Transactions on Human-Computer Interaction

Volume 10 Issue 4

12-2018

Team Video Gaming for Team Building: Effects on Team Performance

Mark Jeffrey Keith

Brigham Young University, mark.keith@gmail.com

Greg Anderson

Brigham Young University, profganderson@byu.edu

James Eric Gaskin

Brigham Young University, james.eric.gaskin@gmail.com

Douglas L. Dean

Brigham Young University, doug_dean@byu.edu

Recommended Citation

Keith, Mark Jeffrey; Anderson, Greg; Gaskin, James Eric; and Dean, Douglas L. (2018) "Team Video Gaming for Team-building: Effects on Team Performance," *AIS Transactions on Human-Computer Interaction* (10) 4, pp. 205-231.

DOI: 10.17705/1thci.00110

Available at: http://aisel.aisnet.org/thci/vol10/iss4/2

Team Video Gaming for Team-building: Effects on Team Performance

Mark Jeffrey Keith
Brigham Young University, USA

Greg Anderson
Brigham Young University, USA

James Eric Gaskin
Brigham Young University, USA

Douglas L. Dean
Brigham Young University, USA

Abstract:

Teams rapidly form and dissolve in organizations to solve specific problems that require diverse skills and experience. For example, in the information systems context, cross-functional and project-based teams that comprise a mix of personnel who temporarily work away from their usual functional groups (best perform agile software development (Barlow et al., 2011; Keith, Demirkan, & Goul, 2013). These newly formed work teams need to become productive as quickly as possible. Team video gaming (TVG) has emerged as a potential team-building activity. When new teammates play a collaborative video game, they engage in cooperative and challenging goals while they enjoy the games. Although research has shown that video games can promote learning and recreation, it has not investigated the effects of commercial video games on subsequent work-team performance. Better understanding this issue will provide insights into how to rapidly develop cohesion among newly formed work teams and, thus, lead to greater team performance. We examined this issue through a laboratory experiment. We found that teams in the TVG treatment demonstrated a 20 percent productivity improvement in subsequent tasks (in our case, a team-based geocaching scavenger hunt) over teams that participated in traditional team-building activities.

Keywords: Video Games, Team Video Gaming, Collaboration, Team Performance, Team Cohesion.

Dennis F. Galletta was the accepting senior editor for this paper.

1 Introduction

Organizational tasks and problems are often complex and require a carefully coordinated group effort to achieve goals (Dervitsiotis, 2012; LaFasto & Larson, 2001). For example, software development requires carefully coordinated team work and a diversity of skills in order to produce a high-quality product that meets client expectations. For example, agile software development benefits most from cross-functional project-based teams that comprise employees who temporarily work away from their functional "home" groups (Barlow et al., 2011; Keith et al., 2013).

Because teams (and IT project teams in particular) often fail to succeed (Cataldo & Herbsleb, 2013; Hollenbeck, DeRue, & Guzzo, 2004; Marks, Sabella, Burke, & Zaccaro, 2002), companies invest in team-building activities designed to increase team cohesion and performance (Dyer & Dyer, 2013). Dyer and Dyer (2013) describe the concept of team building as a process of diagnosing team dynamics and instituting processes to improve team performance. Research has shown that team-building activities can significantly improve team productivity (Klein et al., 2009; Macy & Izumi, 1993). However, it is not practical to spend a lot of time and money on team building-activities if employees participate in a particular team only temporarily. With that said, such teams may still be able to benefit from team-building activities.

Recently, in-house team video gaming (TVG) has emerged in organizations as an interesting alternative to traditional team-building activities. TVG can take place in short sessions (less than 60 minutes) and can occur "in house" at the physical location of the team. Therefore, employees play team video games during breaks and before or after work. Due to these games' popularity, some organizations dedicate specific rooms or areas to video games (Lin, 2014). These rooms have video screens, game consoles, controllers, and sometimes even video game-based musical instruments (Lucasimo, 2014). One study estimates that a third of all employees in Australia and New Zealand have used video games in some form to enhance their workplace productivity (Brand, Todhunter, & Jervis, 2017). However, no studies have yet empirically linked video game play to improved team performance. Therefore, in this study, we empirically examine the efficacy of TVG as a team-building activity. That is, we examine whether TVG-based team-building activity improves team performance on subsequent tasks.

To theoretically explain why TVG-based team building may be effective, we draw from research on team cohesion and goal commitment—perhaps the two strongest indicators of team performance established in prior research (Ahronson & Cameron, 2007; Boyle, 2003; Carron, Colman, Wheeler, & Stevens, 2002).

Team-building activities can improve team performance by improving team cohesion (Carron, 1982; Carron, Widmeyer, & Brawley, 1985; Festinger, Schachter, & Back, 1950; Mullen & Copper, 1994). Ideally, team-building activities will produce greater team cohesion, which refers to the unity and bond that forms when team members have mutual positive feelings toward each other, when they can manage conflict and solve problems in a supportive and trusting environment, and when they are satisfied about how the team works together (Carron & Brawley, 2012). While some evidence shows that TVG improves several constructs related to team cohesion such as social bond (Greitemeyer & Cox, 2013), pro-social behavior (Jin & Li, 2017), group identification (Morschheuser, Riar, Hamari, & Maedche, 2017), and social communication (Peña & Hancock, 2006), research has not yet explicitly tested the direct effect of TVG on team cohesion itself.

Team-building activities also activate a strong level of goal commitment in team members (Klein et al., 2009; Salas, Priest, & DeRouin, 2005). Research has demonstrated increasing goal commitment to improve team performance across a variety of settings (Klein & Mulvey, 1995; Klein, Wesson, Hollenbeck, & Alge, 1999). Accordingly, many traditional team-building activities include a component that focuses on discussing and setting team goals (Bruner, Eys, Beauchamp, Côté, 2013). However, although TVG clearly creates a context for –goal setting and goal commitment, prior research has not tested the relationship between TVG and goal commitment.

In summary, we have both practical and theoretical reasons to study the research gap we address in this study. Theoretically, TVG has the potential to activate many of the constructs established in prior research that make effective team-building activities such as problem solving, goal commitment, and team cohesion (Klein et al., 2009; Salas et al., 2005). From a practical perspective, many companies have already adopted TVG, and consulting firms that specialize in team-building activities even offer it as a service[1]. But, to be

[1] For example, consulting firms such as *Firefly Events* (https://fireflyteamevents.com/team-building-office-video-games/) offer video gaming services which they promote as team-building activities.

clear, we neither propose nor test whether TVG is better or worse than traditional team-building activities that require an intensive investment of time and resources, such as rope courses and retreats (Gillis & Speelman, 2008). Rather, we demonstrate that organizations can use TVG as an effective and quick team-building activity that they can typically perform in the workplace. For example, the TVG treatment we used in this study took only about an hour. If effective, this approach can benefit teams that form to accomplish a specific but temporary assignment such as developing software, solving problems, or planning and conducting a trade show.

To address this opportunity, we conducted a laboratory experiment that explores the effect that TVG compared to that a traditional brief team-building activity had on team cohesion, goal commitment, and team productivity. We found that TVG can improve team performance about 20 percent over a traditional goal-setting and planning workshop.

This paper proceeds as follows: in Section 2, we explain how TVG will increase team performance through team cohesion, goal commitment, and directly. In Section 3, we theorize how traditional team-building activities and TVG-based team-building activities will affect team cohesion, goal commitment, and team performance. In Section 4, we test our theoretical model through the use of a laboratory experiment and, in Section 5, present the results of the experiment. In Section 6, we discuss the implications of the results. Finally, in Section 7, we conclude the paper by expression how this research contributes to the body of knowledge about how best design effective teams.

2 Team Video Games

For many people, video games have become a pervasive part of life. A majority of Americans and over 2.2 billion people globally play video games (Statistica, 2018). Research on online games shows that people play games for various reasons, such as achievement, entertainment, immersive experiences, and interactions with other players (Bartle, 1996; Ryan, Rigby, & Przybylski, 2006; Yee, 2006).

Much research has already discussed and showed evidence that video games can have negative effects (Griffiths, 2005; Smith, 2006; Weber, Ritterfeld, & Mathiak, 2006). However, much research has shown that video gaming has positive effects as well. Individuals can use video games for more than just entertainment and escape (Lowry, Gaskin, Twyman, Hammer, & Roberts, 2013). Via the entertainment and enjoyment they provide, video games can help individuals accomplish a variety of worthwhile objectives. They can enhance education (Gaskin & Berente, 2011), improve training, and provide experience in complex situations (Huntemann & Payne, 2009). Individuals can also use them to practice collaborative decision making (Daylamani-Zad, Angelides, & Agius, 2016) and to facilitate social networks (Gaudiosi, 2011; McGonigal, 2011). Video games also see use as therapeutic tools (Lieberman, 2006; Ritterfeld & Weber, 2006) and training aides for certain disorders and psychotherapy sessions (Griffiths, Davies, & Chappell, 2003; Gunter, 2005). Research has found that video games help players develop an affinity for technology, develop their problem-solving skills, and enhance their motor and spatial skills. Further, research has shown that video games in the workplace can help employees recover from fatigue and stress (Reinecke, 2009; Waltz, 2016).

TVG, a particular type of video game, require coordinated action by multiple players who simultaneously participate in the same game. In a team-building context, TVG provides an accessible medium that teams can use to learn to work together and accomplish the goals of team-building activities (Lucasimo, 2014). The fact that so many people have experience with popular team video games provides an opportunity for team-building activities in organizations. When all members in a newly formed team have prior experience with the same video game, teams can play the game without the start-up cost of having to learn the game. Thus, organizations can conveniently use TVG for team-building activities.

A traditional team-building activity does not use TVG nor does it primarily focus on entertaining participants. Instead, team members become acquainted with one another and organize themselves to meet a business goal. They create patterns of communication, practice cooperation, discuss and set business goals for the team, and make plans about how to achieve those goals. Each step in the process focuses on helping the team to achieve its business goals.

Note that our using TVG for team building does not represent an example of gamification. Gamification usually refers to adding game-like features to serious processes or artifacts to increase the intrinsic motivation to perform (Treiblmaier, Putz, & Lowry, 2018). We do not add game-like features to the traditional team-building process as is typical of most gamification designs. Rather, we use TVG to let the team

cooperate and practice achieving goals while playing an intense, enjoyable game. In TVG, individuals focus on playing and enjoying the game itself not on achieving a business goal or business process. With TVG, individuals exercise their skills, cooperate, and engage in intense coordinated effort with teammates in an enjoyable activity. In essence, they learn to cooperate by playing the game. Individuals learn to depend on and be dependable for other team members, which results in building relationships and strengthening teamwork skills (Cole & Griffiths, 2007). In summary, the team attributes developed during team-building activities can and do (Klein et al., 2009; Salas et al., 2005) carry over into their cooperative work in high-tech, cross-functional, team-centered workplaces (Gee, 2003).

