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Enhancing Team Cohesion Through a Custom MOBA Game: Development, Implementation & Impact

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Abstract: The quality of a team in organizations has an impact on the success of the team in achieving their goals. Team building activities are one of the elements which can improve relationships in different kinds of teams. One of those can be playing competitive digital games, whether for teams working remotely or on site. This paper presents a case study that explores the design and development process of an innovative online game that combines elements of third-person action and multiplayer online battle arena (MOBA) games to provide an experience that strengthens team cohesion. The game design and mechanics support distribution of team roles based on Belbin's theory, highlighting the importance of diverse roles for balanced team functionality. By integrating unique character functions, the game encourages players to understand and appreciate the different roles individuals play in a team, enhancing empathy and mutual respect among team members. The game is uniquely designed to be simpler and more accessible than typical MOBAs, making it an ideal tool for educational and organizational settings to boost team cohesion and communication skills among people from various backgrounds. The leveling of the playing field allows individuals with minimal gaming experience to participate fully and effectively. The design principles ensure that the core mechanics of the game encourage teamwork and effective communication over individual skill, emphasizing collective success. The case study delves into the development process, the challenges faced, the solutions implemented, and the outcomes observed as part of a research project conducted between 2022-2023. The findings suggest that game-based learning can significantly transform traditional team-building methods, introducing a new paradigm for fostering high-performance teams in an increasingly digital world.

Keywords: Competitive Games, Game Development, Multiplayer Online Battle Arenas, Soft Skills, Team Cohesion, Team-Building

1. Introduction

In the rapidly evolving landscape of organizational management, the strength and cohesion of teams have become pivotal to achieving strategic objectives. Team cohesion, which embodies the unity of purpose and mutual commitment among team members, is not only vital for enhancing productivity but also critical for fostering an environment conducive to innovation and growth (Casey-Campbell, Martens, 2009; Chiocchio and Essiembre, 2009; Grossman et al, 2022). Recent developments in educational technology, particularly the integration of game-based learning, have introduced novel methods for cultivating essential teamwork skills (Ellis et al, 2008). Both commercial, open-source and serious digital games have been examined for their potential to foster teamwork and other important social skills (Di Pietrantonio and Mendonca, 2022; Kovalčík, Švecová and Kabát, 2023; Qian and Clark, 2016; Zheng et al, 2021; Zhong et al, 2022). Earlier studies have identified digital games as effective tools for collaborative learning (Hämäläinen, 2011; Karakas, Manisaligil and Sarigollu, 2015), imparting teamwork skills (García et al, 2016; Hewett, 2022; Wang and Chen, 2012) and enhancing team cohesion (Anderson and Hilton, 2015; Garcia et al, 2022; Greitemeyer and Cox, 2013; Keith et al, 2016; Keith et al, 2021). Riivari, Kivijärvi and Lämsä (2021) explored how collaborative learning and the use of games can improve the acquisition of teamwork skills within higher education settings. Wang and Huang (2021) examined serious collaborative games and identified game mechanics supporting collaborative play, with the most common being the player team and chatting channel.

Group processes in existing digital environments have primarily been studied through multiplayer online role-playing games such as *World of Warcraft*. However, teamwork in *WoW* is almost never enforced and it is possible to achieve high levels of the game without any social interactions. On the other hand, multiplayer online battle arenas (MOBAs) must be played together in a group, requiring coordinated team play and strategic decision-making. These games provide a dynamic and engaging platform for enhancing team dynamics (Tang, 2018) and their players get a sense of satisfaction from teamwork (Johnson, Nacke and Wyeth, 2015). They simulate challenges that require collaborative problem-solving, effective communication, and adaptive leadership—skills crucial for any high-functioning team. In MOBAs “individual players act collectively; teams coordinate to meet shared goals” (Tyack, Wyeth and Johnson, 2016). As Buchan and Taylor (2016) suggest, researching group processes in MOBAs can help develop understanding of group processes in work contexts.

