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Exploring the Effect of Game Premise in Cooperative Digital Board Games

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Abstract. The design of cooperative games is challenging due to the requirements of cooperation between the players. The major need of the design is to provide an environment that enables players to achieve the game goal in a cooperative fashion. The game premise which is the story behind the game is one of the dramatic elements and impacts the engagement of players. In this paper, we investigate the effect of game premise on the engagement of the players and the cooperation between the players. Hence, to understand this effect, we developed three versions of the Pandemic game with three premises namely positive, negative, and neutral. Using these game versions, we conducted an experiment to see how game premise affects the player experience. The results show that premise can significantly influence the players' intrinsic motivation, the connection with the game and the cooperation strategies.

Keywords: cooperative games · game premise · player experience · players' cooperation.

1 Introduction

Cooperative and collaborative games are rapidly increasing on the market. Similar trends are observed with board games [26] such as Pandemic and The Lord of the Rings [29, 9]. These board games facilitate the players to have fun together while assisting each other in achieving the goals of the game, which they might not be able to solve individually. This characteristic of cooperative and collaborative games not only engage players to collaborate during the game but also train a player's social skills and abilities to work as a team. This makes cooperative games widely used in the context of serious games, which can be stated as the games that focus on learning and training purposes while also serving as entertainment [29, 23]. However, the design of cooperative or collaborative games is challenging as the games require proper mechanics that foster collaboration. One of the challenges is to set specifiable outcomes that can motivate players to help each other and to improve their performance. The unspecified outcomes lead to players not being able to understand the consequences of their actions. Hence, they might not want to play it again.

Literature on game experience often attempts to formalize features of games that engage players. Fullerton defines games by its formal and dramatic elements. While formal elements describe a strong interplay of boundaries and technology, dramatic elements formalize elements that affect the players' emotions providing context to the gameplay and give a meaningful experience [8]. The elements make the game more emotionally engaging. The complicated dramatic techniques such as premise, character, and story are used in many games to explain the abstract elements of the formal system which can create a deeper connection with player experience [8, 27].

In this paper, we report on a user study that employed a custom Pandemic-like video game, with three different premises of positive, neutral and negative player roles to investigate the influence of dramatic elements on player experience (pX) in cooperative games. Our study is motivated by two research questions: (i) *Do the game premises affect the players experience in cooperative games?* (ii) *How do three different premises affect the player cooperation in cooperative games?* Our work suggests that premise has an essential impact on pX and players' cooperation and that the negative premise provides most engagement. This work can help researchers and developers to apply premise more effectively into game design.

2 Related Literature

2.1 Game Premise

Dramatic elements can be used as a set of tools for game designers for elicitation of emotional reaction from players. Fullerton's definition of games include premise as a dramatic element [9]. Premise establishes meaning to the players actions through a setting or metaphor [8] and its base-level effect is to make players easily understand and operate essential features in the games [6, 8, 15, 17, 1]. Game premise differs from the story in narrative aspect. A premise stays the same throughout the game unchanged by players' actions whereas the game story builds upon the setting or theme (i.e., premise) and unfolds throughout the progression of the game. For example, the premise of "Simcity" [11] is to build a city from scratch using limited financial resources. For the whole game, player actions mainly focus on construction of the city, while the story of the game consists of the small events that affect a player's decision.

Psychologists define behavioural intentions as "instructions that people give to themselves to behave in certain ways" [24] as the intentions have a strong relationship with behaviours. We have utilized this concept in developing our game premise. We define a game with "Negative" premise that asks the players to employ negative behaviours (to kill the rival gangsters). In contrast, "Positive" premise sets the goal with the positive behaviours (discovering the cure of diseases) with the positive intention to save the world. For the neutral version, we created the game with an abstract environment (without any context). We had not set any background story for the players in the neutral version and they just complete the game mission. Research focus on studying the effect of game

premise with the pX has been considerably limited in the literature. However, quite many examples are found in literature that employ dramatic elements such as premise, characters and story in order to operationalize pX [9]. Birk et al. [5] showed that identification and customization with an avatar can increase the intrinsic motivation of the players. Iten et al. [12] showed the impact of meaningful choices in a narrative-rich game which leads to the players having more appreciation for the narrative in addition to winning the game. Holmes et al. [10] studied the effect of game narrative and theme on pX. They found preferences towards Horror and Sanitized themes whereas higher curiosity was observed in the horror scenario. In contrast to Holmes et al., our paper manipulates the premise of the players role rather than comparing different aesthetic elements of the game.

