

# Left Them 4 Dead: Perception of Humans versus Non-Player Character Teammates in Cooperative Gameplay

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## ABSTRACT

Why do we care if our teammates are not human? This study seeks to uncover whether or not the perception of other players as human or artificial entities can influence player experience. We use both deception and a between-participants blind study design to reduce bias in our experiment. Our qualitative results show that people do care about the perceived nature of other players, even though they are not always able to correctly identify them as human or as non-player character teammates. Interview data suggest believing that one is playing with other humans can positively affect a player's subjective experience. Furthermore, our qualitative results indicate that players view their non-player character teammates as humanized entities, but adopt a neo-feudalistic (i.e., an unequal rights) view of them. Based on our results, we establish game design guidelines for non-player character teammates leading to stronger, emotional human-computer relationships in video games.

## ACM Classification Keywords

H.5.m. Information Interfaces and Presentation: Miscellaneous; K.8.0 Personal Computing: Games

## Author Keywords

Cooperative Games; Sociality; User Experience; Games User Research (GUR)

## INTRODUCTION

Major publishers of next-generation console games are focusing on the development of multiplayer, multicharacter gaming experiences. Consequently, players engage more often with both human and computer-controlled opponents and partners. Regardless of the proximity and number of human players, computer-controlled characters are an important part of video

games. They add depth to the player experience (i.e., the experience of interacting with human players and virtual characters during play).

A character we encounter in a gaming environment may be a human-controlled character, i.e. an avatar [20, 15, 25, 27] or a computer controlled character, i.e. a Non-Player Character (NPC). The term NPC covers many virtual characters—opponents, acquaintances, collaborators—and the player's relationship with each of these may range from non-existent to highly valuable. The specific focus for this research is to explore how NPC Teammates [33] or NPC-Ts—a sub category of NPCs that we define for this paper—are perceived and valued in comparison to human teammates. Unlike other NPCs, a player's NPC-Ts assist, support, and cooperate with them. NPC-Ts sometimes replace human players entirely. Sometimes, game missions are impossible without NPC-Ts, which makes them valuable to the player. However, when NPC-Ts replace human teammates, players have a clear preference for human teammates [42, 24, 20].

Two research opportunities follow from this dissatisfaction with NPC-Ts. First, one could continue to seek improving in-game Artificial Intelligence (AI) so that NPCs—in particular NPC-Ts—reach a sophistication level where humans feel NPC-Ts are as competent as human teammates [38]. However, we also have to ask a related question about NPC competency: Will NPCs—regardless of their sophistication—ever be perceived on par with human-controlled characters in a game? Said differently, imagine the only way to tell AI apart from a human-controlled character is if you are told your teammate is an NPC: How similar or different would the interaction with a human player be?

Answering this question depends on context. At present, people approach AI in games, especially NPCs, with biases and expectations triggered by the limitations of AI. While acknowledging present-day limitations, research seeking to understand current perspectives and practices regarding NPC-Ts and human-controlled teammates is worthwhile on two fronts: First, it may help us understand *a priori* biases that condition reactions to AI, which contextualizes what users report when they evaluate NPC-Ts in particular, NPCs in general, and AI in games overall. There is psychological evidence that pre-conceived biases are hard to overcome: For example, the

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*Pygmalion Effect* (i.e., higher expectations lead to higher performance) is well-established in psychological research [45]. Second, understanding the effects that improved AI has on players can reveal how enhancements to NPC behaviour affect human perception of these characters. In particular, we want to understand how our perspectives change when we fully grasp the 'lived experiences' of players interacting with these characters.

While researchers are aware that human players prefer other humans and look down on NPCs, understanding the rationale for value judgments of NPCs warrants more research, particularly for NPCs with whom players collaborate (i.e., NPC-Ts). To explore these questions, we designed a single-blind, qualitative, deception experiment to examine attitudes toward NPC-Ts and human collaborators in games. First—to explain the deception part—we occasionally deceived human players in our experiment about the nature of their teammates, indicating they were AI when they were humans playing with the participant, or indicating they were human when they were AI. Alongside deceiving participants, the experiment was conducted by a facilitator, and during the multiplayer experience, both the player and a research assistant (interacting with and observing the player during the experiment) were not aware they were being deceived. This ensured that, during gameplay, no one was aware of the presence or absence of human players. The truth was revealed during post-experiment debriefing and interviewing by a second researcher.