Incorporating digital tools and gamification into employee training and development processes is increasingly seen as a vital strategy to enhance team cohesion and adaptability within modern organizations. Research by Stacho et al (2022) explores the utilization of digital tools and gamification in the adaptation process of Generation Z employees. Their findings highlight a significant gap in the adoption of these innovative practices, with only 30% of employers in Slovakia implementing comprehensive adaptation systems that include gamification elements, despite recognizing the potential benefits. This gap suggests a critical opportunity for organizations to enhance their adaptation strategies, particularly in engaging the incoming tech-savvy workforce effectively.

To enhance team performance within organizations, our project merges the dynamic mechanics of MOBAs with Meredith Belbin's theory of team roles. This integration is designed to cultivate an environment where team cohesion, communication, and role functionality are paramount. The union of these frameworks not only enriches the player experience but also stands as an effective developmental tool for assessing team dynamics in scenarios that mirror both competitive and collaborative professional settings. Meredith Belbin's research, which culminated in the identification of nine distinct team roles, provides a structured methodology for understanding and optimizing team dynamics. These roles are segmented into three categories: Action-Oriented (Shaper, Implementer, Completer Finisher), People-Oriented (Resource Investigator, Teamworker, Co-ordinator), and Thought-Oriented roles (Plant, Monitor Evaluator, Specialist), each offering unique contributions to team success. For instance, Shapers are dynamic and driven, often challenging the team to improve. Implementers, however, are more practical, turning ideas into actionable tasks, while Teamworkers support and maintain team cohesion through their cooperative nature. As Belbin explains, "[t]eams roles are functions of the different demands made on team members if the team is to become effective. Individuals respond to these demands in different ways" (Belbin, 2010). Belbin does not prescribe an exclusive role for each team member. One person can prefer two or more team roles. He also emphasizes that team members can consciously choose to play a distinctive team role (further aligning professional teamwork with playing).

Our research aims to build upon these findings by developing and implementing a MOBA game with complex gameplay mechanics and an emphasis on role specificity to improve team cohesion. Its working title is *Untitled Belbin MOBA Game* (*UBMG*), and it has not yet been released publicly. The structured environment of MOBAs forms temporary teams of complete strangers who must collaborate intensely and strategize in real-time to fulfill complex tasks within a short time (Mora-Cantallops and Sicilia, 2018), mirroring the dynamics of professional team settings. In Buchan and Taylor's (2016) findings, optimal functioning teams should consist of friends communicating through a voice chat, at similar play level and willing to perform different team roles. In professional settings individuals with different skill levels and work experience can be grouped to perform a task without prior acquaintance. We simulate this condition by testing the developed game on groups of strangers with varying levels of experience with digital games. Communication mechanics are implemented together with specialization of team roles that in Belbin's management theory should support effective teamwork (Belbin and Brown, 2022). The intention is to enhance the game's effectiveness in promoting a balanced team dynamic, where members appreciate and leverage their diverse roles for collective success. By aligning the game design with established theoretical frameworks, we aim to create an innovative tool that not only enhances team cohesion but also serves as a model for future developments in educational game design. The current paper presents a detailed case study of this game's development process, from conception through testing, with an emphasis on the challenges faced and the solutions implemented. We discuss the specific game mechanics and features designed to foster team cohesion and examine their effectiveness based on participant feedback collected during the study period between 2022 and 2023. Our empirical insights and practical frameworks can be applied across various environments to enhance team dynamics, making a significant contribution to the dialogue on innovative educational tools and lifelong learning. This paper aims to demonstrate how MOBA digital games can transform traditional team-building methods and set new standards for developing high-performance teams in a digital-first world.

2. Game Design and Gameplay Implementation

MOBA games such as *League of Legends* and *Dota 2* are characterized by their strategic depth, requiring players to select from a diverse roster of characters to form a balanced team capable of both offensive assaults and defensive stands. These games emphasize real-time collaboration, strategic role fulfillment, and adaptive tactics, all within a high-pressure environment where teams must destroy the opponent's base to win (Mora-Cantallops and Sicilia, 2018). Our original MOBA game *UBMG* is designed with simplicity and team collaboration at its core. The game mechanics are streamlined to ensure that players of all skill levels can participate effectively. The

primary game mechanics include character roles, communication, and interactive elements such as chests. To further enrich the character designs in *UBMG*, each character's unique abilities and their strategic importance in the game are closely aligned with their corresponding Belbin roles. These abilities enhance the gameplay experience by enabling players to engage in complex strategies and interactions that mirror real-world team dynamics. Each team consists of five fixed characters: Marksman, Flyer, Healer, Jungler, and Bruiser. Number of five team members has been proposed to be optimal for MOBAs (Thavamuni, Khalid and Iida, 2023). The roles are designed to promote interdependence, team cohesion, communication and strategic collaboration. Below is a detailed mapping of the game roles to the corresponding Belbin roles (Table 1). There may be more than one team role each member can perform, so it is possible to map nine Belbin roles onto five game characters.