Given this background on TVG, we pursue the following research questions (RQ):

RQ1: Will TVG increase team cohesion and goal commitment?

RQ2: If so, will team cohesion and goal commitment improve how teams perform on subsequent tasks as prior research has demonstrated?

RQ3: Will TVG also have a direct effect on team performance that team cohesion and goal commitment do not explain?

3 Theoretical Model

In this section, we theorize how traditional team-building activities and TVG-based team-building activities will affect team cohesion, goal commitment, and team performance and develop testable hypotheses. We synthesize the team performance and team video game literature and extend it based on the theory we develop and test in this study.

As we describe in Section 2, past research has found that team performance is primarily a function of team cohesion and goal commitment (Ahronson & Cameron, 2007; Boyle, 2003; Carron et al., 2002; Costello, 2004; Ensley & Pearson, 2005; Klein & Mulvey, 1995; Senécal, Loughead, & Bloom, 2008). Therefore, interventions that promote these outcomes should improve team performance. Figure 1 visualizes our theoretical model and hypotheses, which we explain throughout this section.

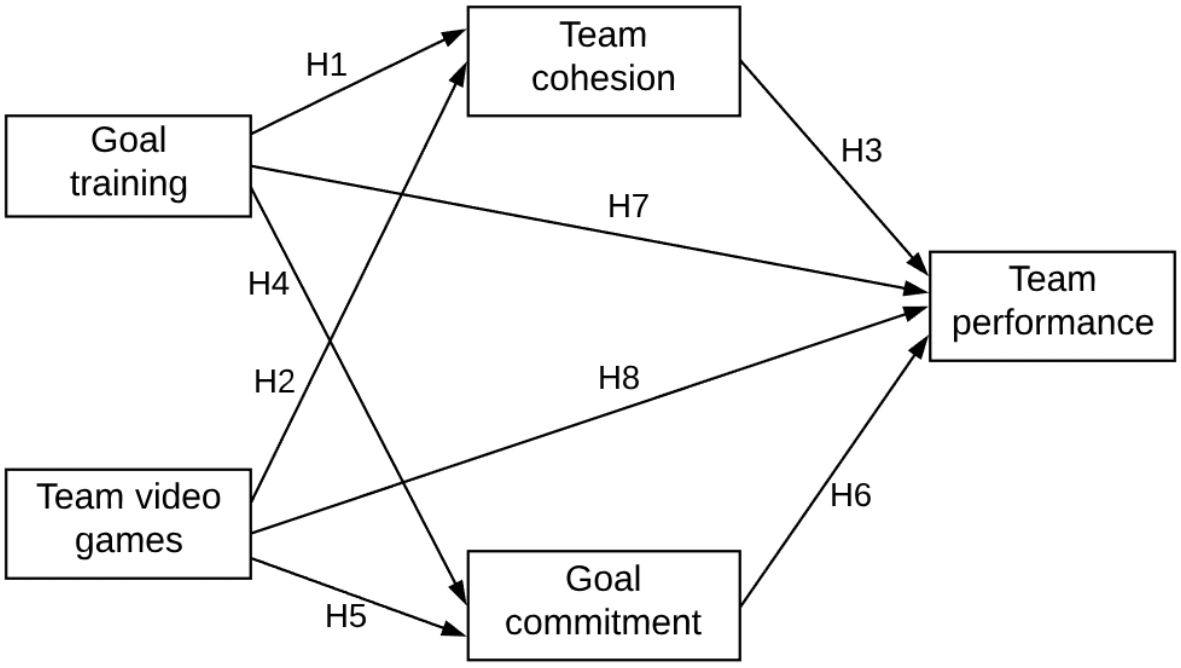


Figure 1. Theoretical Model

3.1 Team Cohesion and Team Performance

Some of the early conceptualizations of team cohesion include "the total field of forces which act upon members to remain in the group" (Festinger et al., 1950) and "the resistance of a group to disruptive forces" (Gross & Martin, 1952). These and other definitions of cohesion[2] share a common characteristic in that they both address how a team handles stress as it completes goals. According to Cartwright (1968), a cohesive group refers to one in which members are drawn toward one another and desire to remain a part of the group.

Later, researchers theorized and operationalized team cohesion as having two dimensions: task cohesion and social cohesion (Carron, 1982; Carron et al., 1985; Festinger et al., 1950; Mullen & Copper, 1994). Task cohesion reflects members' beliefs about whether team members cooperate well and feel like they can contribute toward the team's objectives and can help each other meet those objectives. In short, teams with task cohesion believe they can work well together to achieve common goals. The social component of team cohesion reflects team members' motivation to develop and maintain team social interactions. Members find the social bonding and task unity that develop in teams pleasing. Baumiester and Leary (1995) noted that the need to belong is a fundamental human motive. Therefore, the formation of social bonds produces positive affect, whereas failing to belong leads to negative feelings such as anxiety, loneliness, and jealousy. Research has found that both task cohesion and social cohesion are positively related with team performance (Beal, Cohen, Burke, & McLendon, 2003; Chiocchio & Essiembre, 2009). When cohesive, teams do not exhibit traditional barriers to task accomplishment, such as miscommunication, member misbehavior (e.g., free riders), and conflicting goals (Tjosvold, Yu, & Hui, 2004); thus, team cohesion facilitates goal realization. Figure 2 depicts the multidimensional group cohesion construct.

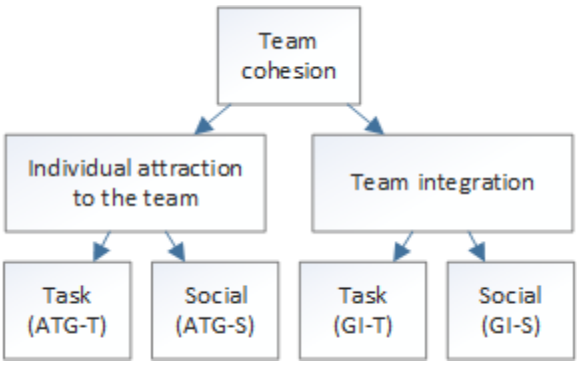


Figure 2. Team Cohesion Model

Team cohesion includes individual attraction-to-group (ATG) and group integration (GI). The GI-T and GI-S represent the "us", "our", and "we" individual perceptions of the group and, thus, suggest closeness, similarity, and bonding. The ATG-T and ATG-S represent the "I", "my", and "me" individual perceptions of self and an individual's motives to remain in the group (Carron et al., 2002). The "S" represents the social relationships in the group and how an individual views the social aspect of a group. The "T" identifies the individual's perception toward achieving a specific goal or objective. In summary, group cohesion includes both task (GI-T and ATG-T) and relationship (ATG-S and GI-S) subconstructs.

Over time, team cohesion has become a dominant explanation for team performance in organizations (Ahronson & Cameron, 2007; Boyle, 2003; Carron et al., 2002; Costello, 2004; Ensley & Pearson, 2005; Klein & Mulvey, 1995; Senécal et al., 2008). Indeed, researchers have found that cohesive teams are more productive than non-cohesive teams across a variety of team types and settings (Beal et al., 2003; Chiocchio & Essiembre, 2009). Cohesion in teams has both an instrumental and affective basis. All teams form to fulfill one or more purposes (Carron & Brawley, 2012; Huczynski & Buchanan, 2007). People participate in teams—work teams, sports teams, creative teams, and gaming teams—to meet their individual wants, needs, and responsibilities. Each team context requires a combination of skills, such as the ability to communicate, collaborate, and problem solve along with other team members. Therefore, as teams develop

[2] Team cohesion is a positive team construct that one can contrast with more negatively valenced team constructs such as groupthink and majority influence (Tan, Wei, Watson, Clapper, & Mclean, 1998), which suppress minority voices rather than leverage them.

greater cohesion, they are more likely to perform better and more likely to meet those needs (Carron, 1982; Carron et al., 1985).

In some cases, as teams develop strong cohesion, they may also develop some negative processes such as majority influence and groupthink. Majority influence occurs when the majority of team members are more vocal and convincing in accepting the majority's opinions and decisions (Crano & Chen, 1998). Majority influence can cause a group to abandon or ignore the minority's thoughts, decisions, and opinions. The majority influence effect occurs when the majority applies pressure to the minority to conform to their work. The minority desires to comply and, therefore, withholds their opinions and influence. However, this majority influence effect only occurs when a group majority judges an issues to be relevant to social identity concerns (Crano & Chen, 1998). In other words, majority influence occurs when the outcomes of the group are salient to how group members derive their self-concept. However, in team-building activities such as TVG, the game has inconsequential results that do not define the group status or legitimacy in their organizational environment. Therefore, we believe that group members will have little motivation to develop a majority influence from TVG.

Groupthink occurs when a group wants to minimize conflict and converges too quickly on group decisions without critically evaluating all the alternatives (Janis, 1972). Groupthink causes a loss of creativity and independent thinking. Groupthink often occurs when members have common beliefs, attitudes, and backgrounds. Team members extrapolate those commonalities to unrelated contexts. For example, team members might believe that, because they share similar political beliefs, they will agree on the best course of action in a business problem. We do not expect groupthink to be a serious concern with TVG because 1) success in video games does not relate to team members' common beliefs and backgrounds and 2) the short period of time required to engage in TVG as a team-building process (e.g., about one hour or less) and the focused, immersive nature of TVG does not allow the time or opportunity for teams to share common backgrounds and beliefs; hence, TVG will not encourage groupthink. In summary, although we expect TVG to lead to higher levels of team cohesion, we do not expect it to result in the negative outcomes of majority influence and groupthink.

3.1.1 The Effect of Goal Setting on Team Cohesion

Much research has demonstrated various treatments to improve team cohesion. In particular, research has often used traditional goal-training sessions in which newly formed teams meet to discuss and follow a formal process to set goals (Senécal et al., 2008). Although we focus on examining the effects of TVG on team outcomes (including cohesion) in this paper, we briefly theorize about goal training and goal setting in order to compare its treatment effects to TVG. In other words, we include a goal-training treatment as an example of a traditional team-building activity and also propose and test a TVG as a new form of team building.