2.2 Cooperative Games

Sedano et al. [23] define cooperative games as games where players have individual actions but a common goal to be achieved together. Designing cooperative games are complex as the game requires mechanics enabling cooperation in a meaningful way [29]. Beznosyk et al. [4] identified closely- and loosely- coupled collaboration patterns and they found that close collaboration provides higher enjoyment while increasing the communication challenges between the players. Emmerich et al. [7] analyzes pX and social interaction of three game patterns: player interdependence, time pressure and shared control. They found that high player interdependence indicates more communication and less frustration, whereas shared control results in lower competence and autonomy. Similarly, Johnson et al. [13], compares the impact of teammate on pX in cooperative game. They found that playing with human teammates was associated with greater sense of relatedness, but less competence and flow than playing with computer-controlled bots. The presented literature identified important factors and patterns of cooperation in games. Our work investigates which aspects of cooperation are affected by the games premise.

2.3 Good and Bad Roles in Games

Peter [20] pointed out that video games allow a discussion about morality in a unique manner, since they allow experiencing unethical content. Liebrand et al. [16] studied how the social values of self relate to the interpretation of the others. They classified subjects into four types on social values: altruistic, cooperative, individualistic and competitive and also asked subjects to rate others behavior. The authors found that cooperators attached more significance to factors like sincere, fair, just, dishonest (evaluative dimension) whereas the individualists attached more significance to factors like weak, self-assured, purposeful, naive (potency dimension). Weaver et al. [25] examined how moral decision of players affect their emotional response. The results showed that antisocial behavior increases without an impact on the enjoyment. In our paper, we focus on exploring how dramatic elements influence on pX in a cooperative game. We

developed games which asked players to cooperate in three different objectives: to save the world (positive), to eliminate the boss (negative), and to remove all cubes (abstract). We compared the effect of these game settings by measuring the pX of the games, observing players behavior, and asking semi-structured interview questions.

2.4 Gender in Video Games

Further, there are various discussions on gender differences in video game characters [14, 19, 2]. Miller and Summers showed that significant differences of gender exist in portrayal of video game characters such as the males having a high likelihood to be heroes and main characters while females more often tend to be supplemental characters [19]. Bergstrom et al. discusses the relation between gender and professions in non-player characters (NPCs) games and the results show that the characters in the game world have been chosen to reflect the real world demography [2]. Similarly, Kivikangas et al. showed that males prefer competition over cooperation while females choose cooperation over competition [14]. In our game design, we kept the characters in the game gender neutral to avoid biases of gender in our study.

3 Study

To investigate the effect of premise on pX we designed a simplified version of the Pandemic game with three different premises and an additional setting to dynamically enable and disable special abilities mechanics. Our prototype implements 3x2 versions of the game. First, we explain the original Pandemic game and its features followed by our game design of the modified versions for the experiment. Next, we present the measurements and the procedure of the comparative study.

3.1 Pandemic Game

Originally, Pandemic [28] is a multi-player cooperative game where the goal is to stop spreading of a diseases on a map by discovering the cure of the diseases before the pandemic occurs. The players have to work cooperatively in order to win the game. The game begins with spreading of the infection. In turns, the player take actions, which consist of the following three phases: Action phase: The player needs to execute movement actions and actions for treating/discovering. Draw phase: The player draws cards that allow movement and cure actions from the player deck. Infection phase: The player draws two cards from infection deck and the infection progresses on the map. The game has a non-zero-sum outcome and ends if any of the following lose conditions occur: (i) The players run out of cards from player deck. (ii) all infection markers are set on the map. (iii) an outbreak (a city has more than three infection items and hence, leads to a cascade spreading to adjacent cities) occurs more than eight times. To win the game, the

players need to discover a cure for all diseases. The game is designed in such a way that the more turns the players use, higher are the chances to lose the game by running out of cards or by outbreak. The game design forces players to work cooperatively in order to achieve the goal of discovering cures for the diseases within limited game turns. A typical play session takes at least 45 minutes. The original version is available as a board game and also as a mobile application.