Table 1: Game characters and their corresponding Belbin team roles

Healer	- maintains team health and stability during battles, using abilities such as healing, protection spells, and status enhancement, provides support during critical moments - can use directed spell to heal one character for 30% of hit points at a time or place a field that heals anyone standing in it for 5 seconds	The Healer is a character suitable for Teamworkers. Teamworkers are cooperative, perceptive, and diplomatic, supporting and encouraging teammates (Belbin and Brown, 2022). Complementary Belbin roles: Implementer, Specialist.
Flyer	- focuses on reconnaissance and coordination, providing strategic information from a high vantage point and coordinating team efforts - their abilities include flying to high points, vision enhancement, and strategic coordination	The Flyer combines best the roles of Resource Investigator and Coordinator. Resource Investigators are outgoing and enthusiastic, exploring opportunities and developing contacts, while Coordinators clarify goals and delegate effectively (Belbin and Brown, 2022).
Marksman	- offensive and strategic role, utilizing long-range attacks to disrupt enemies and provide strategic guidance to the team - abilities include long-range attacks making use of strategic positioning skills	The Marksman is suitable for the role of a Plant. Plants are creative, imaginative, and unorthodox, solving difficult problems by coming up with original ideas and strategies (Belbin and Brown, 2022). Complementary roles: Completer Finisher, Monitor Evaluator.
Bruiser	- leads the team in frontline engagements, ensuring strategic plans are executed effectively - they have high durability, strong melee attacks, and crowd control ability	The Bruiser integrates the roles of Shaper and Implementer. Shapers are dynamic and thrive on pressure, driving the team forward, while Implementers are practical and efficient, turning ideas into actions (Belbin and Brown, 2022).
Jungler	- manages resources and provides critical analysis, unlocking chests by answering questions and offering strategic advice - they can open chests to add boosts for the team by answering questions	The Jungler can perform the role of a Monitor Evaluator. Monitor Evaluators are serious-minded, prudent, and capable of providing logical, impartial, and critical views (Belbin and Brown, 2022). Complementary roles: Plant, Completer Finisher.

Voice communication is integral to the game's mechanics. Players must continuously share updates, make strategic decisions, and call for support, ensuring the team functions cohesively and can respond quickly to changing situations. For instance, the Flyer relays critical information from high vantage points, the Jungler reads out questions to unlock chests, and other roles communicate their needs and status. Interactive elements such as chests add a layer of strategy and teamwork. The Jungler can unlock these chests by answering questions, providing boosts and resources essential for the team's progress. This requires collaboration, as players must work together to solve the puzzles and gain the benefits, such as increased health, damage, or strategic advantages. The game progresses through a series of objectives that require strategic planning and execution. Teams must capture key points, defend their base, and engage in battles with the enemy team. The constant need for communication and collaboration ensures that every player is actively involved in the team's success. For example, in a scenario where the team plans an attack on an enemy tower, the Flyer would ascend to a high vantage point to observe enemy movements, relaying real-time updates and coordinating the attack to ensure

that team members are positioned effectively. This scenario showcases the Flyer as a Resource Investigator, identifying opportunities, and a Coordinator, organizing the team.

