


# Promoting Social Relationships Using a Couch Cooperative Video Game: An Empirical Experiment With Unacquainted Players

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## ABSTRACT

Social relationships are a fundamental aspect of human existence. Unsurprisingly, policymakers are incessantly devising strategies that accentuate the benefits of social relationships and diminish the risks of social isolation. The natural manifestation of player-to-player interaction in a video game context poses a unique opportunity to study the effects of co-playing on social relationship formation. However, most studies recruited players with existing relationships (e.g., family and friendship), utilized random commercial video games, or experimented in an online environment. These research gaps warrant further investigation on the utility of video games for promoting social relationships among unacquainted players while in the same physical space. Thus, this study presents the development and evaluation of a couch cooperative video game grounded on sequential team-building mechanics. The findings of this study offer empirical evidence that would have significant practical implications for any organization seeking to increase teamwork and cooperation among its members.

## KEYWORDS

Cooperative Game, Multiplayer Game, Social Relationship, Teamwork, Video Game

## 1. INTRODUCTION

The WHOQOL instrument developed by the World Health Organization (1997) positions social relationships as a fundamental construct for measuring how individuals perceive their quality

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of life. Broadly defined as the connections between people (e.g., family members and friends) who have meaningful interactions, social relationships are associated with self-esteem (Harris & Orth, 2019), life satisfaction (Amati et al., 2018), quality of life (Datta et al., 2015), and human and societal development (Psaltis et al., 2015). Social epidemiology research has also contributed sufficient evidence on the protective effects of social relationships on health and longevity (e.g., Holt-Lunstad, 2018; Umberson & Montez, 2010). Accordingly, the inadequacy of social network ties (e.g., via social isolation or loneliness) qualifies as a risk factor for morbidity and premature mortality. More and better relationships alleviate these adverse effects through social regulation, companionship, and social support. Thus, policymakers are continuously formulating strategies that emphasize the benefits of social relationships and reduce the risks of social isolation (Umberson & Montez, 2010). While there have been proposed interventions (e.g., positive psychology activities; O’Connell et al., 2016), there is still a necessity to explore other mechanisms (e.g., technology-based) to have better alternatives (Holt-Lunstad, 2018).

In a video game context, social relationships are a potential outcome (Domahidi et al., 2014; Grove, 2014). There is a natural manifestation of player-to-player interaction because the game environment serves as a platform for self-expression and community engagement (Cole & Griffiths, 2007; Jansz & Martens, 2005). In addition, the gameplay that fuels this in-game social interaction is observable as a social activity (e.g., psychophysiological game research; Kivikangas et al., 2011). Because shared enjoyment plays a significant role in building and maintaining relationships, the ‘*fun*’ factor of video games can stimulate feelings of social integration with others (Kaye & Bryce, 2012). These attributes unlock an opportunity to capitalize on video games as a tool for promoting social relationships. However, most studies recruited players with existing relationships, such as family (Chai et al., 2011) and friendship (Verheijen et al., 2019). The existence of these prior connections could have dictated the outcomes because of distinct social gaming patterns when gamers play with friends, family, or strangers (Eklund, 2015). Meanwhile, previous studies that recruited strangers mainly employed online video games in exploring relationship formations. According to Gioia et al. (2022), socially anxious individuals perceive the virtual worlds of online gaming as safer social environments than face-to-face interactions. This distinction could have moderated the designated obligation of video games to establish social ties among players. Finally, prior works that utilized random commercial video games could have reported inaccurate findings because of uncontrolled game design (e.g., cooperative vs. competitive) and purpose (e.g., relaxation vs. socialization). Verheijen et al. (2019) asserted that players’ behavior during gaming is dependent on whether the video game is played cooperatively or competitively.

The foregoing research gaps warrant further investigation on the utility of video games for promoting social relationships among unacquainted players while in the same physical space (offline video games). Thus, the aim of this study was bipartite. First, a cooperative video game called “*Quick Fix*” was developed by explicitly incorporating game mechanics that employ sequential team-building tasks to encourage teamwork. Instead of capitalizing on competition between groups of players as what cooperative game theory dictates, the study prioritizes the importance of cooperation between teammates. Then, a one-group pretest-posttest design was used to evaluate the impact of cooperative video gaming on social relationships. Consequently, this study contributes to the body of knowledge by providing (1) relevant academic work for game companies that intend to develop cooperative video games and (2) empirical research findings for policymakers who plan to employ video games as a tool for promoting social relationships. Evidence supporting these contributions would have significant practical implications for any organization seeking to increase teamwork and cooperation among its members, which could be translatable to more positive and productive outcomes.

