ability to diagnose teamwork breakdowns/issues within the team and reach effective solutions internally on a continual basis	Mutual performance monitoring Effective communication Leadership	Smith-Jentsch, Cannon-Bowers, Tannenbaum, and Salas (2008)
Team-coordination training	Targets the improvement of a team's shared mental-model framework or facilitates a common understanding of issues related to achieving team goals	Back-up behaviors Mutual performance monitoring Understanding of teamwork skills	Entin and Serfaty (1999)
Crew Resource Management (CRM)	Provides instructional strategies designed to improve teamwork by applying well-tested training tools (e.g., simulators, role playing) targeted at specific content	Communication Briefing Back-up behaviors Decision making Team adaptability Shared situation awareness	Salas, Burke, Bowers, and Wilson (2001)

Table 5. Team Building and Team Training Meta-Analysis Results

Outcome Type	Team training		Team building	
	ρ	% Variance accounted for	ρ	% Variance accounted for
Cognitive outcome	0.42	17.64	0.13	1.69
Affective outcomes	0.35	12.25	0.44	19.36
Process outcomes	0.44	19.36	0.44	19.36
Performance outcomes	0.39	15.21	0.26	6.76
All outcomes combined	0.34	11.56	0.31	9.61

Note: Adapted from Klein et al., 2009; Salas, DiazGranados, et al., 2008.

ρ = product-moment correlation

There are some caveats that go along with team building effectiveness. This intervention is traditionally designed to work when team members are involved in diagnosing their teams' problems (Dyer, 2007). Thus, although outside facilitation is necessary, team members must be willing and able to speak up and identify their needs. Furthermore, for the most part, team building is conducted with intact teams that have some type of issue to resolve. Therefore, these findings are most applicable to already-existing teams that have some experience performing together.

Team training: What works

Team training has received a significant amount of attention in recent literature, in part inspired by industries such as medicine and aviation that have begun to benefit from this intervention (Salas, DiazGranados, et al., 2008). A wealth of empirical support has been found in regard to different types of team training and team outcomes. Salas, Nichols, and Driskell (2007) examined three specific training strategies—cross-training, team coordination and adaptation training, and guided team self-correction training—finding that performance improved across all strategies. Breaking out team cognitive, affective, process, and performance outcomes, positive moderate outcomes were again found for all outcomes and all types of team training (see Table 4; Delise, Gorman, Brooks, Rentsch, & Steele-Johnson, 2010; Salas, DiazGranados, et al., 2008). Furthermore, on average, team training had a greater impact on outcomes than did team building. Team training was also particularly effective for process and cognitive outcomes.

These results show positive support for team training as an effective intervention. Team training can serve to ensure that teams have a shared understanding regarding their purposes, goals, and the behaviors necessary to work effectively. Team training also has an influence on improving team performance outcomes, often in critical situations. For example, a recent evaluation of team training administered to surgical teams found that participation was associated with lower mortality rates in 74 facilities (Neily et al., 2010). Finally, these empirical

findings highlight the complementary nature of team building and team training, in that although both aid in improving process outcomes, team training may be better for improving team cognition, whereas team building may be more useful for ensuring positive team affect.

Much like team building, team training also has caveats, one in particular being the effort required. Team training requires the identification of the specific team-based knowledge, skills, and attitudes to be developed, in order to subsequently determine the appropriate learning objectives and training design strategy, all of which can be time consuming and resource intensive. However, this work is necessary in order for a team training program to be successful and address the desired outcomes.

Key Takeaways

Certainly much can be gained from this exploration into the science of team development interventions and their effectiveness. In particular, there are three key takeaways that we would like to note. First, *there are distinct intervention strategies for distinct team needs*. From our review, it can be seen that the differences in intervention strategies should be carefully reviewed for relevance and appropriateness based on team needs prior to implementation, in order to maximize impact.

Second, *in terms of team needs, team building is most effective for solving specific teamwork breakdowns, whereas team training is most effective for providing the knowledge and skills needed for teamwork*. Team building is an intervention designed around targeting problems that arise in teams during performance, such as a lack of cohesion or trust. Team training is designed to prepare teams prior to performance so that they can competently work together. Both of these types of interventions therefore have different effects in terms of their outcomes and when they should be utilized.

Finally, *team development interventions are most effective when these distinctions are attended to and the science behind them is utilized*. Both team building and team training can be effective when they are designed systematically for the right

Table 6. Purposes of Team Building and Team Training Interventions and Circumstances in Which They Are Effective

Team building	Team training is used:
To address problems and breakdowns during team performance	To build and refresh team-based knowledge, skills, and attitudes prior to and during team performance
To improve affective outcomes (e.g., trust, attitudes, confidence in team members)	To improve team performance outcomes—particularly through teamwork training
To improve process outcomes (e.g., communication, coordination)	To improve cognitive outcomes (e.g., shared knowledge among team members)
To reduce conflict within a team	To improve team process outcomes
To improve team critical thinking	To improve team decision making
To clarify team member roles	To improve team coordination
To aid in team goal setting	To enable continuous team self-correction
To enable teams to solve task-related problems	To cross-train individual team members
When task interdependence is low	When task interdependence is high

reasons (see Table 6 for summary). Team building in particular often gets misused and trivialized as a team-development intervention because it is often not designed appropriately, but as shown by the empirical literature it can have a positive impact if done right.

Moving Forward

Certainly, there is an existing science behind the development of team interventions that can enable organizations to utilize them appropriately. As we move forward, we must continue to advance and evaluate what is known regarding the science of these interventions. This includes adapting interventions to work with the growing use of technology and the increased prevalence of teams dispersed around the world (Salas, Cooke, & Rosen, 2008). It also means developing teams to work in large systems that may have complex interdependent goals (DeChurch et al., 2011) or teams with cultural diversity (Connaughton & Shuffler, 2007). Furthermore, we must understand the interactions between different types of interventions and how implementing multiple strategies (e.g., both team building and team training) can affect teams' effectiveness.

As we can learn from the examples of the "waterboarding company" and the US Airways crew, not all team development interventions are created equal. However, those that rely upon our current state of the science regarding team development interventions can greatly benefit, as exhibited by recent empirical support. Furthermore, it is important to continue exploring research in this area as we redefine teams in today's work environment. In our technology-driven world, the use of "there's an app for that" has become widespread in reference to phone applications designed to do something more effectively or efficiently. For making the practice of designing and implementing

team development interventions effective and efficient, we propose a new phrase: "There's a science for that."

Recommended Reading

- Cannon-Bowers, J.A., & Bowers, C. (2010). (See References). A recently published review of relevant literature on team development and team interventions.
- Cannon-Bowers, J.A., Tannenbaum, S.I., Salas, E., & Volpe, C.E. (1995). (See References). A well-written overview of how to effectively develop team training.
- Dyer, W.G. (2007). (See References). A well-written, updated version of the seminal book on team building, describing the appropriate procedures for systems.
- Hollenbeck, J.R., DeRue, D.S., & Guzzo, R. (2004). (See References). A paper providing a more thorough discussion of team building and team training for readers who wish to learn more.
- Marks, M.A., Zaccaro, S.J., & Mathieu, J.E. (2000). (See References). A representative study that illustrates original research about team training and its applicability.

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Declaration of Conflicting Interests

The authors declared that they had no conflict of interest with respect to the research, authorship, and/or publication of this article.

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