UBMG stands out from typical MOBA games in several significant ways:

- Fixed character roles: Unlike other MOBA games that offer a vast array of characters and emphasize team composition and meta-strategies, *UBMG* features only five fixed characters. Each team consists of the same roles, reducing the complexity of character selection and promoting balanced team dynamics and equal participation.
- Accessibility for all skill levels: The game is designed to be accessible to players with varying levels of gaming proficiency. The controls and abilities of the characters are straightforward, ensuring that people with different gaming experiences can play together. Experienced gamers do not gain a significant advantage from complex mechanics, as the game has a short learning curve and focuses more on strategy and teamwork rather than individual skill mastery.
- Emphasis on voice communication: The core mechanics of *UBMG* rely heavily on communication via voice chat, enhancing team coordination and strategic planning. Players must continuously share updates, make strategic decisions, and call for support, fostering a high level of interaction and cooperation. While this is also true for other MOBA games, it is vital for people to develop their communication level by sharing all kinds of information that players of different games would obtain from tutorial or introductory rounds playing against bots.
- Interactive elements: The game includes interactive elements such as chests that the Jungler can unlock by answering questions. These elements add a layer of strategy and teamwork, as players must collaborate to provide the correct answers and gain the benefits.
- Low poly graphics: The game features simple, low poly graphics designed to run on most types of non-gaming specific computers. This ensures that the game is easily readable and understandable, even by people with specific needs, and does not distract players from the objectives.

By integrating fixed character roles, ensuring accessibility for all skill levels, and emphasizing continuous voice communication, *UBMG* offers a unique approach to team-based gameplay. These design decisions, combined with the incorporation of Belbin team roles, create a cohesive and collaborative gaming experience that differs significantly from typical MOBAs. The emphasis on real-time communication and strategic planning over individual skill mastery ensures that team cohesion and effective collaboration are at the forefront of the gaming experience. These abilities not only define the gameplay mechanics but also deepen players' understanding of how each role contributes to the team's overall strategy and success. By engaging with these characters and their unique abilities, players experience firsthand the dynamics and challenges of working within a diverse team, enhancing both their strategic thinking and team collaboration skills.

The game takes place in a classic MOBA setting with three lanes connecting two opposing bases (Figure 1). Each lane is guarded by defensive towers, and the primary goal is to destroy the enemy's central structure. The journey towards this goal requires careful strategic planning and execution, beginning with the character selection phase. During this phase, five players on each side choose characters whose abilities complement each other, and they engage in real-time voice communication to strategize. This early interaction sets a collaborative tone, emphasizing the importance of choosing appropriate roles and planning a coherent strategy.

AI-controlled minions spawn at each base and move along the lanes toward the enemy. Players must work alongside these minions, using them as both shields and support to progress towards enemy towers. This aspect of the game necessitates players to communicate their movements and intentions, deciding collectively when to advance or retreat, thereby reinforcing team dynamics. Each character in the game is designed with unique abilities that necessitate reliance on other team members. For example, the Bruiser can absorb a great deal of damage and is effective at breaking through enemy lines, but this character relies on the Healer for sustainability and the Flyer for setting strategic traps that can disrupt enemy formations. This interdependence ensures that no single player can dominate the game alone, emphasizing the importance of each team member's role and fostering a sense of mutual reliance.