Figure 1. Official Video Game Poster of Quick Fix



## 2. RELATED LITERATURE AND GAMES

### 2.1 Video Game Research

Much of the early video game research has focused on the emergence of gaming as a form of hedonistic entertainment. The characterization of video games as a perfunctory diversion filled with monsters and myths contrived a premature conclusion about how they can elicit the feeling of enjoyment but not meaningfulness. In entertainment research, a meaningful experience is triggered by fulfilling eudaimonic needs (e.g., contemplation of human life's poignancies and existential questions surrounding mortality issues), even if at the expense of the hedonic pleasure (Oliver & Raney, 2011). The stereotypical view of video games as a solitary hobby likewise tipped the scales in favor of hedonic gratifications. Conversely, Rogers et al. (2017) conducted a comparative analysis on video game experience and debunked the presupposition on how players consume gaming content. Rather than purely enjoyable, playing video games can also prompt meaningful experiences. This eudaimonic gratification infers immersion in fantasy worlds and complex narratives, thereby interconnecting players and their respective in-game characters. The analysis also highlights the fulfillment of relatedness needs as paramount in facilitating a meaningful game experience, reflecting the importance of social bonds in gaming. Most notably, the findings exhibited deep interactions with other players (i.e., social experiences) as a meaningful game condition. This very same fabric woven on the social nature of modern video games illuminates the furtherance of hedonic and eudaimonic gratifications.

The preliminary research agenda also encompassed the potential negative consequences of video games, such as the relationship between violent video games and human aggression (Prescott et al., 2018) and pathological gaming prevalence (Ferguson et al., 2011), to name a few. As the industry evolves, the transformational impact of video games has opened new research avenues towards their positive and practical applications. Beyond the core purpose of entertainment, different sectors have

been repurposing video games as an agent of change in a pluralistic society. For instance, Luluquisin et al. (2021) developed a third-person action role-playing game embedding relatable storyline and symbolism as instruments to promote social issue awareness. The game objectives revolved around capturing a beast, which is only possible by dissecting its origin stories and understanding how it connects to a particular societal issue (e.g., the beast stray dog and poverty). A similar video game is *Trash Attack* (Fernando et al., 2019), whose primary goal is to raise environmental awareness and foster waste segregation behavior. The gameplay features special-colored guns (green gun for biodegradable, yellow for non-biodegradable, and blue for recyclable), and players must select and use the right weapon in shooting various wastes. Both video games attest to the resultant metamorphosis of the industry, where both hedonic and eudaimonic experiences are embedded within the game mechanics.

## 2.2. Cooperative Video Games

Over the last half-century, video games have evolved from controlling an armed starship on a black and white screen to roaming an open world with other online players. What was once stereotypically identified as a solo and socially isolating activity now facilitates social interactions between players. Cooperative video games, the likes of *Left 4 Dead* and *Call of Duty*, have been a popular genre in the video game market. It is a multiplayer mode where players work together as teammates to achieve a common objective. Their acclaimed recognition can be partially attributed to the favorable response of players towards communal experiences shared in the same physical space (Bateman & Boon, 2005). The literature also emphasizes that co-playing video games improve prosocial behavior significantly (Dolgov et al., 2014; Velez et al., 2012), making this type of video game more appealing to many. In addition, it decreases aggressive cognitions (Schmierbach, 2010) and angry feelings (Eastin, 2007) and increases the feelings of trust (Velez et al., 2014) and positive attitude (Stiff & Bowen, 2016) towards a video game partner. These effects on players' behaviors are often illuminated through the theory of *Bounded Generalized Reciprocity* (Yamagishi et al., 1999), which asserts that players under the same team are expected to reciprocate positive behaviors more than out-group members.