3.2 Game Design

For our experiment, we developed three variants of simplified version of the original Pandemic game and reduced it to only the core mechanics. Consequently, we took out some game elements, downsized the map from 48 cities to 24 cities and decreased the number of diseases from 4 to 2. The game was developed as a multi touch game in Unity3D. During our design process we iteratively play-tested a paper prototype of the downsized modified game to estimate the play-time and identify the game strategies. And to develop strategies for the tutorials, which will be discussed later in this section. Figure 1 shows screenshots of the final prototype. We intentionally kept the visual design simplistic as we were concerned that advanced graphics would interfere with the three variants.

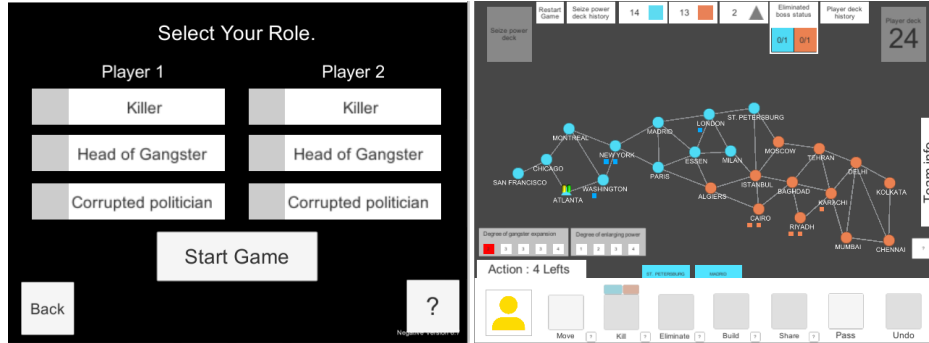


Fig. 1: Screenshots of the game prototype

3.3 Additional Game Element

Due to the complexity of the game and in order to establish a stronger connection of the premise with players actions we added an option to introduce a subset of the additional game mechanics from the original. These mechanics are not required in order to make the game playable, but add dramatic elements that improve the dynamics of the gameplay (cards that affect infection rate, reshuffle the infection deck and resort infection markers on the map) and mechanics that give players roles with special abilities. Namely, we used the: operations expert,

dispatcher and medic roles. The researcher and scientist roles were discarded as they were loosely coupled with the game mechanics for the downsized game.

3.4 Game Versions with Different Premises

For the study, we developed three premises, that put players into specific roles.

Positive premise: Two diseases are spreading around the world. The plot involves a group of two heroes, who cooperate in traveling around the world to discover the cures for the two diseases (red and blue cubes) and save the world.

Negative premise: Two groups of gangsters intend to expand their criminal enterprises around the world. The bosses of both teams try to send their gangsters to seize power over the other networks in the cities of the world. The players from the team of greatest head of gangsters, have to stop the other gangsters from increasing their power by killing their members (red and blue cubes). Then, the players need to bring down the other gangsters by taking over their criminal businesses and evacuating their bosses.

Neutral premise: Two colors of cubes are spreading on the map. The players have to remove the cubes (red and blue) and stop the spreading of the cubes.

In our design process, we ensure that all three game versions have the same game mechanics but the naming of the game elements such as the name of actions, roles of players as well as the tutorials are phrased differently depending on the game premise. Table 1 lists the different naming of game elements and the roles of players in the three versions of the game.

Table 1: Game elements in three different game versions.

Game elements	Naming of game element in different versions of games		
	Positive premise	Negative premise	Neutral premise
Game actions	Treat Cure disease Build research station Share knowledge	Kill Eliminate bosses Build enterprise Share license for gambling enterprise	Remove Stop spreading Build triangle Share card
Other elements	Outbreaks rate Infection rate Epidemic card	Degree of enlarging the gangs power Degree of gangster expansion Expanding power card	Spreading rate Explosion rate Spreading cube card
Roles	Medic Dispatcher Operations expert	Killer Head of gangster Corrupted politician	Remover Transporter Builder

3.5 Measures

To measure pX we employed Player Experience of Needs Satisfaction (PENS) [21] on a 7-point Likert scale 1 (strongly disagree) to 7 (strongly agree). PENS assess intrinsic motivation on the dimensions competence (how players are able to produce their wanted outcome), autonomy (willingness to do a task) and relatedness (need of being connected to others) from Self-Determination Theory [22] and on two additional game related subscales presence/immersion (how are player are “in the game” [21]) and intuitive control (usability of the game controls).

To assess player cooperation we used observation metrics established by Bernard et al. [3]. During the play session, we logged the actions of players and we recorded their conversations. To explore the effect of premise, we conducted a semi-structured interview with 8 questions regarding the participants attitude towards the premises and player roles.