Overall, two primary theories arise from an inductive analysis of our interview data. First, regarding power dynamics of in-game relationships, we compare tendencies toward NPC-Ts with the social-contract negotiated power dynamics between human teammates

[13, 18, 63]. Within these dynamics, it is important to recognize that, as with any power structure, human players can be better or worse at collaborating with other humans as peers and the same holds true for NPC-Ts. Second, regarding perception, we look at issues of humanization and competence with respect to discursive interactions between participants and NPC-Ts and human teammates. We observed a double standard: when viewing teammates as human, compassion is given for errors; however, NPC-Ts are judged on their humanness based on competency.

## RELATED WORK

Much literature is focused on improving NPC behaviour through development of AI [64]. Techniques such as evolutionary learning [39] and scaling for difficulty [46] are common. Research has sought to improve AI including attempting to create believable movements and behaviours [3, 21, 29, 35, 34, 40], design of characters [19, 18, 23], and programming reactions to the environment [17].

The literature spans diverse topics including machine consciousness [1] and imitation of human players [41]. In addition, programming game AI has been the focus of books and edited volumes [6, 5]. The goal of improved AI is making NPCs in a game more believable; thus, development of AI for control of NPCs, especially for conversational interactions

with players resembles the Turing test [52, 37]. Livingstone [28] reviewed literature about creating more believable computer characters. Assuming characters have a sufficient level of believability to enhance player experience, an emerging question—particularly in co-operative games—is the socialization with NPCs: if and whether this socializing differs from socializing among human players [57, 58, 56].

Outdoor games as well as board and card games are considered a social activity. Stenros *et al.* [47] argue that even single-player computer games are social because of the surrounding social interactions, including discussing the content of the game. Leveraging this understanding of games as a social interaction, researchers including Szentgyorgyi *et al.* [50], Volda and Greenberg [55], and Linderoth *et al.* [26] discuss social aspects of multiplayer, in-person gaming.

Some game types, including many handheld and console games, are skill tests where the social experience is not core to the game itself [50, 55]. The social components in these games improve player experience, but other games require socialization and communication among participants to successfully play. These latter games are called cooperative games and plenty of them exist and are popular among players. The goal of our research is to explore this field of cooperative gaming, particularly in an online gaming context. When judging the effectiveness of a cooperative game, it is important to understand the sociability of the game. Sociability depends on the players. We must understand the characteristics of video game players as well as the design of NPC-Ts when investigating NPC-Ts. Lastly, the attitudes of players towards their computer-controlled teammates or Non-Player Character (NPC) teammates, commonly referred to as AI, is an important component of cooperative games—particularly when cooperation with NPCs is necessary.

One main difference between human and NPCs is how they socialize. Many researchers have studied social aspects of gaming [47, 50, 55]. Many studies have investigated socialization in games: We learn game techniques from other humans [60] and enjoy couch-cooperation. We find that people's co-presence and attention to the same stimulus changes our experience [61]. Additionally, we are encouraged by on-looker feedback [22]. Overall, the literature on cooperative gaming is extensive and accounts for many different game types (e.g., exergames [36]).

Generally, we accept the intuitive idea that differences between human-human and human-AI gaming exist. Disentangling whether these differences are because of AI efficacy or other social factors is challenging. In a study by Lee *et al.* [24], *Flow*, the optimal experience characterized by the feedback of the task as the reward [9], was found to be higher when playing with other people cooperatively, as opposed to playing alone. DeKort *et al.* [10], reviewed video game sociability and human interaction in games. They state that players can be influenced by a feeling of involvement in another player's social group, or by social affordances allowed by the interaction. Both DeKort *et al.* [10] and Stenros *et al.* [47] discuss the differences between conditions of co-location and mediated interaction (i.e., whether or not the players are in the

same place), for example, if the players are co-located, but not situated in a traditional face-to-face interaction model.

While characterizing human-to-human engagement tells us much about social gaming, much of this work is orthogonal to distinguishing differences between human-human and human-AI sentiment. It is acknowledged that NPCs are valuable for player experience. NPCs populate the world and increase the frequency of interactions available to players [16]. NPCs are also valuable in console gaming [55] where—without NPCs—one could only play with another human player, and in handheld gaming [50] where many games are primarily designed with NPC opponents in mind.