Finding a balance between entertainment and cooperative elements is an enigma for this video game genre. However, it is paramount to align enjoyment and pleasure with purpose and meaning to accentuate the social aspects of play. The development of serious games underscores comparable incongruity where contents intended for learning overlay the hedonic satisfaction from gameplay (Harteveld et al., 2007). Following this game philosophy, a question arises: how can cooperation be superimposed on players while still making the experience fun and meaningful? As the literature on balancing cooperative and entertaining elements is still scarce, the balance between learning and fun in serious games can be an alternative guideline. For instance, Christopher et al. (2014) implemented several strategies to blend education and entertainment, including *narrative-learning synthesis*, *supplemental feedback*, and *player guidance*. By interlacing educational content and game narrative, players are more immersed in incorporeal facets of gameplay. Garcia (2020) implemented a similar strategy in a visual novel game where a relatable storyline wooed preschoolers in addition to the actual gameplay. This strategy is also an opportunity to showcase the interplay of playing context, narrative, and mechanics. On the other hand, supplementing players' actions with feedback can be a mechanism to foster extrinsic motivation. One example is rewarding players with spendable points as an incentive for every accomplishment (e.g., level completion). By allowing these incentives to influence the flow and mechanics, players are more proactive in their game experience. Lastly, teaching players and guiding them to navigate the game world highlights the necessity for scaffolding rather than providing all information at once. This strategy is analogous to the concepts of game difficulty and level progression, whereas players have a wiggling room to decipher rules within the game world. Nevertheless, future research is still warranted on how to weave together the elements of entertainment and cooperation in a video game.

### 2.3. Game Design Patterns

Researchers have been actively exploring various game design patterns for cooperative video games (Beznosyk et al., 2012; El-Nasr et al., 2010; Emmerich & Masuch, 2017). Although likewise applicable in other genres, some impactful cooperative game design patterns are *synergies between abilities*, *shared goals*, and *complementarity*. The first pattern is often engraved within the game mechanics to ensure players perceive their teammates as instrumental to efficient team performance. For instance, the *Battle Royale* mode of *Call of Duty: Mobile* offers various classes that afford players special abilities, from summoning a medical station to heal the entire team (i.e., Medic) to launching a cluster airstrike in a designated area to devastate other teams (i.e., Spotter). The second pattern insinuates that players have a single, non-exclusive goal that must be accomplished as a group. Matching objectives allows players to view the success of a team based on the capability of each member to accomplish goals. This rule is noticeable in the *World of Warcraft*, where players should kill enemies that are much easier to achieve together. The last pattern lives on the interdependence of players. For instance, two different game characters for the same role may have distinct abilities but are complementary to one another. To foster positive interdependence, each player must perceive that achieving personal success (or failure) is only possible when teammates succeed (or fail). This strategy is evident in team-based first-person shooter games like *Counter-Strike*, where a team loses when every member dies or wins when all enemies are killed. This ‘*sink or swim together*’ mindset is the same philosophy of a cooperative learning strategy in education (Garcia, 2021).






The embedment of cooperation in the game mechanics without conspicuous accentuation is another compulsory pattern to capture. The formation of social attachments needs to happen naturally and involuntarily, making it a challenge to hide the core mission of the video game. Unlike its online counterpart, the *gaming community* of couch cooperative video games is composed of players present in the physical space. Creating a sense of belonging with this community demands fulfillment of needs, whereas each member contributes to the team’s success. The conversion of this necessity into the rules and procedures within a video game means that every player should receive an equal opportunity to make a difference. There should be an imposition of cooperation and communication, where giving and taking (i.e., task delegation) is at the forefront of level progression. At the same time, there should be a balance between the increasing pressure of game difficulty and dynamic group performance to guarantee a safe atmosphere and avoid conflict among players. Thus, the cooperative nature of the video game should elicit feelings of social belonging, networking, and interactions with other players.

## 3. MATERIALS AND METHODS

### 3.1. Game Design

*Quick Fix* is a couch cooperative video game whose primary goal is to foster social relationships among players. The entire gameplay features five primary levels (Table 1), and the game world is viewable in a camera angle set to a bird’s eye view giving all players the complete map perspective. The game mechanics emulate the model of an auto repair simulator, where players perform repairs and other services on vehicles. In line with the goal, the in-game tasks (e.g., car wash, body car paint, and tire inflation) imitate a sequential team-building design, playable by a minimum of two (using a keyboard) and a maximum of four players (using controllers). Rather than restricting each game character to a specific role, players have the freedom to distribute task assignments. The formulation of teamwork is dependent on how players intercommunicate with one another during gameplay. The necessity for communication means players have an opportunity to build interpersonal relationships. By hiding the obligatory player-to-player interaction behind entertaining gameplay, players can surmount difficulties in social engagement (e.g., face-to-face communication). Finally, assertive players are bound to drift to leadership positions to ensure organizational efficiency and gameplay performance. Therefore, aside from teamwork behavior, developing leadership skills is a good casualty of the video game.

