Expanding Access To Learning Decision-Making And Teamwork Skills Using Low Fidelity, Tabletop Games: A Measurement Approach

Lisa N. Townsend
U.S. Army Combat Capabilities
Development Command (CCDC)
Soldier Center (SC)
Simulation and Training Technology
Center (STTC), Orlando, FL
lisa.n.townsend2.civ@army.mil

Grant H. Johnston
Orlando, FL
granthjohnston@aol.com

Joan H. Johnston
Orlando, FL
joanhjohnston@gmail.com

Jerry Mize
U.S.A. CCDC SC STTC
Orlando, FL
jerry.r.mize.civ@army.mil

Tami Griffith
U.S.A. CCDC SC STTC
Orlando, FL
tamara.s.griffith.civ@army.mil

Jake Engel
Orlando, FL
engel.jake27@yahoo.com

ABSTRACT

Interactive TableTop Role Playing Games (TTRPGs) have an expanding user base in rivalry with a tremendous growth in computer-based games (IMARC Group, 2024). The foundation of many of these games stems from military training, with applicability to military and emergency response teams who use TTRPGs to initiate and manage stress due to their effectiveness in developing teamwork, decision-making, and leadership skills (U.S. Army, 2014). TTRPGs are particularly effective at fostering knowledge acquisition, developing role-play skills, strengthening team building, and encouraging collaborative creativity (Daniau, 2016). To expand trainee access to learning these skills, the authors developed a novel crisis-management game employing a hybrid of a TTRPG with Live-Action Role Playing elements using the familiar and uncomfortable Zombie antagonist narrative and conducting the game with participants in an Interservice-Industry Simulation, Training and Education Conference 2023 workshop. This game within the workshop created a stressed space to evaluate specific behaviors. In this paper, we describe a tested measurement method aligned to an event based dynamic scenario used to observe expected behaviors during gameplay and consider those behaviors in correlation with surveys administered to participants to better understand decision making, teamwork, leadership, communication, cohesion, and cooperation under stress. Creating measurement opportunities by embedding triggers within events allows for learning specific skills and observing expected behaviors (Fowlkes, Dwyer, Oser, & Salas, 1998). The results indicated the approach contributed to recognition of behaviors within key events and assessment of participants and their interactions, allowing for greater exercise control, culminating in an impactful After-Action Review focused on team reflection and self-correction. The Generalized Intelligent Framework for Tutoring system enabled participants to quickly input survey responses. Recommendations for future workshops include expanding assessment of teamwork and using electronic tracking solutions to improve understanding of dynamic behavioral processes used by teams and emergent leaders.

ABOUT THE AUTHORS

Lisa N. Townsend, MS., is a Senior Research Psychologist at the U.S. Army CCDC, SC, STTC. She has an M.S. in Industrial/Organizational Psychology and a B, A. in Psychology, from the University of Central Florida (UCF). She has worked on many diverse teams including those within Research and Development, Technology Transfer, Instructional Systems Design, and Human Systems Integration. Ms. Townsend's areas of expertise involve team training, Front End Analysis (FEAs), Training Systems Analyses (TSAs), Instructional Systems Design (ISD), Training Effectiveness Evaluations (TEEs), and the development of training and organization related metrics. Her efforts in these areas have spanned across Services and platforms.

Grant Johnston received a Bachelor's degree in Sociology from the University of Florida**.**

Joan Johnston, PhD., has over 3 decades of experience as a military research psychologist. She developed and led award winning research on training effectiveness, team training, and training technologies at the Naval Air Warfare

Center Training Systems Division, and the U.S. Army CCDC, SC, STTC. Dr. Johnston collaborated on and authored over 80 publications and presentations on these topics. She received her M.A. and Ph.D. in Industrial and Organizational Psychology from the University of South Florida.

Jerry R. Mize, MA., is a Program Analyst for the U.S. Army CCDC, SC, STTC since October 2019. Formerly he is a 28-year Army Veteran working in Special Operations, Communications, Military Intelligence, Air Defense, and Acquisition. He holds an Associate of Applied Science in Electronics, a BS in Technology, and a MA in Acquisition and Procurement. He has worked in varied tactical and strategic positions conducting warfighting and administration, particularly in Operational Planning and Exercises. He served as instructional faculty at Jacksonville State University and was a published author. He continues to work with research teams in simulation and training research. His efforts seek to link personal, military knowledge and practices into research and development products.

Tami Griffith, PhD., is a Chief Engineer at the U.S. Army Combat Capabilities Development Command, Soldier Center, Simulation & Training Technology Center (CCDC, SC, STTC). She completed her PhD in Engineering Modeling & Simulation from University of Central Florida (UCF) with a focus on virtual character interactions. She has worked on both the technical and programmatic side of training system acquisition at the U.S. Army Program Executive Office, Simulation Training and Instrumentation (PEO STRI) as well as on cutting edge research in support of training technology at CCDC, SC, STTC. Her passion is immersing learners in simulated training environments.