Goal-setting sessions focus on increasing motivation among team members to achieve objectives, which helps them determine what resources the team will need, establish roles and improve interpersonal relations, and generate motivation among themselves (Salas et al., 2005). All of these factors help to reduce the potential for future conflict that inhibits the development of team cohesion (Huang, Wei, Watson, & Tan, 2003; Widmeyer & Ducharme, 1997). Therefore, we hypothesize:

H1: Goal training increases team cohesion beyond no treatment (control).

3.1.2 The Effect of TVG on Team Cohesion

Similar to goal setting, we also expect that TVG will improve team cohesion for both similar and unique reasons. TVG typically includes a clear task and a team goal that requires teams to collaborate (Gaskin & Berente, 2011). For example, many first-person shooters (e.g., Halo) feature multiplayer campaigns in which teams must work together to defeat a common enemy. In music-based games (e.g., Rockband), teams work together to play a song without failing or to achieve a threshold score. In both examples, the overall team performance depends on each team member's interdependent actions.

Furthermore, research has also shown that video gaming can help individuals form social bonds and feelings of belonging (Peña & Hancock, 2006), which are important to team cohesion's social component. In addition to its other benefits, TVG provides a low-risk collaborative activity in which teammates must communicate, coordinate their efforts, and decide on an appropriate division of labor. In other words, TVG provides a "safe" environment to fail, which reduces the likelihood of conflict. For example, if the team fails in a video game, team members often laugh and banter with one another in a friendly way. Indeed, because

of the fun and enjoyment aspect of video gaming, failure in games can even lead to bolstered efforts and a greater desire to remain engaged (Blackwell, Trzesniewski, & Dweck, 2007; Granic, Lobel, & Engels, 2014). Research has proven that task failure represents a significant predictor of future success (Brunstein & Gollwitzer, 1996). TVG allows teams to fail with minimal or no consequences. Therefore, they can obtain the benefits from failing while avoiding the conflict that may also arise with team failure that may impair team performance (De Dreu & Weingart, 2003).

In summary, TVG provides an opportunity for teams to replicate the goal orientation, task attraction, and social cooperation required in typical business tasks but in a low-risk environment. Therefore, we hypothesize:

H2: TVG increases team cohesion beyond no treatment (control).

3.1.3 The Effect of Team Cohesion on Team Performance

Research has established that team cohesion represents a primary driver of team performance (Beal et al., 2003; Carless & De Paola, 2000; Carron et al., 2002; Chiocchio & Essiembre, 2009; Cohen, 1993; Evans & Dion, 2012; Gully, Devine, & Whitney, 1995; Kaymak, 2011; Klein & Mulvey, 1995; Smith, 1996; Van Vianen & De Dreu, 2001). Cohesion provides a benefit when efficiency is important because cohesive teams communicate clearly and quickly and coordinate their actions effectively. This efficiency benefits teams that perform interdependent tasks. Thus, team cohesion, in an interdependent task context such as the TVG and goal-setting tasks performed in our experiments, should improve team performance.

Note that, as we discuss above, high levels of team cohesion can sometimes lead to negative outcomes such as groupthink. One indication that groupthink may exist in the presence of high cohesion (and negate performance effects) is when team members rate the social aspects of team cohesion (GI-S and ATG-S) as high or as higher than the task aspects (GI-T and ATG-T) (Bernthal & Insko, 1993). Due to 1) the short period required for the team-building activities we test and 2) the focus on the task in both the goal-setting and TVG treatments, we do not expect team members to do so (and we validated as much in a post hoc analysis). Thus, we hypothesize that team cohesion will increase team performance without the negative influences from groupthink.

H3: Team cohesion increases team performance.

3.2 Goal Commitment and Team Performance

A goal refers to a cognitive representation of a desired state, an idea of how we would like things to turn out (Fishbach & Ferguson, 2007; Kruglanski, 1996). Goal commitment refers to one's determination to reach a goal (Locke & Latham, 1990). In the context of team performance, effort toward a goal increases when all members of a team have adequate goal commitment.

Individuals with high goal commitment direct their cognitive and behavioral resources toward attaining the goal, whereas individuals with low goal commitment may direct their efforts into unrelated activities because they have not internalized the goal (Aubé & Rousseau, 2005; Renn, 2003).

Ansoff (1970) states that goals facilitate team performance in ways beyond just representing a desired outcome. Goals help groups decide what needs to be done; they encourage the division of labor, stimulate coordinated effort, and help group members to assess the group's progress. The goal can involve a variety of activities that help develop good internal social interactions that a team needs to increase its united purpose (Levi, 2013). Team goals and commitment to those goals provide another means of influencing team performance (Shaw & Barrett-Power, 1998).

Goal commitment conceptually differs from the task element of team cohesion and, therefore, necessitates that one include it as a separate construct in a model of team performance. In particular, the task element of team cohesion represents a social construct concerning the individual team member's belief that the team can work effectively on the task, whereas goal commitment represents an individual team member's determination to achieve a team goal. Therefore, as with prior research (Klein & Mulvey, 1995; Klein et al., 1999), we include both in our model.

As with prior research, we expect a goal-training treatment to increase goal commitment because the task of goal setting helps team members to agree on a shared goal. Therefore, we hypothesize:

H4: Goal training increases goal commitment.

We also expect the TVG-based treatment will increase team members' goal commitment. Researchers have identified several attributes of TVG as important determinants of goal commitment. Competition leads to greater goal commitment (Locke & Latham, 1990; Locke, Latham, & Erez, 1988). Competition is a key element of almost all video games (Vorderer, Hartmann, & Klimmt, 2003). Participation in the goal-setting process (as opposed to assigned goals) is also a key indicator of goal commitment (Latham & Yukl, 1975). TVG naturally allows all team members to participate in the goal to win (i.e., to beat the other team they play against or to beat the game). Team members self-select these goals. No authoritative figure dictates that a work team must win at TVG. Finally, peer influence is another strong indicator of goal commitment. Peers can act as role models because motivated peers can encourage others to commit to goals (Bandura, 1986). Role models may emerge in TVG activities because those who are more excited and competitive about the gaming may encourage those who are less so (Infante et al., 2010). In summary, we hypothesize:

H5: TVG increases goal commitment.

Goals are a pervasive construct that a variety of theories, such as goal theory (Locke & Latham, 1990) and social cognitive theory (Bandura, 1991), use to explain self-regulation and motivation (Klein et al., 1999). Goal commitment improves performance by focusing group members on the outcome of their interactions, which accelerates their actions toward a united goal (Klein & Mulvey, 1995; Klein et al., 1999). When compared to groups with competitive or individual goals, groups committed to cooperative goals tend to exhibit greater performance (Tjosvold et al., 2004). In summary, we hypothesize:

H6: Goal commitment increases team performance.

3.3 Direct Effects of Treatments

We also have reason to expect that the goal training and TVG treatments will have direct effects on group performance. These direct effects represent variance that the team cohesion and goal commitment theories do not explain. For example, goal training—while clearly beneficial—does not inherently offer the same level of potential enjoyment as TVG. Furthermore, video games can facilitate a "flow" state where team members can lose track of time and get "in the zone" due to the right combination of enjoyment and challenge (Chen, 2007; Cowley, Charles, Black, & Hickey, 2008). The lack of intrinsic rewards and enjoyment during a goal-setting task may produce negative effects on subsequent task performance. However, we do not formally theorize and hypothesize all possible effects in this paper. However, because academic research has not previously studied TVG, we also explore the direct effects that may warrant future research. Therefore, we posit the following undirected hypotheses:

H7a: Goal training has no effect on team performance.

H7b: Goal training has an effect on team performance.

H8a: TVG has no effect on team performance.

H8b: TVG has an effect on team performance.

3.4 Entrainment Theory

Although multiple meta-analytic studies have established that the team processes and outcomes developed during team-building activities have a significant carry-over effect to workplace tasks (Klein et al., 2009; Salas et al., 2005), we review some theoretical reasoning for why this carry-over effect exists. When teams initially form, they begin to develop "norms"—informal and unwritten rules that govern individuals' behavior (Feldman, 1984; Shaw, 1971). These group norms may include how a team interacts, communicates, defines roles, delegates responsibility, and maintains accountability (Shaw, 1971). We expect these norms to "carry over" from one type of group task to another. But, to explain why this phenomenon occurs, we draw from entrainment theory (Ancona & Chong, 1996; Moon et al., 2004).

Entrainment theory posits that, as a set of norms and habits become routine in a group, they become self-reinforcing (i.e., "entrained")—meaning they will persist over time even if the cause of their initial formation no longer exists in the same form (Ancona & Chong, 1996). Research has demonstrated this phenomenon in a variety of team functions, such as decision making (Bettenhausen & Murnighan, 1985), role structure (Moon et al., 2004), and advice seeking in teams (Keith, Demirkan, & Goul, 2010). This carry-over effect occurs because rules for team governance—even if they are unwritten and unofficial—help increase the predictability of team members' behaviors in new settings, which facilitates task accomplishment (Feldman,

1984). In other words, team members know what they can expect from each other and, therefore, adopt roles and responsibilities faster and with less uncertainty in new contexts.

For example, if a newly formed work team began by participating in a cooperative task such as TVG, the norms developed during that activity would persist to future activities and help team members set expectations for roles, interaction, communication, and even accountability. If they care about performance, they will need to engage in some type of team self-correction to improve their performance. Guided team self-correction has a significant positive impact on future performance (Smith-Jentsch, Cannon-Bowers, Tannenbaum, & Salas, 2008). It includes developing a shared mental model of redefining roles and accountability. It also requires that team members have a willingness to accept correction and communicate effectively. When stakes are high, team self-correction can be a delicate and difficult task (Tannenbaum & Cerasoli, 2013). Among its benefits, TVG allows the norms for team self-correction to develop in an environment that has proven to be enjoyable and immersive with limited personal risk (Greitemeyer & Cox, 2013). And, according to entrainment theory, these norms can carry over to subsequent tasks. In summary, entrainment theory explains why it is logical to measure the effects of team-building activities (e.g., goal-training and TVG) on team outcomes (e.g., performance) on subsequent tasks as prior research on team-building exercises has demonstrated (Klein et al., 2009; Salas et al., 2005).

4 Methodology

To test our theoretical model (see Figure 2), we designed a laboratory experiment.