Table 1. Game Levels of Quick Fix

Levels (Game Map)	Featured Items	Game Environment
A New Beginning (Uncle Billy's Garage)	Tire Shelves, Toolbox, Tire Inflator, Cashier	
Waste Not a Sweat (Sunset View Garage)	Items from Previous Level, Engine Oil, Air Station, Body Repair Station	
Time is Running So Slowly (Upkeep Station)	Items from Previous Level Car Batteries, Battery Shelves	
Catching up for the Race (Winter Windfall Carport)	Items from Previous Level, Car Paint Station, Queue Area, Newspaper Stand	
The Final Screw (Quick Fix Depot)	Items from Previous Level, Car Wash Station, Towels, Car Shampoo, Vacuum Cleaners	

In addition to the foregoing game design patterns, Garcia (2020) asserts that commercial video games are blueprints to ensure the applicability of rules and designs. Therefore, before the game development commenced, the characteristics of similar video games were explored. First, the *Car Mechanic Simulator* shared the same auto-repair theme and gameplay concentrated on repairing automobiles. The elaborate nature of simulation in this video game served as a baseline on how to break down procedures of fixing vehicles. On the other hand, *Overcooked* is a prime example of how a video game should foster cooperation amongst players. The game delivers chaos and pressure

where a group of players pushes through together to engage in a cooperative activity (i.e., cooking) to achieve victory. Then, *Dinner Dash* was the basis of strategy and management factors where more features are presented as difficulty increases, so does the demanded quota to be satisfied by players. Like most of these video game titles, *Super Mario Odyssey* caters to multiplayer format, puzzles, and casual gaming aspects. However, one charm of this video game franchise absent in other video games is its musical score that enriches players' emotions. Finally, *Crawl* was the inspiration of the game world, where game characters are placed in a single polygon room that gives players a complete view of the map. Relevant and positive characteristics of these video games were replicated in the game development. Figure 1 shows the official poster while Figure 2 shows the screenshots of the final video game.

### 3.2. Gameplay and Tasks

Following the *narrative-learning synthesis* design pattern in serious games (Christopher et al., 2014), each level begins with a backstory tied onto the gameplay. This strategy aims to establish a connection between real players and in-game characters. Each player character has a corresponding personality and motivation, and the character development is interconnected. By building interrelated player-character relationships, the inclination of players to want to succeed together is more feasible. The background stories precede the continuous arrival of automobiles into the garage – a mere transition from backstory to actual gameplay. Each automobile has a corresponding task indicator, or what kind of repair or service is needed, and its arrival is dynamically contingent on the game progression (e.g., current level, scores, and points). This task indicator serves as a decoy for players to plan their strategy (e.g., who does what) for the upcoming automobiles queued outside the garage. In addition to randomizing the services required by each customer, automobile classification (e.g., Coupe, 4x4, Sedan, Sportscar, SUV, and Jeepney) likewise influences task complexity (e.g., oil change varies from one model to another). The more players present in the garage, the more challenging the mechanics are, and the greater the reward is in terms of time percentage (See Table 2). Therefore, there are three concurrent game difficulty variables (i.e., service type, vehicle classification, task complexity) employed to balance the gameplay. Should the group fail to finish the demanded service within the given time, the task is lost; and consecutive task loss means the current level is lost. Cooperation is key to winning the game, and thus players need to coordinate with one another to establish a team strategy and distribute roles per each service.