Jake Engel, BA., graduated from UCF in August of 2024 with a B.A. degree in Psychology. He is currently pursuing a Master of Science (M.S.) degree in Organizational Sciences at Florida International University (FIU).

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Orlando, FL
joanhjohnston@gmail.com

Jerry Mize
U.S.A. CCDC SC STTC
Orlando, FL
jerry.r.mize.civ@army.mil

Tami Griffith
U.S.A. CCDC SC STTC
Orlando, FL
tamara.s.griffith.civ@army.mil

Jake Engel
Orlando, FL
engel.jake27@yahoo.com

INTRODUCTION

Humans have engaged with games in leisure and labor since the beginning of recorded time (Tylor, 1879). One such early game was *Chaturanga* which evolved into *Chess* (Davidson, 2012). In the 1970s *Braunstein,* developed by David Wesely, became the impetus for *Dungeons and Dragons (D&D)* (Peterson, 2012). Over 50 million people in the United States have played *D&D* (Wieland, 2021). It is recognized as the first commercial TableTop Role Playing Games (TTRPG), and there are an estimated 13.7 million active tabletop *D&D* players worldwide (Camp, 2019). While some argue that *D&D* is not that popular, this game grew well beyond its original niche market spawning popular movies and references in recent shows such as Stranger Things (Rath, 2024). In further justification of popularity and support the global board game market in 2023 was $16B with a growth rate projected to reach $40.1B by 2032 (IMARC Group, 2024). Many of these widely played games have military attributes. In *Chess* each player is associated with a paramilitary title – General, Bishop, Knight, King, Queen. The General manages pieces that represent aggregate capabilities in war. *D&D* focuses on an individual character's contributions to a small team and local events in a fictional setting, but these events can scale up to consider regional or world events. There are permutations of TTRPGs in virtual tabletops and online gaming, but at their purest form these games are conducted in person and have a similar format to wargaming, and TableTop Exercises used by the military in training. Further, Live Action Role Playing (LARP) games, which approximates military/historical reenactors, equivocates to military small unit training such as Squad Training Exercises (STX) and mission rehearsals, which is the enactment of preset actions; the former being role playing with predetermined historical outcomes the latter role playing with anticipated outcomes. The military values training as a core function because "Training builds confidence and competence, while providing essential skills and knowledge, resulting in unit readiness" (p. 2) (U.S. Army, 2014). The history of TTRPGs and LARPs stem from military exercises and wartime events and make it a natural framework from which to create a novel, low-cost game experience to explore teamwork, decision-making, and leadership.

Background

Crisis management encompasses the processes and actions taken to identify, assess, and respond to crises effectively. Leadership and teamwork play a pivotal role in crisis management, as leaders emerge and provide guidance through uncertain and challenging times. These crisis leaders prioritize the well-being and safety of their team members, ensuring that appropriate support systems and resources are in place (The Psychology Behind Great Leadership for Crisis Management, June 15, 2023). As this occurs, Maslow's hierarchy of needs quickly comes into play, as those leading shift personal focus to the needs of the group at large (Maslow, 1943). In today's self-regarding environment we often encounter those more focused on personal social and self-esteem needs. However, in a crisis, such as the infrastructure collapse presented in this workshop, human needs that motivate behaviors rapidly shift and fall into physiological and safety needs (Mize, 2010). To better fulfill these physiological and safety needs individuals promptly realize that working as a team will provide greater benefits and increase speed in meeting more immediate needs. Teams with higher levels of team cohesion and team efficacy are better at engaging in teamwork processes (e.g., information exchange and communication) and achieving improved team performance (Johnston, Phillips,

Milham, Riddle, Townsend, DeCostanza, Patton, Gamble, & Fitzhugh, 2019; Mathieu, Gallagher, Domingo, & Klock, 2019).