4.1 Subjects

We recruited undergraduate students at a private university in the western United States to participate in the study. We recruited them via an online university system that allowed students across a variety of disciplines to register to participate in research activities for extra credit. Therefore, the research also took place on campus but in laboratory environment designed specifically for academic research. We randomly assigned the participants to teams and the teams to treatments. We did not put the participants in teams with other participants with whom they had preexisting relationships. The participants who we assigned to the TVG treatments could select one of two possible popular[3] games—Rock Band or Halo 4—based on their familiarity with them, which allowed them to play the game that they had the most experience with and that they found most interesting and engaging. We allowed participants to make this choice to maximize the likelihood of the video game effect and because the process resembled how a team would select a video game in real life. To control for video game ability, we asked subjects about their level of experience with the game and then balanced the level of video game experience across teams so that teams competed against other teams of roughly equivalent skill. A total of 352 participants (80 teams) completed all the procedures. Of the participants who reported their gender, 21 percent were female.

4.2 Task Selection Criteria

We designed the task in the experiment to replicate the context of a newly formed work team in competition with other teams and under time pressure. Therefore, we selected a task that met the following criteria: 1) it limited how long participants could try to complete the task, 2) it included an element of competition to increase team motivation, 3) it required teams to set their own team goals, 4) it required team members to coordinate and collaborate to achieve the best results, 5) it allowed teams to select their own strategies and division of labor so that the team could benefit from their own creativity and ingenuity, and 6) it offered readily calculable objective performance measurements and feedback so that teams could evaluate their own performance and compare their performances to one another.

4.3 Study Design

The study included several steps. The teams 1) performed the first round of the mobile application Findamine (see Section 4.3.1) as a pre-test task to establish a team performance baseline, 2) received team performance feedback so they could see how they performed and could evaluate their performance relative to other teams, 3) received an intervention/treatment, 4) set a team goal for performance for the second

[3] These games were chosen based on their popularity. Rock Band 3 (McGonigal, 2011) and Halo 4 (Peacocke, Teather, Carette, & MacKenzie, 2015) have both been best-selling team video games.

round of the Findamine post-test task, and 5) performed the second Findamine task as a post-test so that we could measure changes in performance.

4.3.1 Task

For the experimental task, we used a mobile geocaching application called Findamine (pronounced "find a mine") that researchers created for research purposes and have successfully used in prior field experiments in IS research (Keith, Babb, Lowry, Furner, & Abdullat, 2015; Steinbart, Keith, & Babb, 2016), though we modified it to fit our context. The application presents clues for finding specific landmarks. Rather than giving GPS-based latitude/longitude coordinates, Findamine gives players short, text-based clues (e.g., "This building was built in 1973") that could help the participants identify the landmarks. We distributed the destination landmark across different locations on campus. If participants could not determine the landmarks by the clue alone, they could use the "hot-cold" meter on the application that told them how close or far away they were from them based on the real-time global positioning system (GPS) coordinates that the player's device provided. The teams earned points by successfully deciphering the clue, traveling to the landmark, and taking a picture of themselves with it. The mobile application automatically uploaded the pictures to a website.

The participants could identify and visit more landmarks by dividing into pairs, so they received rewards for dividing labor, communicating with other team members, and collaborating with other team members. However, the application tracked the total time elapsed from when someone opened a clue until the application submitted the correct picture of the landmark (verified by the GPS coordinates embedded in the photo). We deducted the natural log of the minutes elapsed from the possible clue points to incentivize participants to work quickly.

Teams completed this task twice (with different clues and landmarks the second time, and we randomized both times), and we had an intervention between the two tasks so we could conduct a survey. We also conducted surveys before and after the tasks. The full procedure required three hours.

4.3.2 Pre-task: Establishing Baseline Team Performance

After we assigned participants to teams, two team members (and only two) installed the Findamine application on their smartphones[4]. The Findamine application on each device downloaded six clues associated with six specific landmarks (the same six clues for each phone and each team). We then explained the purpose of the application and the rules of the task. We provided the subjects with 25 minutes to find as many landmarks as fast as possible[5]. Their total score equaled the combined total of the points on both phones. The other team members could use their phones only for communication. The teams could devise their own strategy (e.g., stay together in a team or divide into subteams). We gave every team five minutes to discuss their strategy. We then sent them on their way to find as many landmarks as possible in the 25-minute time limit. We asked each team to earn the highest score possible and incentivized them by noting that we would provide a US$20 Visa cash card to each member in the winning team. As the teams found lamdmarks, the website that the application uploaded the photos to displayed a leaderboard in real time. As the teams returned, we showed them their standing on the leaderboard so they could compare their performance with other teams. The teams then recorded their own team performance scores.

4.3.3 Team Interventions: Treatments

After completing the pre-test task, we randomly (but evenly) assigned each team to one of three treatments: 1) control, 2) goal training, or 3) team video gaming.

We asked the teams we assigned to the control treatment to spend the next 45 minutes working by themselves on homework. We instructed the team members not speak with each other until we brought them back together to set a goal before the post-test task began. With the control treatment, we could measure the change if any in team performance from teams that worked on the same type of team task in the pre-test and post-test with no team-building intervention in between.

[4] At least two participants in each team had a smartphone that had GPS capability that they could use for the task.
[5] Due to the time limit, participants had to physically exert themselves to some degree. Although we did not restrict participation to able-bodied individuals, only able-bodied individuals participated in the study. As such, physical ability did not hamper or provide a systematic advantage to any one team.

For the goal training treatment, we followed a method approach to the task-oriented team-development method that Rubin, Plovnick, and Fry (1978) developed due to its popularity, simplicity, and easy replicability. Researchers have also successfully applied it to student groups in a brief team-development intervention similar to our own study (Bushe & Coetzer, 1995). We gave individuals in teams in this treatment a specific series of questions to answer about four potential inhibitors that might have limited their performance on the first Findamine outing: 1) the process the team chose to use, 2) how the team allocated individuals to tasks, 3) how well team members communicated and coordinated their work, and 4) whether all team members gave their best effort. We then asked the team members to compare their answers and discuss whether they believed each of the four potential inhibitors negatively impacted their team performance. They then discussed ways to improve their team performance. Subsequently, we asked the teams to set specific performance goals for their second Findamine task. We gave the teams a worksheet to complete that required them to specify a measurable objective and a challenging but achievable goal for the score they wanted to earn in the next round of Findamine. We asked the teams to define the steps and strategies they would take to achieve that goal and to record these strategies on their worksheet.

Finally, for the TVG treatment, we selected Rockband 3 and Halo 4 primarily because of the interdependent nature of the team tasks and because the popularity of the games meant that many students knew how to play them. In Rock Band, individuals play different instruments and must coordinate their activities to correctly perform the songs. In Halo, the players participated in the "capture the flag" mode in which teams of four against must coordinate their attacks and defensive strategies to beat the other team. We tasked each team in the Rock Band condition with earning the highest possible score against another team in the condition across any four songs they liked. The winning teams earned large candy bars for each member. We tasked each team in the Halo 4 condition with winning at least two out of three rounds against another team in the condition. The winning teams earned large candy bars for each member.

All three treatments lasted 45 minutes. We observed the teams in the goal training and TVG treatments. Participants in the TVG treatment became highly engaged in the video games. Participants in the goal training workshop treatment completed the tasks we assigned to them but seemed less absorbed in the intervention than the subjects in the TVG treatment. Regardless of the treatment, all teams completed the posttask (i.e., a second round of Findamine).

4.3.4 Posttask: Measuring Change in Team Performance

After the treatment, two team members in each team again downloaded new clues for new landmarks on campus to their smartphones, though this time they downloaded seven rather than six clues and, thus, could find seven rather than six landmarks[6]. Once again, the teams had 25 minutes to find and photograph themselves at as many landmarks as possible. After finishing this task, the teams viewed their standing on the leaderboard for the second task and completed another survey that measured team cohesion.

4.4 Measures

We measured the attitudinal variables in this study using latent construct items that we drew from prior research and adapted to this study. We measured team cohesion based on Carron et al.'s (1985) conceptual model, which includes GI-T, GI-S, ATG-T, and ATG-S. We modeled team cohesion as a first-order reflective and second-order formative construct based on prior research (Carron et al., 1985). We adapted task interdependence from Sharma and Yetton (2007). Similarly, we drew goal commitment drawn from prior research. As we mention above, we measured team performance as the team composite score on the Findamine task. The score equaled the number of landmarks found minus the natural log of the minutes required.

We performed an initial analysis to test the convergent and discriminant validity of the reflective subdimension measures, to test for multicollinearity, and to ensure reliabilities. We show the results for these analyses in Tables 1 and 2.

Table 1. Latent Measurement Items and Outer Loadings

Construct	Item	Outer loading

[6] We increased the number of landmarks and clues in the second task because pilot tests revealed that participants gained experience and skill from the first task that translated into faster task completion times. Therefore, to even out the total time that the two tasks required, we needed to increase the number of clues and landmarks.

Table 1. Latent Measurement Items and Outer Loadings

Group integration task	**GI-T1r**: I am not happy with my level of participation within these activities and what my responsibilities are during the activities.	0.736***
	GI-T2r: I am unhappy with my team's level of desire to do well in this activity.	0.854***
	GI-T3r: This team does not give me enough opportunities to improve my skills used in these activities.	0.717***
	GI-T4r: I do not like the style of how this team completes this activity.	0.781***
Group integration task	**ATG-T1**: Our team is united in trying to reach its goals and performance in this activity.	0.837***
	ATG-T2: We all take responsibility for any loss or poor performance by our team.	0.692***
	ATG-T3r: Our team members have conflicting aspirations for the team's performance.	0.536***
	ATG-T4: If members of our team have problems while they are doing this activity, everyone wants to help them figure out how to improve their performance.	0.782***
	ATG-T5r: Members of our team do not communicate freely about each other's performance and abilities during this activity.	Dropped
Inter-dependence	**INT1r**: My portion of the Findamine task could be performed fairly independently of others.	Dropped
	INT2r: My portion of the Findamine task could be planned with little need to coordinate with others.	0.871*
	INT3r: My portion of the Findamine task was relatively unaffected by the performance of other individuals in my group.	0.910**
Goal commitment	**GC1**: I am strongly committed to pursuing this goal.	0.821***
	GC2: I think this goal is a good goal to shoot for.	0.822***
	GC3r: Frankly, I don't care if the group achieves this goal or not.	0.827***
	GC4r: It would not take much to make me abandon this goal.	0.623***
	GC5r: It's unrealistic to expect to reach this goal.	0.487**

Table 2. Validity and Reliability

Construct	ATGT	GIT	ATGS	GIS	GC	INT	Composite reliability	α	VIF
ATGT	**0.526**	0.394	0.257	0.442	0.272	0.122	0.812	0.697	2.08
GIT	0.155	**0.611**	0.184	0.605	0.198	0.190	0.862	0.786	2.13
ATGS	0.066	0.034	**0.741**	0.474	0.009	0.149	0.851	0.632	1.43
GIS	0.195	0.366	0.225	**0.539**	0.228	0.171	0.777	0.569	2.17
GC	0.074	0.039	0.000	0.052	**0.536**	0.114	0.848	0.775	1.16
INT	0.015	0.036	0.022	0.029	0.013	**0.501**	0.729	0.793	1.12

Note: AVEs appear on the diagonal, correlations appear above the diagonal, and squared correlations appear below the diagonal.