3.6 Procedure

In each session, two participants were randomly paired, as a team and randomly assigned to one of the three premise version of the game. First, the participants were informed about the study and asked to complete a consent form followed by a demographics questionnaire that assesses, their experience with board games, digital games and their current gaming habits. Subsequently, they performed a two part tutorial which taught them the basic game rules. After they completed the tutorial, the participants played the game in normal mode, then with special abilities. After they finished playing two modes of the game, the subjects filled out the PENS. Finally, the examiner conducted a semi-structured interview and the subjects were debriefed.

3.7 Participants

30 Participants (18 female) volunteered to participate in our study. Most subjects were between 23 and 34 years old. Most (n=20) participants had experience in playing board games and 6 participants stated they knew the Pandemic board game. 11 participants stated that they play video/mobile game daily.

4 Results

Our measures consist of subjective self-reports on the PENS, audio recordings during gameplay and game logs. There were 54 game sessions in total. 24 pairs finished the game successfully, 20 pairs lost and 10 groups restarted the game because it was impossible to finish. A Kruskal-Wallis Test didn't show any differences of number of wins between the conditions.

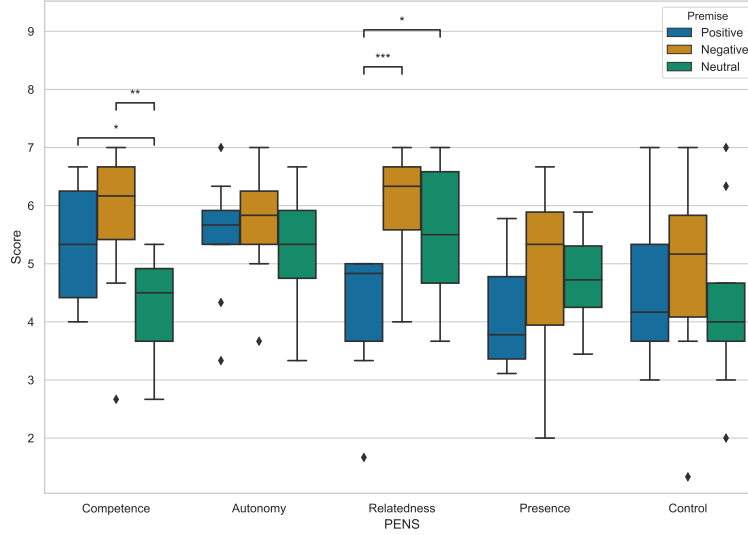


Fig. 2: Boxplots of the PENS results.

4.1 Game Premise and Player Experience

We conducted a one-way analysis of variance (ANOVA) on the subscales competence, autonomy, relatedness, presence/immersion, and intuitive controls of PENS with the premise as factor. The analysis revealed a significant differences on the sub-scales relatedness ($F_{2,27}=7.667$, $p=.002$) and the competence ($F_{2,27}=5.34$, $p=.011$). A plot of the sub-scales and detailed view subsequent post-hoc tests with Bonferroni correction is presented in Figure 2. A multivariate analysis of variance (MANOVA) of PENS with premise and gender as factors did not show any significant differences for gender ($F_{5,20}=1.767$, $p=.166$) nor an interaction effect of premise*gender on player experience ($F_{10,40}=0.985$, $p=.471$). A Pearson correlation between gender and the PENS subscales revealed a significant correlation on relatedness ($r = -0.386$, $p < .05$) and presence ($r = -0.378$, $p < .05$). With females showing higher ratings on both subscales. However, there was no significant correlation between prior experience with Pandemic and PENS.

4.2 Player Actions

From the game logs we extracted *number of turns*, *game ending*, *usage of special abilities* and *sharing knowledge actions*. A one-way ANOVA revealed a significant