More recently, games such as *Pokemon Go* are based primarily around the collection of ‘living’ in-game characters. We hypothesize that differences in value may not solely be caused by NPCs not being ‘real’ people: Players often assign meaning and value to game objects [51, 65]. Research also demonstrates players have emotional emphatic reactions to works of fiction [32, 31], which can extend to game narratives [4] and players’ relationships with in-game avatars [2, 27].

When comparing playing with humans versus playing with NPCs, prior research has leveraged physiological measures to try to determine if there are distinctions and what those physiological distinctions might be [30, 42, 20]. Recent results in this area [20] found playing with humans increased relatedness (i.e., relation to others) and increased brain activity in the alpha, beta, and theta bands. The researchers believe playing with human players was therefore more work which they referred to as ‘*mentalising*’. In contrast, video game players tended to elicit greater feelings of competence. The researchers concluded that flow was higher in this condition. This work echoes earlier work by Weibel *et al.* [62] reporting that—compared to playing with computers—playing online with humans increased presence, flow, and enjoyment.

Given past work—particularly using physiological measures—existing differences seem indisputable. Alongside quantitatively measured differences, we have conducted analyses that argue for higher levels of engagement and flow during human-human gaming, providing guidance as to what those differences are between human-human and human-NPC gameplay. *Why* these differences exist remains less clear to us in our exploration of past work. We lack knowledge on what motivates different engagement and flow. It could be the efficacy of the AI alone. Whether it is or it is not, is solely a question of AI efficacy, but how do these differences manifest with respect to perspective on game characters?

#### METHODOLOGY: ATTITUDES TOWARD NPC-TS

Our interest is in probing the attitudes and experiences of players working collaboratively with computer-controlled characters to understand how perspectives toward human teammates and NPC-Ts differ. To begin answering this question, we need both a context of study and an experimental design which will allow us to compare these factors while controlling—to the extent possible—confounds associated with *a priori* biases that arise when one knows the nature of one’s teammate. In this section, we describe the study design setup, the gaming

environment chosen, and the experimental methodology. We justify each in turn with respect to our study design.

#### Setup and Deception

We evaluated three possible study scenarios to determine differences in attitudes toward human versus toward computer-controlled collaborators. First, we considered providing full awareness of whether one is playing with a human or a computer and then elicit a reaction. The challenge was that preconceived biases may play a role in the assessment of the game and of the interaction with in-game characters, a casual “human primacy”. The next option was to simply not tell users and allow them to play with an undefined collaborator which may be human or computer. The problem with this setup is that issues of competence and efficacy of AI within the game may come to dominate perspectives. Players may also be tempted to ascertain whether they are playing with humans or AI through on-going evaluations of interactions, a form of quasi-Turing-testing. Our third option, and the one we adopted was to leverage deception to understand whether differences in treatment arise from an awareness that it is the AI or from the efficacy of the AI making decisions for computer-controlled collaborating in-game characters (i.e., NPC-Ts).

We studied 30 participants divided into two groups. Half of the participants played with the human confederate team, the other half played with the NPC-T. We deceived one third of participants (five from each group) by falsely informing them that they were playing in the opposite condition. This study design allowed us to see if they were reacting to their perception (who they were told they were playing with) or the true condition (who they actually played with). In summary, ten people played with humans and were informed they were playing with humans, ten played with NPC-T and were told they were playing with NPC-T. Finally, ten were deceived into believing they were playing with the opposite condition.

#### Game and Modification

We used *Left4Dead2* (L4D2)[G3] played on Steam (Valve Corporation) as a stimulus. The game is a first-person shooter (FPS) that involves four players escaping from a Zombie apocalypse. The game is rated M for violence, and only participants 18 years and older were invited to participate. The level played was titled “No Mercy”, a level echoing the original *Left4Dead* [G2]; as a result, the original game characters were used.

The researchers added modifications<sup>1</sup> to ensure that the game protocol did not reveal the social environment (i.e., to preserve the unawareness of the deception). These modifications included the prevention of game end upon death of the participant’s character. Additionally, the characters’ names were always their default names (no Steam user names were used).

Our choice of L4D2 was motivated by several characteristics of the gameplay. L4D2 is a game where teammates are required to rely on each other to complete tasks, meaning coordination and collaboration are important. This coordination and collaboration peaks when a teammate—near the end of the

<sup>1</sup>Dziggy (2013). Improved Bots (Advanced) <http://www.l4dmaps.com/details.php?file=15461>

game—is required to sacrifice themselves so that the mission can be completed.