To better understand how to expand trainee access to learning leadership and team skills the authors developed a novel crisis-management game that employed a hybrid of a TTRPG with LARP elements using Zombies as the antagonist during an infrastructure collapse (Bedwell, Pavlas, Heyne, Lazzara, & Salas, 2012). Attendees at the 2023 Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC) participated in a workshop entitled "From the Last of Us to the First of Us: Rebuilding After a Zombie Crisis." Bringing with them individual differences on perceived and reactionary stress, their stress and coping mechanism norms could be used to maintain performance and allow expected skills to emerge as the stress associated with survival induced motivation for the game (Vartanian, Boscarino, Jarmasz, & Zotov, 2022). The game objectives were for participants to select a safe-haven location and work as a team with other participants to solve daily challenges in this new world and make numerous on-the-fly critical decisions to stay alive and not become a Zombie – the initial cause of the destruction and devastation. Because this was a first-time test of the game, the purpose of this paper is to describe how we developed and used an assessment approach designed to evaluate *how well the game would enable* participants to achieve these goals within a reasonable amount of time of about two hours. Preuß (2021) studied learning processes in live action simulation games on learning outcomes and compared a game played for two-hours or two-days. For the 2-hour group, the predictor variables of interest, challenge, and immersion (subscale: *engagement*) impacted the self-reported learning outcome in a significantly positive way. In this paper, we first describe a game design testing framework that informed our measurement methods and how the methods were aligned to event-based daily scenarios. We then present and discuss findings about participant attitudes and game play reactions, what game play observers were able to assess, and describe implications for the next iteration of the game itself.

APPROACH

Game Design and Development

In a 2019 study, Balint, Stevens, Dudfield, and Powell divided participants into groups that either used a desktop set-up (low immersion) or an HMD set-up (high immersion) to perform a task in PAYDAY 2 (Starbreeze Studios, 2013). The task performed in the game resembled a military task of clearing a building. Participants in the less immersive desktop condition had higher perceived teamwork (Leadership, Team Orientation, Mutual Performance Monitoring, Back-Up Behavior, and Adaptability) and three enabling mechanisms (Shared Mental Models, Mutual Trust, and Closed-Loop Communication) compared to participants in the more immersive VR condition. Balint et al. concluded the results could be due to a lack of familiarity with the HMD even though the group did complete familiarity training. These results support the benefits of lower-fidelity simulation technologies and methodologies for team training. In this workshop, we applied simulation-based training design principles and team learning science to our low fidelity game. Gamification in the context of learning is a design process of adding game elements to change existing learning processes (Sailer & Homner, 2019). Event-based techniques guided the design of training opportunities by systematically identifying and introducing events within training exercises that provide known opportunities to observe behaviors of interest. The authors employed the Event-Based Approach to Training (EBAT) methodology known for producing effective training for team tactical decision making under stress (Fowlkes, Dwyer, Oser, & Salas, 1998). With EBAT, explicit links are maintained between training objectives, exercise design, and performance assessment. The authors also drew from guidelines developed by Di Loreto, Mora, and Divitini (2012) that recommended ensuring training scenarios incorporate key characteristics of crisis management from which learning objectives are derived. Di Loreto et al. (2012) conducted a literature review and analysis of 10 crisis simulation-based and tabletop games to assess whether and how well the training had incorporated these key elements. Much like military training scenario characteristics (U.S. Army, 2014), the Di Loreto et al. crisis elements focus on manipulating scenario features that elicit team decision making, leadership, teamwork, and stress reactions. We used TTRPG functionality to allow individuals the freedom to experience stress and difficulty factors to meet objectives and stay alive – as a team, while using narrative to a small extent to provide boundaries and simplified rulesets in which to observe the emergence of the characteristics associated with team development, decision-making, and leadership. Di Loreto et al. (2012) also recommended coaching and After Action Reviews (AARs) to encourage team learning. Next is a brief listing of the Zombie game and instructional features that were aligned with the Di Loreto et al. crisis management elements with expected effects on game participants:

Multiple, Inter-related, and Time Dependent Problems
- Sequential, inter-related, and increasingly complex problems embedded in the game narrative required solving multiple problems; breaking problems down into manageable parts; communication, collaboration, negotiation, and/or competition; and emergent leadership and adopting roles to increase survival.
- Limited time to learn game rules required learning on the fly and working with others while trying to survive Zombie attacks and obtain resources to survive.
- Limited (day) and unlimited (night) Zombie attacks increased stress through time pressure and fear of becoming a Zombie or a Dearly Departed Soul.

Unpredictable Game Outcomes and Limited Availability of Information
- Limited time available to learn game rules would promote player communications.
- "Daily" release of new scenario problems would stress player's ability to plan and adapt.
- Game clues in journal entries and news releases scattered around the play site would advantage players with more game knowledge.
- Contents of resource card decks were deliberately varied across physical locations, for example, more guns and handcuffs were located at the police station whereas more food and water were available at the grocery store which would prompt player collaboration and negotiations.
- Various strategies were available for Zombies to attack players (e.g., varied probabilities in Zombie and player dice rolls to gain/prevent entry to a location and limited daytime versus unlimited nighttime attacks) would prompt collaboration among players for protection.
- Players, teams and leaders would have to adapt to rapidly changing conditions.

Planning and Taking Action, With a Focus on a Rapid Return to Normal Conditions
- Survival rules and clues would prompt players to collaborate on having to consider the consequences of decisions in the context of the location players were in (local) versus the capability of other locations (global) to support survival and the capabilities and resources of other players and/or teams (socio-economic).
- Information was obscured but available that had clues to survive and escape the town and seek safety in a more normal setting either at farming commune or a military base prompting players to collaborate.