Figure 2. Splash Screen, Character Selection, In-game Screen for Level 1-1, and In-game Screen for Level 2-1



Table 2. Score Mechanics

Number of Players	Time Percentage	Money Earned
Two	0% - 40%	Minimum Amount
	41% - 70%	Minimum to Maximum
	71% - 100%	Maximum Amount
Three	0% - 50%	Minimum Amount
	51% - 80%	Minimum to Maximum
	81% - 100%	Maximum Amount
Four	0% - 60%	Minimum Amount
	61% - 90%	Minimum to Maximum
	91% - 100%	Maximum Amount

Each service has corresponding puzzle-like car maintenance chores that entail specific step-by-step procedures (Table 3). A single player can perform all services demanded by a customer, but a systematic task distribution strategy guarantees the completion of services more efficiently (time constraints) and productively (quota-based levels). The collaborative effort is also necessary because of the increasing number of customers, job orders, featured items, and car types as the game level progresses. This technique of game progression insinuates that ideal time completion and required quotas per level are harder to accomplish without proper teamwork. At higher levels, customers demand more services (e.g., change oil, body car paint, and tire inflation in a single job order) for one automobile, thereby prolonging job order completion. Extrinsic rewards are available to balance game difficulty and pressure progression and encourage collaboration and participation. For instance, more points are awarded on early completion of job orders and, as a result, more customers can be served. Players have an opportunity to use these points to purchase more efficient tools for repairs and maintenance. For instance, a powered screwdriver performs faster in inserting and removing screws than its manual counterpart.

Table 3. Sample Task Procedure Breakdown (Change Oil)

Tasks	Instance	Action (Duration)	Description
Open Car Hood	Instant	Single Press Button (0s)	Opens instantly when the assigned button is pressed.
Remove Old Oil	Non-Instant	Hold Button and Release to Balance (12s)	Maintain handle within the bar
Change Oil Filter	Instant	Single Press Button (0s)	Occurs instantly when the assigned button is pressed
Add New Oil	Non-Instant	Hold Button and Release to Balance (12s)	Maintain handle within the bar
Close Car Hood	Instant	Single Press Button (0s)	Closes instantly when the assigned button is pressed
Get Payment	Instant	Single Press Button (0s)	Get payment from the customer and go to the cashier to finish



### 3.3. Premise and Characters

The basic premise is set in a modern era where people widely celebrate automobile racing as the most popular sport. It follows the story of a racing team led by a non-playable character (NPC) named *Rey Serz*, who is considered the best racing driver of all time. Assigning the main protagonist as an NPC ensures that each player has an equal opportunity to perform any role in any strategy throughout the missions. The first backstory features the last racing competition and his tragic accident that led to multiple injuries, hospitalization, and the destruction of the team's most valuable racing car. Its primary purpose is to evoke emotion among players and establish some modicum of conflict that they would eagerly resolve afterward. To propel the story forward, an antagonist will appear in the subsequent scenes revealing that there has been sabotaged to advance other race car teams. By adding a common enemy, the cooperative effort of each player becomes more critical, which also leads to a formation of a coalition (De Jaegher, 2021). As the storyline progresses, the protagonist will assemble his team of four playable characters again as preparation for their return to their most beloved sports. As a means of raising money to build a new race car, the team (*Rose, Joshua, Mae, and Sean*) will start an auto repair shop. Although players can choose from these characters (See Figure 2) before starting the game, they do not have distinct abilities for reasons explained in the game design section. Primarily, the absence of special abilities seeks to implicitly designate the task distribution at the discretion of players and thus encourage in-game communication.

### 3.4. Game Evaluation

The video game evaluation was carried out in two stages: a pre-evaluation in 2019 and an in-depth evaluation in 2020. Dividing the assessment into two phases allows for early game usability to gauge the acceptance level of players both in terms of design and functionality. The first stage measured the *technical quality* dimension comprised of video game design components, such as *gameplay, aesthetics, user interface, and audio*. Borrowing concepts from the *Gameful Experience*

Figure 3. Game Characters: Rose, Joshua, Mae, and Sean



*Questionnaire* (Högberg et al., 2019), the *player experience* was added to this dimension. According to this questionnaire, the experiential component is considered progressively significant for players' overall gameplay experience. A total of 54 players (32 male and 22 female) participated in this stage. The second stage measured the *social relationship* dimension using the *Evaluation of Social Systems Scale* (Aguilar-Raab et al., 2015). This instrument is composed of *cohesion*, *atmosphere*, *giving and taking*, and *communication* constructs. For this evaluation, potential respondents were invited to attend the annual open house event for game testing. A total of 20 groups of players (five groups with two players, nine groups with three players, and six groups with four players) playtested and evaluated the video game. Following the nature of the study, each group is composed of unacquainted players.