We removed the questions HE4, ATG-T5, and INT1 because they did not load sufficiently with the other questions in the constructs. With the remaining questions, all criteria were met with the exception of low reliability scores for the constructs ATG-T (α = 0.697) and CO (α = 0.643), which were both just under the 0.7 cutoff (Santos, 1999) but still above the 0.6 cutoff (Hair, Anderson, Tatham, & Black, 1998). However, all other appropriate tests for reflective constructs for convergent and discriminant validity were met at the highest levels. In particular, all AVEs were above the 0.50 recommended cutoff and greater than the squared correlation between the focal construct and the subdimensions (Fornell & Larcker, 1981). Composite

reliability was greater than 0.70 for every subdimension. In addition, multicollinearity was extremely low since all VIFs were well below the recommended cutoff of 10 (Hair et al., 1998).

Considering that all validity criteria were met and given that we drew these items from well-validated existing scales, we opted to keep the remaining items and proceed with the hypothesis testing. Overall, the results indicated acceptable factorial validity and minimal multicollinearity or CMB based on the standards for IS research (Gefen & Straub, 2005; Liang, Saraf, Hu, & Xue, 2007; Pavlou, Liang, & Xue, 2007; Straub, Boudreau, & Gefen, 2004).

5 Results

5.1 Treatments

Figure 3 illustrates the change in performance measured in points earned from the second task over the first task for the three treatments. The results indicate an approximately 20 percent performance improvement for the collaborative video gaming treatment and almost no effect of the goal training treatment. A repeated measures ANOVA analysis shows a clear effect of treatment (F = 5.282, p = 0.007) with no difference between team sizes of three and four and no difference between the two different video games. An a priori power analysis conducted with G*Power resulted in a power of 0.95 for our sample size, well above the 0.80 threshold that Cohen (1988) recommends.

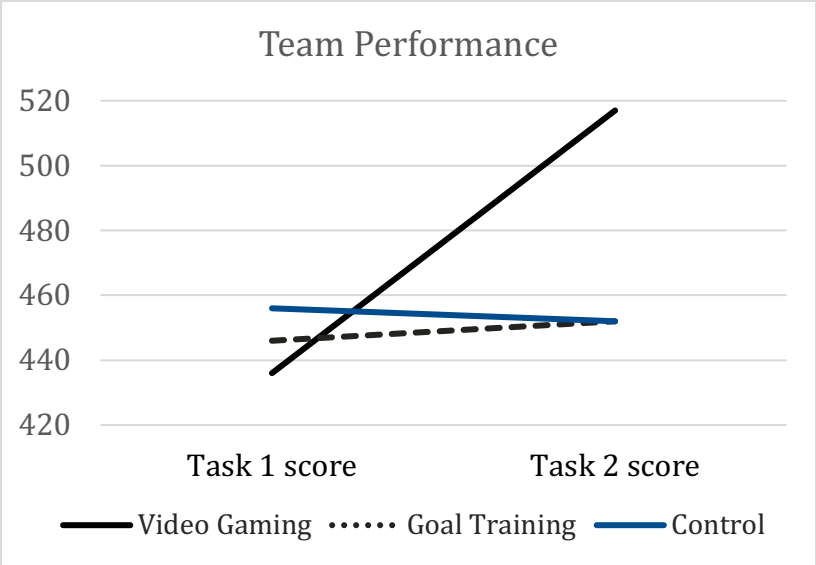
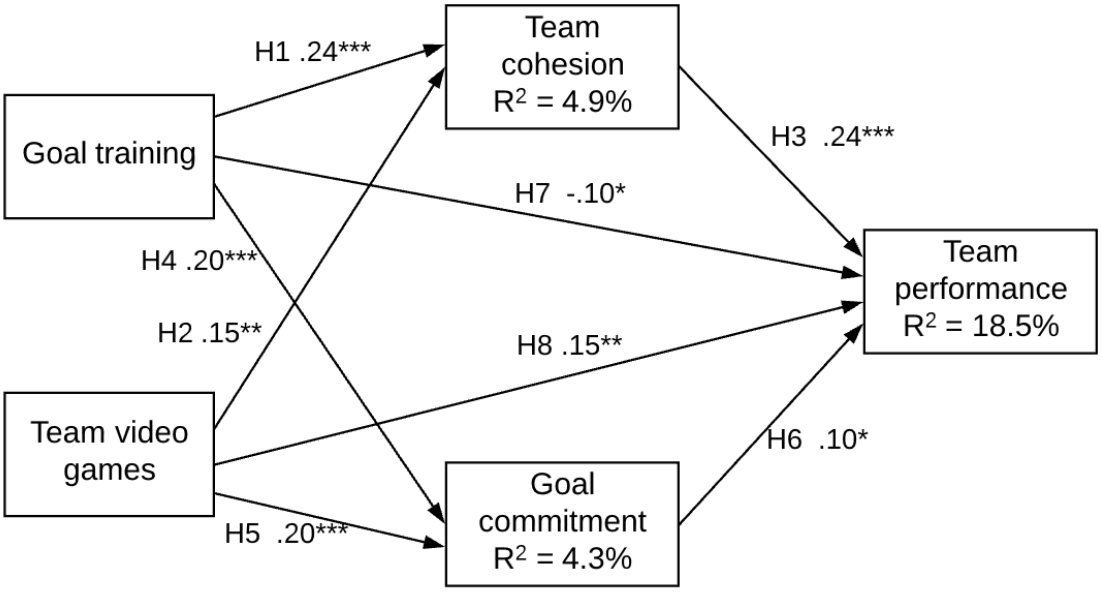


Figure 3. Team Performance Improvement

To test our theoretical model, we developed a path model with the partial least squares (PLS) structural equation modeling technique using SmartPLS 3.2.6. This approach suited our efforts because 1) we needed to test multiple paths in the same model, 2) we modeled two of our constructs as second-order formative factors, and 3) PLS does not depend on normal distributions or interval scales (Chin, Marcolin, & Newsted, 2003; Fornell & Bookstein, 1982), which makes it ideal for our objective measures of task performance.

Figure 4 shows the path coefficients for the PLS model. We generated the t-statistics from running 3,000 bootstrap procedures. R^2 values represent the amount of total variance accounted for by the exogenous variables.



Note: ***p < 0.001, **p < 0.01, *p < 0.05

Figure 4. Path Coefficients and Bootstrap Results

As H1 and H2 posit, both goal training (β = 0.24, p < 0.001) and TVG (β = 0.15, p < 0.01) improved team cohesion. Goal training had a stronger effect than TVG on team cohesion. As H3 posits, team cohesion had a significant positive impact on team performance (β = 0.24, p < 0.001). We also found support for H4 and H5. Goal training (β = 0.20, p < 0.001) and TVG (β = 0.20, p < 0.001) both had a positive impact on goal commitment. Further, as H6 posits, goal commitment had a positive impact on team performance (β = 0.10, p < 0.05).

Our two exploratory hypotheses (H7 and H8) yielded interested results. In both cases, our results rejected the null hypotheses since both goal training and TVG had significant effects. In particular, TVG had a significant positive direct effect on performance (β = 0.15, p < 0.01). However, goal training had a negative direct impact on team performance (β = -0.10, p < 0.05). These direct effects explain the overall performance difference between treatments visualized in Figure 3. We discuss the possible explanations for these effects in Section 6.

Two other control variables had a significant impact on team performance but do not appear in Figure 4 for simplicity. The team performance on the first task had a significant impact on the team's performance on the second task (β = 0.43, p < 0.001), and teams of four outperformed teams of three (β = 0.17, p < 0.001).

Table 3. Summary of Hypotheses and Findings

Hypothesis	Supported?	Finding
H1	Yes***	Goal training increased team cohesion.
H2	Yes**	TVG increased team cohesion.
H3	Yes***	Team cohesion increased team performance.
H4	Yes***	Goal training increased goal commitment.
H5	Yes***	TVG increased goal commitment.
H6	Yes*	Goal commitment increased team performance.
H7a	No	Goal training affected (decreased) team performance.
H7b	Yes*	
H8a	No	TVG affected (increased) team performance.
H8b	Yes**	
Notes: as a reminder, H7 and H8 were *exploratory* (not theoretically supported) hypotheses. ***p < 0.001; ** p < 0.01; * p < 0.05		

6 Discussion

Primarily, we found that the TVG treatment proved significantly more effective than both the control treatment and the goal training treatment in improving team performance. This result provides evidence that TVG may truly be a viable—and perhaps even optimal—alternative for team building. This finding also concurs with entrainment theory and all prior research on team-building activities (Klein et al., 2009; Salas et al., 2005) in that the beneficial effects of the TVG team-building treatment carried over to subsequent work tasks.

TVG and goal training affect team performance directly and through team cohesion and goal commitment. Both team cohesion and goal commitment act as mediator variables.

The results show that, while TVG had a significant effect on team cohesion, the goal training treatment appeared to have a stronger effect than TVG. We attribute this finding to the fact that the participants in the goal training treatment spent their time doing things directly related to developing team cohesion. Specifically, they examined the effectiveness of the team's work process, how they allocated one another to tasks, how well team members communicated and coordinated their work, and whether each person gave their best effort. Plus, they spent this time in face-to-face discussion, which also likely helped with social cohesion. Conversely, the teams in the TVG treatment spent the time cooperating on a challenging and enjoyable video game. They did not spend their time specifically discussing their team performance on the first Findamine task, which, we believe, explains why the goal training treatment had a stronger positive impact on team cohesion. The activities in the goal training treatment increased participants' perceptions that their team members could and would work well together to achieve the team's goal.

Both TVG and goal training had the same effect on goal commitment. The fact that the strength of the effect of both TVG and goal training treatments on goal commitment was the same ($\beta = 0.20$, $p < 0.001$) suggests that the TVG treatment generated goal commitment as effectively as the goal training treatment even though goal training teams spent much more time specifically setting specific realistic and challenging team goals and discussing how they could improve their performance on the post-test task. We believe that TVG had a strong impact on goal commitment because participants work intensely toward team goals while playing the games. They repeatedly work together to set and strive for attaining goals during the gaming experience. Plus, they can observe how much effort each person expends while pursuing the team's gaming goals.