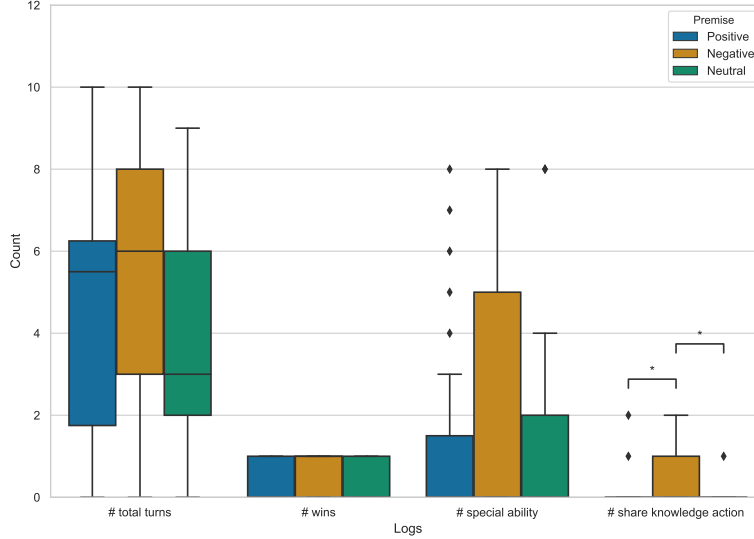


Fig. 3: Boxplots of the game logs per condition

effect of condition on number of sharing knowledge actions ($F_{2,51}=3.91$, $p<0.05$). Figure 3 shows a chart of the accessed game logs.

4.3 Cooperation

We applied Mayrings content analysis method [18] to cluster the the conversations and summarized them into two categories: cooperation approaches and cooperation tasks.

Cooperation approaches for decision making: Most players were trying to cooperate and to plan their actions together. However, half of the players decided to take the actions without asking their partners. We identified five pairs (G1p, G2n, G6p G10p, G14o) that always asked their partners opinion to find the consensus before taking actions. In contrast, in the negative and neutral conditions, decisions were dominated by the players who had more leadership skills (G2n, G7n, G8n, G9n, G12o, G15o). G2n, G5p, G7n started to cooperate for treating/killing/removing actions in different continents. In addition, we observed that all groups that lost the game in the first round adapted their strategies and cooperated closer in the subsequent rounds.

Cooperation tasks: Based on Bernard et al.'s [3] model we identified *divisible*, *disjunctive* and *conjunctive* cooperation tasks.

Divisible tasks: The tasks that can be divided between players in one team, and then integrated together. The example of the scenarios of our games, we found one player from (G2n, G9n, G10o, G11o, G12o) moved to different continents to kill gangsters/remove cubes in their responsible continents in order to avoid the cubes in the storage from running out.

Disjunctive tasks: The tasks that the players completed by assigning more responsibility to one person who has more potential than the other. For our game, we found that in the game with special ability mode, 11 of 15 groups implemented this strategy by using the concept of disjunctive tasks.

Conjunctive tasks: The tasks that require everyone to contribute unique pieces to a puzzle. The conjunctive tasks only succeed when all members succeed. One such scenario involves sharing card action. We found that the players (G1p, G7n, G12o, G14o, G15o) tried to share their cards but did not succeed while (G2n, G9n) were able to use this action.

4.4 Premise and Cooperation

To analyze the effect of game premise on players cooperation, we asked specific questions related to the dramatic elements in the interviews as well as observed cooperation behaviours of players during the gameplay. The difference among three versions are game premise, roles, and special abilities.

Positive premise: 7 of 10 participants like a positive game premise while 3 of 10 participants (P5, P6, P11) mentioned that the premise did not affect their feelings. P7, P8 and P12 highlighted that they enjoyed playing hero, especially when using special abilities. P11 did not feel related to the game as there was no personal relation with the cities. G6 referred to keywords related to game premise when cooperated and mentioned that they feel proud to be a team of heroes. Additionally, G1, G3 and G6 showed more engaged discussions in urgent situations (e.g., when the Epidemic card has been drawn) than groups from other conditions.

Negative premise: 8 of 10 like a negative role. 4 subjects (P4, P13, P16, P17) mentioned a higher sense of achievement. P4, P16, P17 stated they could take a role they cannot take in real-life, but they do not need to handle the consequences of their moral decisions. Also, P16 mentioned that the negative actions was more exciting. Although, P3, P17, P18, P25 liked the negative premise, they preferred to play a positive role. P15, P25, P26 feel related to the cities on the map. P16, P14 were excited to cooperate as gangsters. G2, G7 like cooperative special abilities. Especially "Corrupted politician" and "Killer" were stated as powerful and helpful.