The evaluation instrument used for both stages is listed in Table 4. Before playtesting sessions, researchers evaluated the questionnaire using an expert judgment approach to initially assess its

**Table 4. Game Evaluation Instrument**

Aspect	Factor	Sample Items
Game Quality	Gameplay	The quota for each level is set with the game difficulty in mind.
		The game features finite team-building tasks that promote team play.
		The reward system is useful to perform efficient services.
	Aesthetics	The surrounding objects and characters complement each other.
		The ambient lighting of the scenes on each level is satisfactory.
		The game elements are well-designed.
	User Interface	The user interface matches the game theme.
		The user interface is well-placed and not obtrusive during gameplay.
		The user interface conveys their use based on their design.
	Audio	Sound effects reflect realism to the actions performed in-game.
		The audio elevates the vibe and your mood while playing.
		The background music for backstory scenes is chosen properly.
	Player Experience	Gives me the feeling that time passes quickly.
		Makes my actions seem to come automatically.
		Gives me a sense of having someone to share my endeavors with.
Social Relationship	Cohesion	The tasks are being carried out as a team.
		There is a high level of trust in this team.
		There is smooth coordination between members of the team.
	Giving and taking	The group members are clear about what they must do.
		Each member has his/her function in the game.
		The distribution of tasks is balanced.
	Communication	Knowledge and information are shared openly within the team.
		Every member participates and is heard in group discussions.
		Communication is open and honest.
	Atmosphere	Team members with different ideas are valued on this team.
		Efforts of each member are recognized and acknowledged.
		Each member feels like they are part of the team.

format, readability, and completeness. It was also pilot tested for reliability assessment, and results show that each construct has a Cronbach's alpha value of  $> 0.70$ . Qualitative data gathering was also accomplished on both stages using open-ended questions, such as "How would you describe your gaming experience?" and "How does playing with others make you feel?". Data from the first stage was analyzed using descriptive statistics, while Wilcoxon signed-ranked test was utilized to determine whether there is a significant difference before and after gameplay on the second stage. A non-parametric test was employed because the dependent variable is ordinal and not normally distributed. A supplemental evaluation was also conducted to assess whether the number of players in a group affects the results.

## 4. RESULTS AND DISCUSSION

Cooperative video games pose potential opportunities in establishing social ties among players because of the natural manifestation of player-to-player interaction. However, whether this opportunity is afforded to strangers playing in the same physical space is still unclear. In response to the research gaps presented in this study, a couch cooperative video game was developed by following design patterns that encourage cooperation rather than competition. A series of playtesting sessions were conducted for the evaluation of two dimensions: *technical quality* and *social relationships*.

### 4.1. Technical Quality

In the first stage of evaluation, players rated the video game with scores ranging from 4.30 to 4.50 (see Table 5), indicating that the technical quality is provided at an acceptable level. In terms of *gameplay*, there is a positive acceptance of the applied design patterns that stimulate teamwork through sequential team-building tasks. This finding accentuates the applicability of meaningful narratives to blend cooperative and entertaining elements in a video game. Another layer superimposed on enjoyable gameplay that hides the obligatory teamwork is the visual aspect of the video game (i.e., *aesthetics*). To represent the dramatic theme of social relationship formation less seriously, the characteristic trait of the *stylized* game art (i.e., cartoonish graphics) was applied to the design theme

Figure 4. Playtesting and Evaluation during an Open House Event



of characters, vehicles, and environments. The very existence of these fun and friendly visual vibes secretes the profound goal of the video game in superficial and enjoyable gameplay. In addition, the manifestation of this art form to the *user interface* strengthens the inseparable qualities of aesthetic beauty and functional design. From a technical standpoint, a video game is still software that demands a touchpoint of player-game interaction, and an uncluttered interface between the two can support immersion and playability. The final piece of the puzzle was the *audio*, which stimulates the feeling of presence where the virtual world becomes a new reality for players. This recognition highlights the importance of invigorating sensory gratification where auditory soundscape immerses players in a meaningful but pleasurable gaming experience. All these technical attributes lead to *player experience* that is triggered by various states (e.g., satisfaction, motivation, emotion, immersion, and socialization). Although the multifaceted nature of this construct demands a deeper investigation, the current form of the video game is adequate to offer a satisfactory gaming experience.