Goal commitment had a weaker effect on team performance than team cohesion. This finding generally concurs with prior group-based research that shows that team cohesion is the strongest indicator of team performance (Beal et al., 2003; Carless & De Paola, 2000; Carron et al., 2002; Chiocchio & Essiembre, 2009; Cohen, 1993; Evans & Dion, 2012; Gully et al., 1995; Kaymak, 2011; Klein & Mulvey, 1995; Smith, 1996; Van Vianen & De Dreu, 2001).

In Section 3.1.3, we state that negative phenomenon such as groupthink may coexist with high team cohesion and, thus, negate the positive performance effects. However, our results indicated that team members rated the social-oriented subconstructs team cohesion (ATG-S = 3.72 and GI-S = 4.29) much lower than the task-oriented subconstructs (ATG-S = 5.27 and GI-S = 5.52). This result indicates that groupthink did not likely exist in our results (Bernthal & Insko, 1993).

The interesting direct effects that goal training and TVG had on team performance require further research. In particular, goal training had a significant negative effect on performance after accounting for the variance that the TVG treatment and team cohesion and goal commitment explained due to (we expect) the higher levels of enjoyment and "flow" that TVG creates. Flow, known as "being in the zone", refers to a mental state in which individuals become fully immersed in a task (Csikszentmihalyi, 1975). They get a sense of heightened enjoyment, time dissociation, being in control, and curiosity in their task (Agarwal & Karahanna, 2000). Future research should consider adapting the flow construct to the team level in order to explain these exploratory direct effects.

6.1 Implications

Our results have significant implications for both research and practice. Namely, if the effect of video gaming on team performance (20% improvement) remains consistent across other types of tasks, then any team task that requires three to five hours of work or more could conceivably benefit by first spending 45 minutes on TVG. Organizations without the time or money to spend putting employees through other costly and more time-consuming team-building activities would find TVG particularly useful.

We emphasize that we chose the video games and modes of play that we used in this research because they met important criteria that we theorized would benefit the team-building task. We chose games that people had experience with, that we could easily use for team competition, or that we could use to measure a team's performance over its past game performance. These criteria increased the element of competition against others or against a team's last performance and also made it possible for teams to play at or near their level of ability, which accentuates the beneficial effects on competition on the team-building activity. The games also had excellent scoring capabilities, so they gave accurate and meaningful feedback to teams while the teams played so teams could adapt their performance based on ongoing feedback during the games. The games also required very active levels of collaboration. Team members had to cooperate and coordinate their activities to perform well with the games. Practitioners and researchers should bear in mind that both cooperation and competition may be necessary when using TVG as team-building interventions in the future since not all collaborative games have these characteristics.

The R^2 for team performance (18.5%) compares well to similar studies of human behavior and task performance (e.g., Bruner & Spink, 2010; DeChurch & Mesmer-Magnus, 2010) and is relatively strong for an observed (rather than perceptual) dependent variable.

6.2 Limitations and Future Research

Our research has several limitations that we note here. First, we conducted a laboratory experiment. Although conducting laboratory experiments represent a necessary and useful first step in establishing a phenomenon, future needs to ensure that our results generalize to practical workplace settings.

Second, we used university students as participants. Thus, although we could replicate the context of new teams, students are typically younger and more interested in video gaming than older employees (Lenhart et al., 2008). Our participants were generally familiar with video games and specifically with these games. Therefore, they did not need to spend time learning how to play them. A complete novice at these games would require time to develop these skills, so the results would likely be different for people who did not have these skills. This limitation impacts some organizations more than others. Some organizations have more employees who are younger and are experienced with such games than other organizations. Managers should not assume that all video gaming will be beneficial. We specifically chose the games we used in the research due to their interdependent and competitive features. They have also attracted a large number of users because they are enjoyable and challenging.

Third, newly formed work teams represent our study's context. While this context has practical relevance and usefulness, it does not represent the context in which teams have previously existed for a significant amount of time. In other words, the TVG treatment may not have the same effect on preexisting team members who have already established norms, biases, and opinions about other team members. For example, if teams have already formed and members are familiar with each other, then competitive video gaming may possibly reinforce biases and negative relationships developed from previous experience with team members.

Fourth, the Findamine task we used represents some, but not all, workplace tasks since it 1) represents a time-sensitive, competitive environment; 2) rewards team communication and collaboration; and 3) allows one to easily collect objective performance data. In a workplace that does not feature time-critical cooperative interdependent tasks, then collaborative video gaming may not have as great a benefit. Future research should compare our results to other contexts to see how and where one can best apply them.

Fifth, the fairly modest R-squares for the endogenous variables in our model present an opportunity for future research to better explain team cohesion, goal commitment, and team performance. Other team-level constructs, such as diversity (Horwitz & Horwitz, 2007) or shared vision (Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000), may more completely explain team performance. Additionally, one might elevate individual-level performance predictors, such as cognitive absorption (Agarwal & Karahanna, 2000) or flow (Csikszentmihalyi, 1975), to team-level constructs to better explain team performance. Cognitive absorption,

in particular, may be a salient predictor of performance because it is a rich, multidimensional measure of flow in IS research (Easley, Devaraj, & Crant, 2003; Lowry, Gaskin, & Moody, 2015; Lowry, Gaskin, Twyman, Hammer, & Roberts, 2012) that has a strong background in gamification research (Treiblmaier et al., 2018). Flow accounts for subconstructs such as enjoyment and time dissociation that pertain highly to TVG. The difficulty will be adapting it to the team-level to somehow capture "team flow". We leave such efforts to future research to explore.

Finally, although this research represents a positive "first step" in understanding the positive effects of TVG on team performance, deeper aspects of TVG remain unexplored. For example, Liu, Li, and Santhanam (2013) call for greater research into the effects of competition and cooperation in video gaming. Social interdependence theory (Beersma et al., 2003; Deutsch, 1949) may be a useful lens to explore these effects as it explains how individuals are motivated when others' actions affect their own—both competitively and cooperatively. We recommend that future research dig deeper into our results by theorizing about how the competitive and cooperative aspects of TVG uniquely and jointly influence subsequent team performance.

7 Conclusion

Overall, we found a positive, practical use for collaborative video gaming for enhancing team performance. By basing this team intervention on a theoretical model, one may consider our research as contributing to knowledge about how best design effective teams (in the context we examined). We hope that our theory and results will inspire additional research into the potential benefits of collaborative video gaming for small work teams.

References

Agarwal, R., & Karahanna, E. (2000). Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly, 24*(4), 665-694.

Ahronson, A., & Cameron, J. E. (2007). The nature and consequences of group cohesion in a military sample. *Military Psychology, 19*(1), 9-25.

Ancona, D., & Chong, C. (1996). Entrainment: Pace, cycle, and rhythm in organizational behavior. In L. Cummings & B. M. Staw (Eds.), *Research in organizational behavior* (vol. 18, pp. 251-284). Greenwich, CT: JAI Press.

Ansoff, H. I. (1970). *Corporate strategy: An analytic approach to business policy for growth and expansion*. New York, NY: Penguin Books.

Aubé, C., & Rousseau, V. (2005). Team goal commitment and team effectiveness: The role of task interdependence and supportive behaviors. *Group Dynamics: Theory, Research, and Practice, 9*(3), 189-204.

Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes, 50*(2), 248-287.

Barlow, J. B., Giboney, J. S., Keith, M. J., Wilson, D. W., Schuetzler, R. M., Vance, A., & Lowry, P. B. (2011). Overview and guidance on agile development in large organizations. *Communications of the Association for Information Systems, 29*, 25-44.

Bartle, R. (1996). Hearts, clubs, diamonds, spades: Players who suit MUDs. *Journal of MUD RESEARCH, 1*(1), 19-42.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*(3), 497-529.

Beal, D. J., Cohen, R. R., Burke, M. J., & McLendon, C. L. (2003). Cohesion and performance in groups: A meta-analytic clarification of construct relations. *Journal of Applied Psychology, 88*(6), 989-1004.

Beersma, B., Hollenbeck, J. R., Humphrey, S. E., Moon, H., Conlon, D. E., & Ilgen, D. R. (2003). Cooperation, competition, and team performance: Toward a contingency approach. *Academy of Management Journal, 46*(5), 572-590.

Bernthal, P. R., & Insko, C. A. (1993). Cohesiveness without groupthink: The interactive effects of social and task cohesion. *Group & Organizational Management, 18*(1), 66-87.

Bettenhausen, K., & Murnighan, J. K. (1985). The emergence of norms in competitive decision-making groups. *Administrative Science Quarterly*, *30*(3), 350-372.

Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development, 78*(1), 246-263.

Boyle, I. T. (2003). *The impact of adventure-based training on team cohesion and psychological skills development in elite sporting teams* (doctoral thesis). University of Wollongong, New South Wales, Australia.

Brand, J. E., Todhunter, S., & Jervis, J. (2017). *Digital Australia Report*. Eveleigh, NSQ: IGEA.

Bruner, M. W., Eys, M. A., Beauchamp, M. R., Côté, J. (2013). Examining the origins of team building in sport: A citation network and genealogical approach. *Group Dynamics: Theory, Research, and Practice, 17*(1), 30-42.

Bruner, M. W., & Spink, K. S. (2010). Evaluating a team building intervention in a youth exercise setting. *Group Dynamics: Theory, Research, and Practice, 14*(4), 304.

Brunstein, J. C., Gollwitzer, P. M. (1996). Effects of failure on subsequent performance: The importance of self-defining goals. *Journal of Personality and Social Psychology, 70*(2), 395-407.

Bushe, G. R., & Coetzer, G. (1995). Appreciative inquiry as a team-development intervention: A controlled experiment. *The Journal of Applied Behavioral Science, 31*(1), 13-30.

Carless, S. A., & De Paola, C. (2000). The measurement of cohesion in work teams. *Small group research, 31*(1), 71-88.

Carron, A. V. (1982). Cohesiveness in sport groups: Interpretations and considerations. *Journal of Sport Psychology, 4*(2), 123-138.

Carron, A. V., & Brawley, L. R. (2012). Cohesion: Conceptual and measurement issues. *Small Group Research, 43*(6), 726-743.

Carron, A. V., Colman, M. M., Wheeler, J., & Stevens, D. (2002). Cohesion and performance in sport: A meta analysis. *Journal of Sport & Exercise Psychology, 24*(2), 168-188.