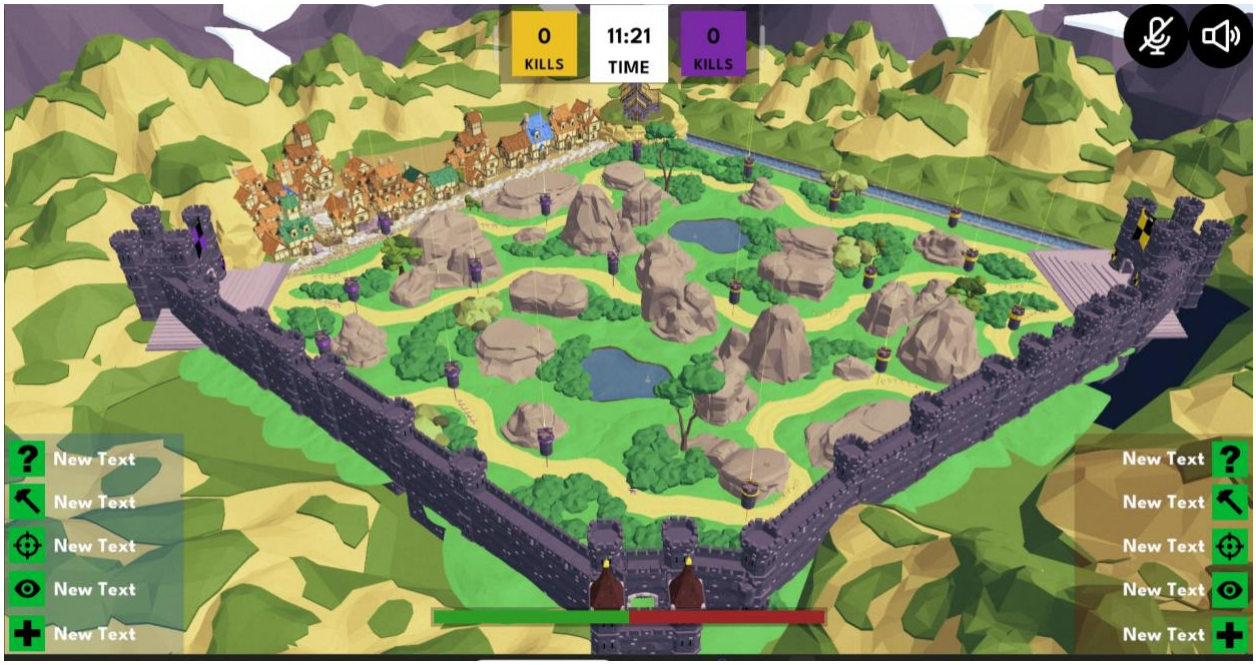

Figure 1: Overview of the map with the typical three lanes layout known from MOBA games

Players must continuously share updates about their status, enemy locations, and potential strategic moves. The third-person perspective of the game means that players do not have a complete view of the battlefield, further emphasizing the need for sharing information and coordinating actions. This setup encourages players to rely on each other for a comprehensive understanding of the game state, enhancing team collaboration.

Strategic decision-making is a constant necessity in the game. Teams must make collective decisions on when to push for objectives, defend against enemy advances, or regroup and strategize. These decisions require a high level of team consensus and adaptability, fostering a deeper engagement with the team's strategic processes. The immediate feedback from these decisions, whether in the form of successful engagements or objectives or learning from failures, helps teams adapt their strategies in real-time. This continuous loop of action, feedback, and adaptation is instrumental in developing team cohesion and dynamic problem-solving skills. By engaging with this MOBA game, players not only enjoy a strategically rich competitive experience but also develop essential soft skills applicable to any collaborative environment. The game's design, which integrates complex team roles and dynamic gameplay, acts as a powerful tool for team building. The deliberate alignment of game mechanics with real-world team dynamics ensures that players learn valuable lessons about teamwork, communication, and strategic planning, which are critical for success in both the virtual and real world.

In the development process, there were periodical tests of gameplay that revealed bugs and glitches that were fixed, but also some shortcomings in original design that proved to be gamebreaking. For example, the Marksman character was able to shoot on towers that were not yet reached by minions or even attack the enemy's core under the right angle. This was solved by nerfing his ability by shortening the arrow trajectory. Similarly, the Flyer (who was originally intended to observe) was used to not only surprisingly attack enemy players from behind, but also was able to drop directly on top of the enemýs castle and attack the core outside the reach of minions. First issue was fixed by adding a sound when the character touches ground and can shoot, the second issue was addressed by adding a roof to the castle.

3. Research Overview and Methodology

Following the detailed account of the game's design, this chapter outlines the methodological framework used to assess the efficacy of the custom-designed MOBA game in enhancing team cohesion. The target population in the conducted quantitative research was selected through purposive sampling, i.e. according to the determined characteristics and on the basis of inclusive criteria. We selected students from three different faculties of UCM in Trnava, Slovakia. To ensure that the subjects did not form teams prior to the study, the sample was selected only from first-year students. The total sample consisted of 144 respondents, with 124 valid responses (74 female and 50 male). In terms of age, the sample consisted of 91 respondents aged 18-21 years, 27 respondents aged 22-25 years, and 6 respondents aged 31 years and older. Respondents varied not only in