Leadership, Team Roles and Communications, Providing Real-time Coaching, and Conducting AARs
- Embedded stressful events and triggers would lead to decision-making opportunities for immediate and emergent leadership skills to be displayed.
- Since roles were not assigned and participants were acting essentially as themselves during the stressful events encountered, we presumed they would decide to assume specific roles to help the team, and/or possibly be assigned roles by an emergent team leader.
- As stressful events increased, and resources become more limited, participants would engage in real time coaching with each other, by stepping in as backup was needed, providing guidance, correcting gameplay errors, and sharing information that was potentially helpful.
- Two AARs were conducted using a framework developed by Navy team training researchers called Team Dimensional Training (TDT) (Smith-Jentsch, Zeisig, Acton, & McPherson, 1998). The AARs were framed around open-ended questions asking about team communications, supporting behaviors, and imitative/leadership. A mini-AAR after Day 1 focused on an event that had just occurred, how it was addressed, and pros and cons of the outcome. A final and longer AAR was also conducted at the end of gameplay that focused on teamwork, leadership, and decision-making.

Assessment Methods

Table 1 shows the crisis management elements aligned with surveys, observational checklists, and AARs used in the study.

Surveys
The surveys noted in Table 2 were administered with the Generalized Intelligent Framework for Tutoring (GIFT). GIFT is a powerful tool for a research psychologist to collect data (Sinatra, 2018). GIFT Courses can be created to provide corrective feedback with various input sources, or a 'course' can be as simple as providing a survey to participants, which is how it was used as part of this workshop. GIFT could be accessed from participant's digital

devices and the authors provided access through a QR code. The survey data can easily be imported into Excel or IBM® SPSS® statistical analysis software. Unfortunately, issues with the Orange County Convention Center accessing reliable WiFi or cellular data interfered with the ability of some participants to use GIFT. Thankfully, the team was prepared with paper copies that were made available for those who had issues.

Table 1. Crisis Management Elements Aligned With Study Assessment Methods

Elements	Self-Report Surveys	Observational Checklists	AARs
• Multiple, inter-related, and time dependent problems		x	x
• Team communications, emergent leader, role adoption, trust	x	x	x
• Outcome predictability and availability of information		x	x
• Planning	x	x	x
• Providing real-time coaching		x	x
• Conduct AARs	x	x	x

Table 2: Surveys

Survey	Description	Administered
Demographics	Questions asked about age, gender, race, job experience and game experience. Participants rated their degree of game confidence in on a four-item scale.	Before Game Start
Team Cohesion and Team Efficacy	Team cohesion and team efficacy were assessed on a 1 to 5 Likert-type scale. Cohesion was degree of agreement with statements that asked how close a unit they thought their team was during the mission just completed. Efficacy was degree of agreement on how confident the team was in its ability to successfully perform and complete future missions together. A higher score indicated higher rated cohesion and anticipation of more effective performance.	End of Day 1
End of Game	Surveyed post-game confidence, team cohesion, and team efficacy. AAR Climate was assessed with 8-items using a 1 to 7 sliding scale to indicate degree the AAR was more open or closed, united or divided, authoritative or participative.	End of Day 5/ Game End
Individual Workshop Reactions	Open-ended questions gauged overall workshop reactions and focused on trust, teamwork, the AAR, and team roles.	End of Day 5/ Game End

Observational Checklists

EBAT was applied in the form of daily events or triggers that were introduced each day to provide opportunities for participants to elicit specific expected teamwork, leadership, and decision-making behaviors (see Table 3). Using the EBAT method, assessment opportunities were created by embedding triggers within events established for exercising specific skills and observing expected behaviors. To observe and track these behaviors we designed a paper-based observation checklist that would allow for easily following the day's trajectory of incidents (Figure 1). Expected behaviors were identified as occurring or not and specific performance objectives for each day were tracked as being met or not.

Observers

A Table Game Manager (TGM) was assigned to each location with the job of ensuring participants adhered to the rules of the game and providing non-invasive guidance when participants requested it. These TGMs also acted as Observers by using a checklist (see Figure 1) to record overall observations, noting expected behaviors for each day, and determining whether and how daily events were addressed. A separate group of observers deemed "Dearly Departed Souls" assisted with participant observations. When Zombie participants did not survive an attack made by

a surviving participant, they were offered the opportunity to be a Dearly Departed Soul, instructed to follow and 'haunt' (observe) one survivor participant. They collected daily data with an observation checklist that had questions that focused on whether the individual being haunted was acting as a leader or had another defined role on the team, how well they worked with other team members, and if they were turned into a Zombie that day.