Neutral premise: 7 of 10 participants liked a neutral game premise. Due to this version has an abstract premise, we asked more specific questions to ensure that the players gave opinions based on the game premise and not the gameplay. We asked the players to choose among different roles which are, hero, gangster or being neutral. Only P20 preferred to play with positive premise while (P23, P24, P27, P28, P29, P30) preferred to play an abstract role, since it allows for imagination (P23, P30). P30 also stated, that players just focus on completing

the game mission. In contrast to other conditions, G10, G11, G15 used abstract terms to describe their cooperation actions. Further, they mentioned to focus on finding cooperation strategies without concerning the name of actions or the background story.

5 Discussion

All participants perceived the game as enjoyable. This is fully supported by the moderate PENS ratings, as well as by many positive comments. Further, the comparable number of turns and winnings indicate that the conditions were comparable and that premise did not affect performance. We identified different cooperative approaches for planning and decision making during gameplay. The players performed divisible, disjunctive and conjunctive cooperative tasks in all conditions, indicating that our game design was successful. Also, the results from the interviews show that all three game versions received positive feedback regarding to the game premise. All subjects agree that the premises fit well with the gameplay. Even though, the results from PENS show that negative premise has the highest ratings for relatedness and competence, most subjects stated that they preferred to play a positive role. The reasons mentioned were related to guiltiness and responsibility for actions. However, subjects from the neutral condition responded that they preferred an abstract role (neutral premise) as it frees space up for imagination and allows to focus on the gameplay itself as well as for exploration of different cooperation strategies.

The results from PENS show that the game premise impacts the pX on relatedness and competence. As the Pearson correlation between gender and PENS shows, females felt more competent and related than males. The negative game version makes players feel most connected with the game and the team members. This is also underpinned by the statements from the interviews where the participants mentioned to be more excited in by the negative premise. The logs show a higher number of share actions in the negative condition, indicating that the negative premise was most effective at fostering cooperative activities. However, there were only 11 share actions in total. Thus these results need to be interpreted with caution. With special abilities we observe a similar trend, however the data failed to reach significance.

Negative premise showed highest ratings on competence. This is inline with the qualitative results. The participants in negative version mentioned that the goal (eliminating bosses) and actions (killing) provided a high sense of achievement while in positive condition they felt more responsible for the consequence of their mistakes (i.e., failed to save the world). Similarly, participants who played the neutral version mentioned that winning the game had no meaning for them since the game has no context. In contrast, in the positive version, the participants perceived more competence than the neutral groups. In the interviews, some participants stated to feel proud of being heroes.

Our results suggest, that premise has a significant impact on player experience and player cooperation. This can be operationalized in game design in order to achieve specific needs of satisfaction or particular cooperative activities.

6 Limitations and Future Work

Although our study shows main effects of premise on player experience and cooperation, we could not identify any specific patterns between the game premise and cooperation strategies. In the future we aim to link how different types of premise can foster specific cooperation patterns and actions considering demographic factors. Further, we asked the participants how they liked their respective premise. These statements are biased by the exposure to the game itself. Future work should investigate unbiased opinions on premise design in cooperative games. Due to small sample size and different distribution of gender in the conditions our findings are not conclusive. Also personality traits were neglected in this study. Future work will investigate how different personalities can be addressed by premise.

However, the results suggest that premise is an easy to use and effective design option to enforce cooperation. This can be useful for game designer, especially improving the engagement of players in serious games. Future research should investigate more specific types of premises and validate these findings in conjunction with learning mechanics in the context of serious games.

7 Conclusion

Game premises are deeply anchored into game design. However, so far their impact on player experience and how the players' role affects cooperation in games is under-investigated. We argue, that the framing of players' actions is a simple and effective way to operationalize involvement and sense of competence as well as to push players towards specific cooperation tasks. In this paper, we report on a study that investigates the effect of game premises on player experience and cooperation in a cooperative turn-based game. From our results, we conclude that the game premises can change players relatedness and perceived competence in a cooperative game setting. Although a positive role is more attractive in the first place, an antagonistic roles allow a deeper discussion with the game's content. On the other hand, abstract designs with a neutral premise fosters exploration and creativity, however the meaning of the players' actions becomes attenuated. Moreover, our results show that negative roles foster a closer cooperation. Our game design suggest that cooperative games can easily be reframed to positive, negative and neutral premises by defining the respective goals and phrasing of the game mechanics. Designers should consider these options in the development of cooperative games to emphasize the players' role and the relation with the game content. These findings should help researchers and designers to organize the motivational aspects of game premises and provide a starting point for a taxonomy.

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