Carron, A. V., Widmeyer, W. N., & Brawley, L. R. (1985). The development of an instrument to assess cohesion in sport teams: The group environment questionnaire. *Journal of Sport Psychology, 7*(3), 244-266.

Cartwright, D. (1968). The nature of group cohesiveness. In D. Cartwright & A. Zander (Eds.), *Group dynamics: Research and theory* (3rd ed., pp. 91-109). New York, NY: Harper & Row.

Cataldo, M., & Herbsleb, J. D. (2013). Coordination breakdowns and their impact on development productivity and software failures. *IEEE Transactions on Software Engineering, 39*(3), 343-360.

Chen, J. (2007). Flow in games (and everything else). *Communications of the ACM, 50*(4), 31-34.

Chin, W. W., Marcolin, B. L., & Newsted, P. R. (2003). A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study. *Information Systems Research, 14*(2), 189-217.

Chiocchio, F., & Essiembre, H. (2009). Cohesion and Performance. *Small Group Research, 40*(4), 382-420.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum.

Cohen, S. B. (1993). *Effects of attribution retraining and positive peer support training on team cohesion, performance, and participant satisfaction* (doctoral dissertation). Hofstra University, Hempstead, New York.

Cole, H., & Griffiths, M. D. (2007). Social interactions in massively multiplayer online role-playing gamers. *CyberPsychology & Behavior, 10*(4), 575-583.

Costello, J. F. (2004). *Developing team cohesion: A quasi-field experiment* (unpublished master's thesis). Air Force Institute of Technology, Ohio.

Cowley, B., Charles, D., Black, M., & Hickey, R. (2008). Toward an understanding of flow in video games. *ACM Computers in Entertainment, 6*(2), 1-20.

Crano, W. D., & Chen, X. (1998). The leniency contract and persistence of majority and minority influence. *Journal of Personality and Social Psychology*, *74*(6), 1437-1450.

Csikszentmihalyi, M. (1975). Play and intrinsic rewards. *Journal of Humanistic Psychology*, *15*(3), 41-63.

Daylamani-Zad, D., Angelides, M. C., & Agius, H. (2016). Lu-Lu: A framework for collaborative decision making games. *Decision Support Systems, 85*, 49-61.

De Dreu, C. K., & Weingart, L. R. (2003). Task versus relationship conflict, team performance, and team member satisfaction: A meta-analysis. *Journal of Applied Psychology, 88*(4), 741-749.

DeChurch, L. A., & Mesmer-Magnus, J. R. (2010). The cognitive underpinnings of effective teamwork: A meta-analysis. *Journal of Applied Psychology, 95*(1), 32-53.

Dervitsiotis, K. N. (2012). An innovation-based approach for coping with increasing complexity in the global economy. *Total Quality Management & Business Excellence, 23*(9-10), 997-1011.

Deutsch, M. (1949). A theory of co-operation and competition. *Human Relations, 2*(2), 129-152.

Dyer, W. G., & Dyer, J. H. (2013). *Team building: Proven strategies for improving team performance*. Chichester, UK: John Wiley & Sons.

Easley, R. F., Devaraj, S., & Crant, J. M. (2003). Relating collaborative technology use to teamwork quality and performance: An empirical analysis. *Journal of Management Information Systems*, *19*(4), 247-265.

Ensley, M. D., & Pearson, A. W. (2005). An exploratory comparison of the behavioral dynamics of top management teams in family and nonfamily new ventures: Cohesion, conflict, potency, and consensus. *Entrepreneurship Theory and Practice, 29*(3), 267-284.

Evans, C. R., & Dion, K. L. (2012). Group cohesion and performance: A meta-analysis. *Small Group Research, 43*(6), 690-701.

Feldman, D. C. (1984). The development and enforcement of group norms. *Academy of Management Review, 9*(1), 47-53.

Festinger, L., Schachter, S., & Back, K. W. (1950). *Social pressures in informal groups: A study of human factors in housing*. New York, NY: Harper & Bros.

Fishbach, A., & Ferguson, M. J. (2007). The goal construct in social psychology. In A. W. Kruglanski & E. T. Higgins (Eds.), *Social psychology: Handbook of basic principles* (pp. 490-515). New York, NY: Guilford Press.

Fornell, C., & Bookstein, F. L. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of Marketing Research, 19*(4), 440-452.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39-50.

Gaskin, J., & Berente, N. (2011). Video game design in the MBA curriculum: An experiential learning approach for teaching design thinking. *Communications of the Association for Information Systems, 29*, 103-122.

Gaudiosi, J. (2011). Future of cloud gaming: Industry leaders' thoughts. *FC Business Intelligence*.

Gee, J. P. (2003). What video games have to teach us about learning and literacy. *Computers in Entertainment, 1*(1), 20-20.

Gefen, D., & Straub, D. W. (2005). A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example. *Communications of the AIS, 16*, 91-109.

Gillis, H. L., & Speelman, E. (2008). Are challenge (ropes) courses an effective tool? A meta-analysis. *Journal of Experiential Education, 31*(2), 111-135.

Granic, I., Lobel, A., & Engels, R. C. (2014). The benefits of playing video games. *The American Psychologist, 69*(1), 66-78.

Greitemeyer, T., & Cox, C. (2013). There's no "I" in team: Effects of cooperative video games on cooperative behavior. *European Journal of Social Psychology, 43*(3), 224-228.

Griffiths, M. (2005). The therapeutic value of videogames. In J. Goldstein & J. Raessens (Eds.), *Handbook of computer game studies* (pp. 161-171). Boston: MIT Press.

Griffiths, M. D., Davies, M. N., & Chappell, D. (2003). Breaking the stereotype: The case of online gaming. *CyberPsychology & Behavior, 6*(1), 81-91.

Gross, N., & Martin, W. E. (1952). On group cohesiveness. *American Journal of Sociology*, *57*, 546-554.

Gully, S. M., Devine, D. J., & Whitney, D. J. (1995). A meta-analysis of cohesion and performance effects of level of analysis and task interdependence. *Small Group Research,* 26(4), 497-520.

Gunter, B. (2005). Psychological effects of video games. In J. Raessens, & J. Goldstein (Eds.), *Handbook of computer game studies* (pp. 145-160). Cambridge, MA: MIT Press.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis*. Upper Saddle River, NJ: Prentice Hall.

Hollenbeck, J. R., DeRue, D. S., & Guzzo, R. (2004). Bridging the gap between I/O research and HR practice: Improving team composition, team training, and team task design. *Human Resource Management, 43*(4), 353-366.

Horwitz, S. K., & Horwitz, I. B. (2007). The effects of team diversity on team outcomes: A meta-analytic review of team demography. *Journal of Management, 33*(6), 987-1015.

Huang, W. W., Wei, K.-K., Watson, R. T., & Tan, B. C. (2003). Supporting virtual team-building with a GSS: An empirical investigation. *Decision Support Systems, 34*(4), 359-367.

Huczynski, A., & Buchanan, D. (2007). *Organisational behaviour: An introductory text* (4th ed.). London, UK: Prentice Hall.

Huntemann, N. B., & Payne, M. T. (2009). *Joystick soldiers: The politics of play in military video games*. New York, NY: Routledge.

Infante, C., Weitz, J., Reyes, T., Nussbaum, M., Gómez, F., & Radovic, D. (2010). Co-located collaborative learning video game with single display groupware. *Interactive Learning Environments, 18*(2), 177-195.

Janis, I. L. (1972). *Victims of groupthink: A psychological study of foreign-policy decisions and fiascoes.* Oxford, England: Houghton Mifflin.

Jin, Y., & Li, J. (2017). When newbies and veterans play together: The effect of video game content, context and experience on cooperation. *Computers in Human Behavior, 68*, 556-563.

Kaymak, T. (2011). Group cohesion and performance: A search for antecedents. *E+M Ekonomie a Management, 14*(4), 78-91.

Keith, M., Demirkan, H., & Goul, M. (2013). Service-oriented methodology for systems development. *Journal of Management Information Systems, 30*(1), 227-260.

Keith, M. J., Babb, J. S., Lowry, P. B., Furner, C. P., & Abdullat, A. (2015). The role of mobile-computing self-efficacy in consumer information disclosure. *Information Systems Journal, 25*(6), 637-667.

Keith, M. J., Demirkan, H., & Goul, M. (2010). The influence of collaborative technology knowledge on advice network structures. *Decision Support Systems, 50*(1), 140-151.

Klein, C., DiazGranados, D., Salas, E., Le, H., Burke, C. S., Lyons, R., & Goodwin, G. F. (2009). Does team building work? *Small Group Research, 40*(2), 181-222.

Klein, H. J., & Mulvey, P. W. (1995). Two investigations of the relationships among group goals, goal commitment, cohesion, and performance. *Organizational Behavior and Human Decision Processes, 61*(1), 44-53.

Klein, H. J., Wesson, M. J., Hollenbeck, J. R., & Alge, B. J. (1999). Goal commitment and the goal-setting process: conceptual clarification and empirical synthesis. *Journal of Applied Psychology, 84*(6), 885.

Kruglanski, A. W. (1996). Goals as knowledge structures. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 599-618). New York, NY: Guilford Press.

LaFasto, F., & Larson, C. (2001). *When teams work best: 6,000 team members and leaders tell what it takes to succeed*. Thousand Oaks, CA: Sage.

Latham, G. P., & Yukl, G. A. (1975). Assigned versus participative goal setting with educated and uneducated woods workers. *Journal of Applied Psychology, 60*(3), 299-302.

Lenhart, A., Kahne, J., Middaugh, E., Macgill, A. R., Evans, C., & Vitak, J. (2008). Teens, video games, and civics: Teens' gaming experiences are diverse and include significant social interaction and civic engagement. *Pew Research Center.* Retrieved from http://www.pewinternet.org/2008/09/16/teens-video-games-and-civics/

Levi, D. (2013). *Group dynamics for teams.* Thousand Oaks, CA: Sage.

Liang, H., Saraf, N., Hu, Q., & Xue, Y. (2007). Assimilation of enterprise systems: The effect of Institutional pressures and the mediating role of top management. *MIS Quarterly, 31*(1), 59-87.

Lieberman, D. A. (2006). What can we learn from playing interactive games. In P. Vorderer & J. Byrant (Eds.), *Playing video games: Motives, responses, and consequences* (pp. 379-397). Mahwah, NJ: Lawrence Erlbaum Associates.

Lin, K. (2014). Can video games in the office make employees more productive? *Entrepreneur*. Retrieved from https://www.entrepreneur.com/article/235663

Liu, D., Li, X., & Santhanam, R. (2013). Digital games and beyond: What happens when players compete. *MIS Quarterly, 37*(1), 111-124.

Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting & task performance*. Englewood Cliffs, NJ: Prentice Hall.

Locke, E. A., Latham, G. P., & Erez, M. (1988). The determinants of goal commitment. *Academy of Management Review, 13*(1), 23-39.

Lowry, P., Gaskin, J., & Moody, G. (2015). Proposing the multi-motive information systems continuance model (MISC) to better explain end-user system evaluations and continuance intentions. *Journal of the Association for Information Systems*, *16*(7), 515-579.

Lowry, P., Gaskin, J., Twyman, N., Hammer, B., & Roberts, T. (2013). Proposing the hedonic-motivation system adoption model (HMSAM) to increase understanding of adoption of hedonically motivated systems. *Journal of the Association for Information Systems, 14*(11), 617-671.

Lowry, P. B., Gaskin, J., Twyman, N., Hammer, B., & Roberts, T. (2012). Taking "fun and games" seriously: Proposing the hedonic-motivation system adoption model (HMSAM). *Journal of the Association for Information Systems, 14*(11), 617-671.

Lucasimo. (2014). Video games in the workplace. *Eric Rettberg*. Retrieved from http://www.ericrettberg.com/datacultg2/longer-essays/video-games-in-the-workplace/

Macy, B. A., & Izumi, H. (1993). Organizational change, design, and work innovation: A meta-analysis of 131 North American field studies—1961-1991. In R. W. Woodman & W. A. Pasmore (Eds.), *Research in organizational change and development* (vol. 7, pp. 235-313). Greenwich, CT: JAI Press.

Marks, M. A., Sabella, M. J., Burke, C. S., & Zaccaro, S. J. (2002). The impact of cross-training on team effectiveness. *Journal of Applied Psychology, 87*(1), 3-13.

Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Salas, E., & Cannon-Bowers, J. A. (2000). The influence of shared mental models on team process and performance. *Journal of Applied Psychology*, *85*(2), 273-283.

McGonigal, J. (2011). *Reality is broken: Why games make us better and how they can change the world*. New York, NY: Penguin.

Moon, H., Hollenbeck, J. R., Humphrey, S. E., Ilgen, D. R., West, B., Ellis, A. P. J., & Porter, C. (2004). Asymmetric adaptability: Dynamic team structures as one-way streets. *Academy of Management Journal, 47*(5), 681-695.

Morschheuser, B., Riar, M., Hamari, J., & Maedche, A. (2017). How games induce cooperation? A study on the relationship between game features and we-intentions in an augmented reality game. *Computers in Human Behavior, 77*, 169-183.

Mullen, B., & Copper, C. (1994). The relation between group cohesiveness and performance: An integration. *Psychological Bulletin, 115*(2), 210-227.

Pavlou, P. A., Liang, H. G., & Xue, Y. J. (2007). Understanding and mitigating uncertainty in online exchange relationships: A principal-agent perspective. *MIS Quarterly, 31*(1), 105-136.

Peacocke, M., Teather, R. J., Carette, J., & MacKenzie, I. S. (2015). Evaluating the effectiveness of HUDs and diegetic ammo displays in first-person shooter games. In *Proceedings of the IEEE Games Entertainment Media Conference.*

Peña, J., & Hancock, J. T. (2006). An analysis of socioemotional and task communication in online multiplayer video games. *Communication Research, 33*(1), 92-109.

Reinecke, L. (2009). Games at work: The recreational use of computer games during working hours. *CyberPsychology & Behavior, 12*(4), 461-465.

Renn, R. W. (2003). Moderation by goal commitment of the feedback–performance relationship: Theoretical explanation and preliminary study. *Human Resource Management Review, 13*(4), 561-580.

Ritterfeld, U., & Weber, R. (2006). Video games for entertainment and education. In P. Vorderer & J. Bryant (Eds.), *Playing video games: Motives, responses, and consequences* (pp. 399-413). Mahwah, NJ: Lawrence Erlbaum Associates.

Rubin, I. M., Plovnick, M., & Fry, R. (1978). *Task-oriented team development.* Englewood Cliffs, NJ: McGraw-Hill.

Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and Emotion, 30*(4), 344-360.

Salas, E., Priest, H. A., & DeRouin, R. E. (2005). Team building. In N. Stanton, H. Hendrick, S. Konz, K. Parsons, & E. Salas (Eds.), *Handbook of human factors and ergonomics methods* (pp. 41-48). London, UK: Taylor & Francis.

Santos, J. R. A. (1999). Cronbach's alpha: A tool for assessing the reliability of scales. *Journal of Extension, 37*(2), 1-5.

Senécal, J., Loughead, T. M., & Bloom, G. A. (2008). A season-long team-building intervention: Examining the effect of team goal setting on cohesion. *Journal of Sport & Exercise Psychology, 30*(2), 186-199.

Sharma, R., & Yetton, P. (2007). The contingent effects of training, technical complexity, and task interdependence on successful information systems implementation. *MIS Quarterly, 31*(2), 219-238.

Shaw, J. B., & Barrett-Power, E. (1998). The effects of diversity on small work group processes and performance. *Human Relations, 51*(10), 1307-1325.

Shaw, M. E. (1971). *Group dynamics: The psychology of small group behavior*. Englewood Cliffs, NJ: McGraw-Hill.

Smith, J. W. (1996). The effect of an intervention program on cohesion with ninth grade female basketball teams (master's thesis). Oregon State University.

Smith, S. L. (2006). Perps, pimps, and provocative clothing: Examining negative content patterns in video games. In P. Vorderer & J. Bryant (Eds.), *Playing video games: Motives, responses, and consequences* (pp. 57-75). Mahwah, NJ: Lawrence Erlbaum Associates.

Smith-Jentsch, K. A., Cannon-Bowers, J. A., Tannenbaum, S. I., & Salas, E. (2008). Guided team self-correction: Impacts on team mental models, processes, and effectiveness. *Small Group Research, 39*(3), 303-327.

Statistica. (2018). *Number of active video gamers worldwide from 2014 to 2021*. Retrieved from https://www.statista.com/statistics/748044/number-video-gamers-world/

Steinbart, P. J., Keith, M. J., & Babb, J. (2016). Examining the continuance of secure behavior: A longitudinal field study of mobile device authentication. *Information Systems Research, 27*(2), 219-239.

Straub, D., Boudreau, M.-C., & Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of the Association for Information Systems, 13*, 380-427.

Tan, B. C., Wei, K.-K., Watson, R. T., Clapper, D. L., & McLean, E. R. (1998). Computer-mediated communication and majority influence: Assessing the impact in an individualistic and a collectivistic culture. *Management Science, 44*(9), 1263-1278.

Tannenbaum, S. I., & Cerasoli, C. P. (2013). Do team and individual debriefs enhance performance? A meta-analysis. *Human Factors, 55*(1), 231-245.

Tjosvold, D., Yu, Z. Y., & Hui, C. (2004). Team learning from mistakes: The contribution of cooperative goals and problem-solving. *Journal of Management Studies, 41*(7), 1223-1245.

Treiblmaier, H., Putz, L.-M., & Lowry, P. B. (2018). Setting a definition, context, and research agenda for the gamification of non-gaming systems. *AIS Transactions on Human-Computer Interaction*, *10*(3), 129-163.

Van Vianen, A. E., & De Dreu, C. K. (2001). Personality in teams: Its relationship to social cohesion, task cohesion, and team performance. *European Journal of Work and Organizational Psychology, 10*(2), 97-120.

Vorderer, P., Hartmann, T., & Klimmt, C. (2003). *Explaining the enjoyment of playing video games: The role of competition.* In *Proceedings of the 2nd International Conference on Entertainment Computing.*

Waltz, P. R. (2016). Experiencing recovery at work: Energetic benefits of social media micro-breaks. Journal of Organizational Behavior, 38(1), 28-44.

Weber, R., Ritterfeld, U., & Mathiak, K. (2006). Does playing violent video games induce aggression? Empirical evidence of a functional magnetic resonance imaging study. *Media Psychology, 8*(1), 39-60.

Widmeyer, W. N., & Ducharme, K. (1997). Team building through team goal setting. *Journal of Applied Sport Psychology*, *9*(1), 97-113.

Yee, N. (2006). The labor of fun: How video games blur the boundaries of work and play. *Games and Culture, 1*(1), 68-71.

About the Authors

Mark J. Keith is an Associate Professor of Information Systems at Brigham Young University in Provo, UT. He received his PhD from Arizona State University. His research interests include team performance, video game outcomes, information privacy and security, and information systems development methodology. His research has appeared in *Information Systems Research, Decision Sciences, Journal of Management Information Systems, Journal of the Association for Information Systems, Information Systems Journal, Computers in Human Behavior, International Journal of Human-Computer Studies, Decision Support Systems,* and other leader journals and conference proceedings.

Greg Anderson is an Associate Professor of Information Systems at Brigham Young University, Utah. He received his PhD from Indiana State University in Technology Management, his MBA with an Information Systems emphasis from the University of Colorado at Colorado Springs, a graduate level certificate in Information Assurance from the University of Maryland University College and a bachelor's degree in Computer Science from Weber State University. His research interests include team dynamics, collaborative learning, and curriculum development/instruction. Greg is on the editorial board for *CrossTalk*, *The Journal of Defense Software Engineering*. His research also appears in leading information systems conference proceedings.

James Gaskin is an Associate Professor of Management Information Systems at Brigham Young University, Utah. He received his PhD in MIS from Case Western Reserve University. He currently has 95 peer-reviewed articles published in top journals and conferences, including *Management Information Systems Quarterly, Information Systems Research, Journal of the Association for Information Systems, Information Systems Journal, Computers in Human Behavior*, among others. His research interests include human computer interaction, time perception, and research and teaching methodologies. James is an associate editor at *Frontiers in Psychology*, in the Organizational Psychology section, and a regular track chair, session chair, and associate editor for International Conference on Information Systems and Academy of Management. As an untenured scholar, he was recognized as an outstanding contributor to the field through the Association for Information Systems early career award in 2015 and the Association for Information Systems education award in 2018.

Douglas L. Dean is an Associate Professor of IS at Brigham Young University, Utah. He received his PhD in MIS from the University of Arizona. He has published articles in *Management Science, Management Information Systems Quarterly, Journal of Management Information Systems, Journal of the Association for Information Systems, IEEE Transactions, Electronic Commerce Research, Expert Systems with Applications*, and others. His research interests include knowledge sharing, data mining methods, scientometrics of academic careers, and collaborative tools and methods.

Transactions on Human – Computer Interaction