Table 3. Daily Events and Triggers

Day	Title	Event/Trigger
1	Welcome to the Apocalypse	You've found a printed item rumpled in the corner. Perhaps this could be useful? What will you do?
2	Good Fences Make Good Neighbors – or – Build That Wall	Acquire supplies to build fences and build them.
3	I Really Need a Drink	So it's in the water – all water must be filtered from this point forward. No filter? Where/how can you obtain one?
4	You're Still in Florida	A hurricane strikes, it leads to injuries, damage, and change. Roll one dice and the number is the Cat # storm you encountered.
5	Many Hands	After the chaos of the storm, you're able to assess the state of things better. You see a twister caused two large trees to fall, blocking access to your location from two directions. One direction leads to a military base and the other leads to a farm. Should you move the trees and how will you prioritize which path to choose?

TM OBSERVATIONAL CHECKLIST

TM Location/Table: _____

Day 1	Y/N
Did the team meet the day's objective?: Address the printed item with information on it	
Did everyone on the team have/find Food and Water?	
Does this Day seem to have a team leader, someone who is in charge and directing the group? Leader Participant #_____	
Do team members seem to have defined roles within the team?	
Did team members become Zombies today? How many? _____	
Were most team members contributing to team decisions?	
Did tables/locations collaborate?	
Did teams share cards internally with the other team members at their table?	
Did teams share cards with other teams?	
Did a new individual try to join the table/leave the table? P#_____to Table _____ P#_____from Table____	
Which of these cards did the team use? Ax ____ Building Supplies ____ Cuffs ____ Gun & Ammo ____ Hammers & Nails ____ Key ____	
Which attribute tokens did the team use? Health ____ Reputation _____ Safety ____	
How well did this team work together: 1 through 5 ____ (1=not at all; 5=well oiled machine)	

Figure 1: Table Game Manager Observational Checklist

After Action Reviews

AARs originated from institutional military debriefs (e.g., focusing on three ups (positives) and three downs (negatives)) but were adapted as research has shown that they can provide a richer and more structured intervention for participants to reflect on performance, adapt, and foster an environment where all team members can share perspectives (Crookall, 2010; Smith-Jentsch & Sierra, 2023). Conducting AARs in this way places a relatively greater emphasis on the accountability of the process versus the outcome and on cooperative versus competitive

interdependence. During the game, real-time feedback and coaching were provided by the research team with participants during a mini-AAR after Day 1 and a final AAR at the end of the game. They focused on teamwork development, leadership, and decision-making around each day's events and triggers. For example, Day 1's focus on utilizing an available source of information led to questions about if and how that information contributed to decisions. Day 2's objective of building infrastructure prompted team development questions about supporting behavior and team members providing and requesting back up. Teams talked about how they addressed the challenges encountered, where leadership emerged, and how the solutions presented impacted decisions.

Procedure

The overall objective was to survive as a human. The workshop began with gameplay introduction, rules, and the Demographics survey (30 mins). Then Gameplay began and ran for 5 "Days" (see Table 3); daytime was 15 minutes and nighttime was 10 minutes. The Team Cohesion and Team Efficacy surveys were collected after Day (Round) 1. One 15 minute mini-AAR was conducted after Day 2. One 15-minute break was allowed at the end of gameplay which was then followed by the End of Game Survey, the post-gameplay AAR (45 mins), the Individual Workshop Reactions Survey, and a final workshop AAR (15 mins). While most participants began as survivors (a few chose to start as Zombies), they encountered Zombies and were attacked. Some either continued to survive or became a Zombie. Once they became a Zombie they were separated from gameplay and received brief Zombie training. As a Zombie they could be attacked and either win and create a new Zombie participant or if they did not survive an attack, they had an opportunity to become the Dearly Departed Soul. During the day, Zombies could only attack (via a roll of dice) three times each, but they could make unlimited attacks (dice rolls). While the Zombie threat was ever present, each day presented a new problem to solve (see Table 3), so participants had address the problems, prepare for Zombie attacks by building fences, collect resources needed to survive, move around the neighborhood to share resources, negotiate, or join teams at other locations. The LARP elements integrated in the game – such as using familiar locations (school, big box store), basic needs (food, water, safety) having to be met, the pace of the game and stress associated with limited day/night times, relevant events encountered, and participants acting as themselves and not assuming other roles, all helped to fully immerse players into this fantasy world within a live setting in a fairly realistic way.