their current educational orientation, but also in their background (gymnasiums, business and hotel academies, vocational schools and others). Eighty-eight respondents regularly play computer games, while 36 respondents indicated that they do not play computer games. Out of 121 respondents, 69 meet new people in online spaces, while 52 do not. To measure team cohesion, we used the Youth Sport Environment Questionnaire (YSEQ; Eys et al, 2009). The YSEQ assesses the perception of cohesion in youth teams and was developed from the Group Environment Questionnaire (Carron, Widmeyer and Brawley, 1985). These questionnaires are commonly used in research focused on group cohesion in sports psychology. The complete questionnaire consists of 18 items, with responses available on a 9-point scale ranging from "strongly disagree" (1) to "strongly agree" (9). Higher scores reflect a stronger perception of cohesion. Cohesion is evaluated in two aspects (dimensions): task cohesion (TC), represented by 8 items (e.g., "We are united as a team"), and social cohesion (SC), represented by 8 items (e.g., "Some of my best friends are members of this team").

The second method comprises two separate questionnaires targeting the following aspects of inclusion:

- Need for Social Inclusion (NSI) – this questionnaire evaluates the extent and strength of the need for inclusion and its characteristics. It allows for diagnosing the motivational component of affiliation. The content focus and question formulation follow the experiences and attitudes influenced by this need.
- Social Inclusion (SI) – this questionnaire evaluates the degree and extent of social inclusion, allowing for diagnosing the behavioral component of affiliation (Kollárik, 2008).

The third method, the Achievement Motivation Inventory (AMI; Schuler and Prochaska, 2011)), is designed to diagnose achievement motivation in a professional context and consists of 170 items assigned to 17 scales (dimensions): compensatory effort (CE), competitiveness (CO), confidence in success (CS), dominance (DO), eagerness to learn (EL), engagement (EN), fearlessness (FE), flexibility (FX), flow (FL), goal setting (GS), independence (ID), internality (IN), persistence (PE), preference for difficult tasks (PD), pride in productivity (PP), self-control (SC), status orientation (SO).

The experiment proceeded in three stages:

1. Initial assessment (pretest) of cohesion level, social inclusion, and AMI in experimental and control groups.
2. Implementation of the designed game in the experimental groups. All participants underwent a comprehensive training session designed to familiarize them with the game mechanics and the specific roles they would be playing. This standardization was critical to ensure that all participants had a similar level of understanding and capability with the game. Following the orientation, teams participated in multiple gameplay sessions where they could apply and refine their teamwork and strategic skills in a dynamic and competitive environment. The game sessions were designed not only to stimulate participants' strategic thinking and role execution but also to foster intense collaboration and communication within the teams. All gameplay sessions were standardized. This involved controlling game variables such as session duration (60 minutes), game settings, and specific challenges presented during the game. The sessions were closely monitored to ensure adherence to the experimental protocol and to facilitate accurate data collection
3. Post-test assessment and two follow-up tests of cohesion level, social inclusion, and AMI in experimental and control groups after completing the game implementation in the experimental groups.

In addition to the post-test, interviews and feedback sessions were conducted after game sessions to collect qualitative insights from participants. This data helped to enrich the understanding of the quantitative findings and provided nuanced perspectives on the participants' experiences and the perceived impact of the game on their teamwork skills and cohesion.

4. Results and Discussion

The experimental results reported in Table 2, where the asymptotic significance values of the chi-square test are displayed (significant differences with $p < 0.05$ are bolded), reveal several notable findings.

Table 2: Experimental results

	Social inclusion								Team cohesion		Achievement motivation inventory															
	NSI	SI	a	b	c	d	e	f	SC	TC	PE	DO	EN	CS	FX	FL	FE	IN	CE	PP	EL	PD	ID	SC	sO	CO	GS
Kruskal-Wallis H	5.396	13,926	18,418	23,776	11,315	7.876	18,473	38,757	3.225	19,195	5.491	1.797	1.661	10,645	12,856	6.767	2.120	14,833	2.909	7.934	7.371	.771	2.965	2.626	.494	12,555	1.122
df	8	8	8	8	8	8	8	8	8	8	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Asymp. Sig.	,714	,084	**,018**	**,002**	,184	,446	**,018**	<,001	,919	**,014**	,139	,616	,646	**,014**	**,005**	,083	,548	**,002**	,406	,062	,126	,856	,397	,527	,920	**,006**	,772