Despite the positive scores for constructs in this dimension, the qualitative feedback implies that there is still room for improvement. These confounding results highlight the importance of early game usability tests and the benefits of mixed data collection methods. In general, the qualitative feedback submitted by players were either bug-related (e.g., “*slightly fix the placement of another interface*”) or technical aspects that could enhance the gameplay (e.g., “*tire pump mechanic is easy so just make it a little harder to pump a tire*”). Although most are minor and unnecessary to implement, other recommendations pose many opportunities. These include the improvement of camera angle for a more visible game world, proper object placements to prevent screen obstructions, and additional objects (e.g., toolbox, tools, and cars) for a more complex and bigger game world. Some players also noted that an online multiplayer version could elicit more enjoyment, although it contradicts the idea of a couch game where players play together physically. Selected recommended modifications, provided relevant to hedonic and eudaimonic experiences, were conducted before moving to the second evaluation.

Table 5. Technical evaluation

Factors	Mean (Verbal Interpretation)	Qualitative Feedback
Gameplay	4.34 (Acceptable)	“It’s great! The game itself is easy but getting 3 stars is hard” - [P2] “The tire air pump was too easy, but the other ones are okay” - [P7] “Playtesting with my friendships was fun and it’s a game that could be casually picked up and instantly start a play session with peers.” - [P31]
Aesthetics	4.50 (Highly Acceptable)	“Visuals are cute, and styles are consistent.” [P39] “Easy to understand, visually pleasing” [P18] “I like stylized graphics and this game nailed this art” [P12]
User Interface	4.37 (Acceptable)	“Levels 2 to 5 have an angle that the mini-games are hard to see. Also, the tire pump mechanic is easy so just make it a little harder to pump a tire.” [P5] “Great concept. Slightly fix the placement of another interface.” [P22] “Looks professional. Although, buttons and menus can still be improved. I suggest a more lively and easy-to-understand design.” [P42]
Audio	4.30 (Acceptable)	“The audio is very nice and appropriate for the game. The game is well made although the toolbox can be thrown outside the shop.” [P42]
Player Experience	4.42 (Acceptable)	“Need instructions before playing the game” [P1] “Enjoyable with friends and family” [P42] “It’s an enjoyable game, just little fix for bugs” [P7] “Overall, the game is perfect for building social relationships. The cartoonish and colorful theme greatly improves the game’s feel.” [P24] “Great game to be played by a group of friends. If online multiplayer will be a thing that would be amazing.” [P27]

## 4.2. Social Relationships

In the second stage of evaluation, nonparametric data were compared (pretest-posttest) using Wilcoxon signed-rank test. Overall, the results (see Table 6) revealed that constructs for this dimension have significantly improved after co-playing. This finding is essential because the facilitation of social interaction has positive effects on individuals' psychological and cognitive well-being (Ackerman et al., 2010; Kahlbaugh et al., 2011). The feeling of togetherness (*cohesion*,  $p = 0.019$ ) among players was stronger because of the requisite collaborative effort to finish the levels. This finding validates the empirical work of Gajadhar et al. (2009) that shows the lack of influence of familiarity on player involvement, and that social presence was experienced the most in a co-located co-play. As players gradually develop familiarity with the game mechanics, they interact more often (*communication*,  $p = 0.041$ ) with other players to discuss strategies. The progression of game difficulty dispenses cooperation as a necessary behavior, making the success of missions heavily dependent on effective communication among team members. In coordinating actions, the efficient task delegation (*giving and taking*,  $p = 0.041$ ) is paramount not only to finish the levels but also to meet the quotas. The game design forces players to allocate sequential team-building tasks among the team members to serve efficiently and spend less time while earning more money. In return, the gaming environment became more relaxing and friendlier (*atmosphere*,  $p = 0.037$ ). Consistent with existing studies (Cole & Griffiths, 2009; Klimmt et al., 2007), this shift could be explained by the feelings of social belonging, networking, and interactions with other players.