RESULTS

Demographics

While 35 participants were counted at the start, fewer responded to surveys throughout the game. The workshop drew a wide range of participant age groups ranging 50 years from 17 to 67, with the mean age of 44 years (SD=14 years, n=32) indicating a mostly mature audience. Participants (n=32) identified as 69% male and 31% female and the majority (78%) identified as white, with the remainder identifying as Black/African American, Asian, Hispanic/Latinx or Native Hawaiian/Pacific Islander. About one third had active-duty military experience ranging from 4 to 30 years (n=30), and about a third had some experience serving as a first responder (Range= 1 to 20 years, n=31). Half declared some amount of experience serving as an educator (Range = 1 to 40 years, n=30) and 39% reported public servant experience (Range= 1 to 28 years, n=31). Nearly all had at least some level of experience (M=26 years, SD= 11 years) working in a team-based setting, and 78% had an average of nine years in a supervisory role with a range of one to 40 years. Nearly all participants reported a wide range of experience (M=29 years, SD=16, n=32) playing either board games or video games, with about one third reporting some game development experience (M=3 years, SD = 7 years, n=32). Many (60%) of the participants reporting (n=32) knew at least one other participant prior to attending the game.

Confidence, Team Cohesion, and Team Efficacy

Table 4 shows at game start participants were evenly divided between low and higher levels of confidence. Confidence appeared to trend higher by the end of the game but was not statistically significant based on a Wilcoxon signed ranks t-test (p=.255). Mean ratings of strong participant perceptions of team cohesion were the same before (M = 4.38, SD = .59) and after (M = 4.18, SD = .80) the game (Wilcoxon signed ranks t test, p=.272), whereas mean ratings of team efficacy (M = 4.13, SD = .56) before the game dropped slightly after the game (M = 3.82, SD = .88) (Wilcoxon signed ranks t test =2.71, p=.007, SE effect size =.234). Table 5 shows consistently strong team cohesion ratings across all items. Examining the team efficacy items in Table 6 suggests that player perceptions of effectively setting contingency plans and determining progress towards goals had diminished by the end of the game which is likely due to all but four players becoming Zombies.

Table 4. Percent of Participants Reporting Confidence Levels at Game Start and Finish

How confident are you that you:	Will perform well at this game? (n=32)	Performed well during this game? (n=29)
Not at all	25	14
A little	28	17
Somewhat	25	41
Very	22	28

Table 5. Mean Ratings of Participant Perceptions of Team Cohesion Items Before and After the Game

Team Cohesion	Mean Rating (SD) Post Scenario 1 (n=31)	Mean Rating (SD) End of Game (n=29)
1. Is a Close-Knit Team	4.1 (0.6)	3.9 (1.1)
2. Works together to get the job done	4.5 (0.7)	4.2 (1.0)
3. Pulls together to perform as a team	4.3 (0.8)	4.3 (0.9)
4. Shows a lot of cooperation and teamwork among our members	4.5 (0.7)	4.3 (0.8)
5. Is united in trying to reach our team goals for performance	4.5 (0.7)	4.2 (0.9)
6. Has a shared sense of task importance	4.4 (0.7)	4.1 (0.9)

SD = Standard Deviation

Table 6. Mean Ratings of Participant Perceptions of Team Efficacy Items Before and After the Game

Team Efficacy	Mean Rating (SD) Post Scenario 1 (n=31)	Mean Rating (SD) After the Game (n=29)
1. Effectively set contingency plans	3.8 (0.8)	3.2 (1.4)
2. Develop Good Strategies	3.9 (0.9)	3.7 (1.2)
3. Understand the tasks at hand	3.9 (1.1)	3.6 (1.3)
4. Coordinate effectively with all members	4.3 (0.6)	4.0 (1.0)
5. Determine our progress towards goals	4.1 (0.7)	3.7 (1.2)
6. Help each other out if necessary	4.4 (0.7)	4.5 (0.7)
7. Communicate Effectively	4.4 (0.5)	4.1 (1.0)

Table 7 presents the correlation matrix of pre-game and post-game measures of game confidence, team cohesion and team efficacy. The matrix diagonal shows the expected high levels of internal consistency reliability estimates (Cronbach's Alpha) for team cohesion and team efficacy. Pre-game confidence had no significant relationships with any of the measures. In contrast, pre-game cohesion and efficacy were significantly related to post-game confidence. The size of these correlations held for post-game team cohesion and efficacy with post-game confidence. These correlations were also similar in size to pre-game team cohesion and efficacy, pre- and post-game team cohesion, and pre-and post-game team efficacy. These findings contrasted considerably with the very strong relationship between post-game team cohesion and team efficacy which are similar in size to correlations (.83 and .79) found by Johnston et al. (2019). Using Spearman's Rho (r_s) correlations were analyzed among the demographic data and measures. Shown in Table 7 they indicate that the greater the age (r_s = -.41, p=.031, n=28) and years of public service (r_s = -.40, p=.04, n=27) the lower the perceived pre-game team efficacy. More years of game development experience were positively related to pre-game confidence (r_s = .44, p=.011, n=31).