- Social Inclusion: The experimental groups demonstrated significant improvements in three out of eight dimensions of social inclusion between the pre-test and post-test groups. This indicates that the interventions applied had a meaningful impact on specific aspects of social inclusion, enhancing participants' feelings of being socially accepted and integrated.
- Team Cohesion: There was a significant increase in the task cohesion aspect of team cohesion within the experimental groups. Task cohesion refers to the degree to which group members work together to achieve common goals. The improvement in this area suggests that the experimental interventions fostered a stronger sense of teamwork and collaboration focused on task achievement.
- Achievement Motivation Inventory: The experimental groups reported significantly higher levels in four dimensions of the achievement motivation inventory:

- Confidence in Success: Participants in the experimental groups showed an increased belief in their ability to succeed. This boost in confidence can positively influence their motivation and performance.
- Flexibility: The increased flexibility suggests that participants became more adaptable and open to change, which is critical for effective problem-solving and performance in dynamic environments.
- Internality: Higher internality scores indicate that participants felt a greater sense of control over their outcomes, attributing success to their efforts and abilities rather than external factors.
- Competitiveness: The rise in competitiveness reflects a heightened drive to excel and outperform others, which can be a strong motivator in both individual and team contexts.

The significant differences observed in these dimensions suggest that the interventions applied in the experimental groups were effective in enhancing specific aspects of social inclusion, team cohesion, and achievement motivation. These findings support the hypothesis that playing MOBAs can positively influence group dynamics and could be used for team building in various organizations. The qualitative data from post-game interviews and open-ended survey responses enriched these findings by providing context to the numbers. Participants described their experiences of adapting to the dynamic demands of the game, mirroring the flexibility often required in professional environments. Many highlighted a greater appreciation for the strategic importance of different team roles and reported a more profound respect for the diverse skills each team member brought to the table. This feedback underscores the value of a gamified learning environment in fostering a deeper understanding of team dynamics and enhancing strategic execution and planning. Additionally, the dynamic nature of the game—requiring continuous adaptation and strategic communication—was frequently praised. Participants noted that these aspects of the game improved their agility and responsiveness, skills that are invaluable in the workplace. This aspect of the game not only made the learning process more engaging but also more closely aligned with the real-world challenges that professionals face. The synthesis of this quantitative and qualitative data paints a clear picture: integrating structured game-based learning environments with theoretical models like Belbin's team roles can significantly enhance crucial workplace skills. The marked improvements across various dimensions of team dynamics suggest that digital game-based interventions are potent tools for developing not only individual skills but also a collaborative team

culture. This approach provides a compelling alternative to traditional training methods, offering a more engaging, effective, and adaptable way to enhance team performance in professional settings.

5. Conclusions and Recommendations

The study underscores the importance of structured activities promoting social inclusion and team cohesion. Digital game-based activities, especially MOBAs respecting Belbin's team roles theory, show potential to enhance team dynamics and communication. Both quantitative and qualitative analyses indicate improvements in team cohesion, social inclusion, and motivation, confirming gamified learning environments' effectiveness in developing teamwork skills. These skills are essential in high-functioning teams, crucial in today's interconnected work environments. Integrating Belbin's team roles into game design helped participants appreciate diverse team roles, leveraging their strengths and enhancing overall team performance. The positive outcomes highlight the value of sophisticated gamification strategies in team development programs, beneficial in educational and organizational settings.

Future research should explore these interventions' long-term effects to determine sustained improvements. Given the study's reliance on self-reported results, future investigations should record gameplay performance metrics. Replicating the study with a diverse sample could provide insights into the findings' generalizability. Investigating specific mechanisms through which interventions exert their effects could refine strategies for different contexts. Exploring other psychological and management theories within the gamification framework could add dimensions to team training, including leadership development and conflict resolution. Further research could examine customized game elements tailored to individual team needs and preferences, enhancing engagement and effectiveness. The significant improvements in social inclusion, team cohesion, and motivation highlight the potential of digital game-based interventions to enhance group dynamics and individual motivation, contributing valuable knowledge to educational psychology, organizational behavior, and game-based learning.

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