Existing papers about the effects of co-playing have mainly focused on family bonding (Wang et al., 2018) and friendship (Verheijen et al., 2019). These findings contribute to our understanding of the potential of video games to promote social relationships among unacquainted players. It also validates the applicability of offline video games and face-to-face interaction as a safe environment in addition to the virtual worlds of online gaming. In general, the social characteristics and the embedded mechanics of the video game resulted in the successful promotion of social ties among players. Nevertheless, the extent of this relationship, whether weak or strong and temporary or long-lasting, cannot be identified by the current study design. It is also possible that the mere presence effect (i.e., increased psychological arousal in the presence of another human being) described by Zajonc (1980) in his drive theory of social facilitation affected the assessment of players. These uncertainties warrant a longitudinal investigation to verify the long-term effects of playing a cooperative video game. Another enthralling research avenue to explore is the comparison of cooperative and competitive

Table 6. One-group pretest-posttest result

Evaluation	Pretest ( $M \pm SD$ )	Posttest ( $M \pm SD$ )	Difference ( $M \pm SD$ )	p-value
<b>EVOS</b>				
Cohesion	2.93 ± 0.90	4.58 ± 1.29	1.65 ± 0.95	0.019
Giving and taking	2.42 ± 1.24	4.82 ± 1.44	2.40 ± 1.19	0.041
Communication	3.68 ± 0.49	4.69 ± 1.36	1.01 ± 1.01	0.041
Atmosphere	2.87 ± 0.95	4.46 ± 1.12	1.59 ± 0.89	0.037
<b>Group Size</b>				
Two	3.24 ± 1.43	3.56 ± 1.38	0.32 ± 1.69	0.128 <sup>NS</sup>
Three	3.01 ± 0.52	4.52 ± 1.21	1.51 ± 0.86	0.042
Four	2.92 ± 1.02	4.39 ± 1.22	1.47 ± 0.88	0.012
Notes: $M$ = Mean, $SD$ = Standard Deviation, <sup>NS</sup> = Not significant				

game mechanics since players' behavior during gaming is dependent on whether the video game is played cooperatively or competitively (Verheijen et al., 2019).

Meanwhile, the number of members in a group affected how players rated the *social relationship* dimension of the video game. More specifically, the post-test score of the group with only two players did not significantly improve, unlike the groups with three or more players. This finding contradicts the concept of group dynamics stating that the intensity of interaction decreases as the group size becomes bigger. One possible explanation is that players are more likely to feel shy when interacting in a smaller group (e.g., one-on-one interaction). Whether the shyness present in this kind of interaction is also pertinent to an online environment is for future research to determine. In addition, exploring the effects of group size is necessary because the structural aspects of social relationships are a characteristic tied to one's health. For instance, having more social ties is associated with lower risks for mortality. The necessity of a larger network size circles back to online video games because they are unrestricted by geography or other physical limitations. The game design and mechanics employed in this study thus serve as a basis for future cooperative video games seeking to facilitate cooperation and teamwork. It is also an opportunity to explore whether the evaluation result of this couch cooperative video game is translatable into online gaming contexts. Finally, the evaluation did not account for differences in social dynamics between participants. Some groups played with limited interaction and communication that may have affected the overall assessment. Future research may control this variable by accounting for the extent of interaction between players.

## 5. CONCLUSION

Social relationships are a fundamental aspect of human existence. Unsurprisingly, policymakers are incessantly devising strategies that accentuate the benefits of social relationships and diminish the risks of social isolation. Beyond the core purpose of entertainment, the evolution of video games has opened new research avenues where players are nourished with meaningful gaming experiences. This study proved that a couch cooperative video game promotes social relationships among unacquainted players. Its success is attributed to the alignment of enjoyment and pleasure with purpose and meaning to accentuate the social aspects of play. The superimposition of entertaining gameplay and friendly visual vibes also hides the obligatory player-to-player interaction, making it easier for players to initiate social bonding. With empirical evidence showing the effectiveness of a cooperative video game in fostering social relationships, various sectors can strategize to incorporate gaming in cultivating teamwork and cooperation among its people. For instance, the education sector could deploy a video game to foster camaraderie between students. Giving them the ability to work with one another opens an opportunity to learn and grow from each other. On the other hand, the business sector could employ video games as an instrument to reduce unproductive competition between employees. Team cooperation between employees means less desire to compete against each other and instead focus on working together to achieve a common goal. In conclusion, video games can be an effective and engaging way of connecting people from disparate backgrounds, cultures, and beliefs. Because they are already part of our lives, repurposing them as an agent of change in a pluralistic society is the next logical step to take.

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