Table 7. Correlation Matrix (Spearman's Rho (r$_s$) of Pre-game and Post-game Measures of Confidence, Team Cohesion, and Team Efficacy

	PreG C	S1 TC	S1 TE	PG C	PG TC	PG E
PreG C	-					
S1 TC	.26	**.93**				
S1 TE	.21	.69**	**.84**			
PG C	.29ᵃ	.55**	.63**	-		
PG TC	.06	.58**	.58**	.50*	**.93**	
PG TE	.10	.63**	.66**	.63**	.93**	**.89**

Diagonal - Cronbach's Alpha; * p=.003; ** P <=.001; ᵃ p=.072; n ranged from 26 to 31.
PreG C = Pregame Confidence; S1 TC = Post Scenario 1 Team Cohesion; S1 TE = Post Scenario 1 Team Efficacy;
PG C = Post Game Confidence; PG TC = Post Game Team Cohesion; PG TE = Post Game Team Efficacy.

AAR and Game Feature Reactions

Most participants saw the AAR climate at the end of the game in a positive light, rating it as more Open (M=2.2, SD 1.8, n=26), Forgiving (M=5.9, SD=1.5, n=27), United (M=2.0, SD=1.4, n=27), Trusting (M=5.9, SD=1.6, n=27), Flexible (M=2.2, SD =1.5, n=27), Respectful (M=6.7, SD=0.5, n=27), Participative (M=6.0, SD=1.4, n=27), and Comfortable (M=2.8, SD=2.1, n=27).

In open-ended responses, nearly all participants (20 out of 21) responded they would play the game again if offered at I/ITSEC 2024, with the majority (76%) reporting they enjoyed the game "a lot." Participants reported their favorite aspect of the game was collaboration and teamwork (n=7) followed by enjoying watching the game unfold and the strategies people used (n=5). The biggest challenges were understanding the rules (n=9), followed by finding and managing resources (n=4), game ambiguity (n=2), staying alive (n=2), using dice (n=1), forming a team (n=1), and strategizing under chaos (n=1). Recommended improvements were more time or help in learning the rules (n=11) and more survival options (n=2). Participants reported they thought of themselves in the role of coordinating with other team members (n=7), supporting and helping others (n=6), evaluating (n=1), implementing plans (n=1), completing/finishing tasks (n=1), watching everyone (n=1), and multiple roles (n=1). All (21) respondents reported they trusted their team members because they felt they were "in it together" and/or to survive and/or to share resources. Similarly, 90% (n=18) reported trusting people at the other game locations. Most participants (n=16) indicated they were likely to use or already use team self-correction when they conducted their own team debriefs/team discussions and to improve teamwork on the job (88%) and to use the four dimensions of teamwork (81%).

Table Game Manager Observations

The highly dynamic nature of the game with players rapidly becoming Zombies starting on Day 2 and players moving to other table locations made using the observational checklist somewhat difficult, with just four out of the six TGMs completing it. Nevertheless, some of the Daily checklist items were consistently observed. TGMs identified 5 individuals that emerged as strong leaders, with two observed by more than one TGM that persisted as leaders to almost the end of the game. Except for emergent leaders, most daily observations (15) indicated players did not appear to have a defined role, with 5 daily observations indicating players did take on a defined role. Almost all the TGM observations (20 of 21) saw players contributing to team decisions, with two thirds (14 of 21) of the observations indicating table locations were collaborating with each other. All the players were observed (21) to be sharing resource cards with each other during each scenario. Some tables were observed (9 out of 21) sharing resource cards with other tables, and 8 out of 21 observations confirmed players left or joined other table locations. Almost all daily team ratings (20 out of 21) ranged between average to very high performance, with the majority (62%) of daily observations giving teams the highest rating for working like a well- oiled machine.

DISCUSSION

The high levels of perceived game confidence, team cohesion, and efficacy, the observed emergent leadership and inter-and extra-team collaborations, and everyone's desire to play the game again in 2024 were strong indicators the game was a resounding success; it was fun! Despite expectations only a couple of demographic indicators were related to two pre-game attitudes. The finding that higher levels of pre-game team cohesion and efficacy were likely predicators of higher levels of post-game confidence, and that pre-game confidence was not indicated we had designed a game that demanded good teamwork among participants, especially toward the end of the game. This may explain the unchanged relationship of post-game cohesion and efficacy with post-game confidence, and the much stronger relationship between post-game team cohesion and efficacy. This relationship may also be partially explained by the observation that Zombies were seen to be acting in teams to better challenge the survivors. Whether a Zombie or one of the few Survivors – participants worked together to better achieve the near-term goal. Similarly, Normand and Johnston (2019) interpreted in their qualitative study on team cohesion and collective efficacy that using positive and negative communications of team cohesion and collective efficacy are necessary for performance to improve and objectives to be met. Positive levels of post-game AAR climate indicated the TGMs successfully led a comfortable discussion among participants about how they played the game as team members. Open-ended comments reiterated how important the collaborative nature of the game was to the participants. Findings in this study should not be considered generalizable since data were collected from a relatively small number of participants that were not randomly selected from the larger conference population.

CHALLENGES

GIFT

While GIFT was a powerful tool for survey creation and allowing accessibility and ease of importing the data into statistical analysis software, it needed consistent and reliable network connectivity which was not available at the I/ITSEC conference. Thankfully the team had paper surveys, but there was some loss of data with gaps between individuals who completed the online surveys and the paper surveys. Some participants were able to access some, but not all GIFT surveys which caused frustration with matching participant numbers on both the paper-based and GIFT surveys. For 2024 we will use a paper-based survey booklet that each participant will receive at the start of the workshop and then collected before they leave. Participants will be guided to each section for completion at the appropriate time during the workshop.

We explored various strategies to collect meaningful data that could answer the research questions and determined that in the future the data could be effectively collected using low-cost wearable cameras (less than $50) but will require considerable time and manpower to conduct analyses. We intend to explore how principles of Sociometry could guide future efforts (Cillessen & Bukowski, 2018). Sociometry is concerned with interactions within the structure of a group and aims to identify individual roles, social relationships, group member attitudes and aptitudes, subgroups/cliques, leaders, group structure, group integrity, and measures for assessing behaviors and interventions to bring about positive change. A variety of tools have been applied to measures in the past to capture social behaviors and patterns with varying levels of success. For example, data include physical location, movements, and communications.

Observational Checklists

One challenge the observers encountered was the ability to track behaviors effectively during gameplay. The observational checklists used were paper based with each sheet representing a day's worth of potential behaviors and although each observer was initially assigned to a table location, as participants moved or locations were decimated, using the sheets effectively became confusing. TGMs found that managing the game and making assessments was overwhelming at times. In future years, the observers will have two improved data collection approaches. One, they will use a computer tablet to input observations into GIFT vice the paper and pencil method as this method has proven more efficient in observable behavior data collection efforts (Townsend, Johnston, Ross, Milham, Riddle, Philips, & Woodhouse, 2017). GIFT will be used to track and organize the data, and the data collected will be pulled into a statistical program for analyses and interpretation. Two, the *potential* behaviors tracked previously will now be *expected* behaviors aligned to specific events and triggers at that table location – simplifying the process of what and

when to observe. Expected behaviors will be identified and defined by team development and crisis management experts to ensure a higher probability of occurrence in the daily events. These expected behaviors will follow the Targeted Acceptable Responses to Generated Events or Tasks (TARGETs) framework (Fowlkes, Lane, Salas, Franz, & Oser, 1994). TARGETs is an event-based measurement technique that systematically tracks performance associated with specific trigger events within training scenarios, providing specific opportunities to both observe and listen for these key behaviors of interest. Ensuring that triggers are linked to measures provides a more objective approach to observing, tracking, and understanding performance through more consistent observations made. The TARGETs methodology has been used in numerous small team training settings, where teams are physically co-located. Fowlkes et al. (1994) reported inter-observer agreement for TARGETs of 89% and internal reliability estimate (split half correlation with a Spearman-Brown correction) was .93. Using the TARGETs technique, with an electronic data collection tool, and incorporating observers that are not taking on the role of TGM will mitigate much of the confusion and provide a method that works better in a fast-paced environment.

LESSONS LEARNED

Having an opportunity to include novel approaches during the 2024 I/ITSEC Workshop allows for applying lessons learned from the 2023 Workshop. Leadership emerging through crisis and the occurrence of team development over a short amount of time was valuable to advance understanding in these areas and for participants to depart with applicable knowledge and skills. These areas will be further explored as new participants encounter unique challenges in the post-apocalyptic environment, some a direct response to actions taken (or not taken) last year. These challenges will afford occasions for participants to lead and grow as a team. The participants who exhibited leadership behaviors last year were the ones that observers tracked more intently – these were the individuals who were surviving and engaging in more interesting activities while doing so. This finding affected the decision to increase and account for more emphasis on leadership and to guide the observers in 2024 to seek out, track, and observe those leaders. It also contributed to the decision to have Dearly Departed Souls focus on apparent leaders and be an additional observer for data analysis. The focus will also be supplemented with distinctive areas that emerged during the 2023 Workshop – patterns in collective decision-making behaviors and perspective taking. During the 2024 Workshop, participants will engage in a brief team training session, where the TDT framework will be introduced and then promoted further during the AAR – implementing learning through training. The gameplay itself will be enhanced by pulling in and adapting additional elements and strategies from current and popular TTRPGs with LARP, as these increased immersion and fidelity of the game.

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