### Participants

Overall, 30 participants completed our experiment, 15 males and 15 females. All participants were older than 18 years (Mode = 20–24 years; Range = 18–45+ years). Skill level or experience with the game was not an exclusion criterion.

Out of the 30 participants, two identified themselves as complete beginners, four as novice players, four as moderate, nine as intermediate, eight as advanced, and three as skilled. Twenty-five participants were PC gamers, and twenty-five claimed to have at least one game console in their household that they use regularly for games. Sixteen participants had played a first-person shooter game before, and twenty-four participants played at least one other genre of games. Fourteen of the participants had previously played *Left4Dead1*, while another fourteen, with some overlap, also played *Left4Dead2* prior to participating in the study.

### Study Structure with Deception

Our 30 players were divided into two groups, one an AI group and one a human group (15 players each, with near gender parity or 8/7 within groups and with skill parity between groups). Players were informed, if in the AI group, that they would be playing with AI and, if in the human group, that they would be playing with humans on their team. To incorporate deception, one third of the players in each group were deceived (i.e., 1/3 of players in the AI group were actually playing with human teammates, and 1/3 of the players in the human group were actually playing with AI teammates).

### Controlled Experimental Setup and Communication

Participants were unaware of the deception involved in the study. As a result, we used human confederates during gameplay in every condition to ensure that AI and human conditions were as similar as possible. Human (confederate) players were of different skill levels. One player acted as a beginner, one as an intermediate, and one as an advanced player. They were told to activate game events at specific points, such as triggering certain enemies. They were asked to stay within reasonable range of the player because of the team-like nature of the game. Confederates were also instructed not to communicate with the participant in any way. At the same time, within game they were told to play competently to their ability. In other words, they should react as their human responses dictated to in-game events.

A blind facilitator, unaware of the deception, conducted the study. This ensured that the blind experimenter could not subtly bias conditions of the study. Further precautions were taken to ensure the blind facilitator could not observe confederate gameplay; the blind facilitator was asked to stay near the participant, observe gameplay and note significant game events (e.g., the appearance of “special infected” unique enemy variants in the game).

The study proceeded as follows. Players were introduced to the confederates during the walk-through of the study by the blind facilitator and informed on whether they were playing

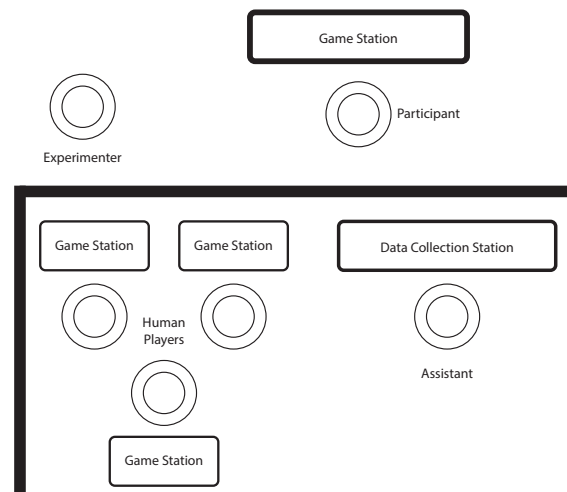


Figure 1. The experimental room layout

with our L4D2 team or with AI depending on whether they were playing with human teammates or AI teammates. Upon consent, players were informed (correctly or incorrectly) of the condition in which they would play for their first game. No verbal, messaging, or out-of-game exchanges were allowed between players and confederates and the environment was physically configured to prevent the blind facilitator or participant from peeking at confederates’ screens to prevent revealing the placebo condition (see Figure 1). Major in-game events were scripted, such as triggering main enemy waves, activating special encounters. This was done to ensure consistency of basic game progression across participants.

All players, including confederates, were asked if they were ready before playing. The human confederates were needed in all conditions to control the environment, preventing differences in audible player activity or number of co-located individuals from affecting the participant perceptions. To control between conditions (e.g., sound of mouse and keyboard, observation of the game, presence of the human players), human confederates always played a game; if the condition was truly a computer-controlled condition, the confederates played a game individually.

### Data and Measures

We collected the following data: Observations of the blind experimenter to gameplay, video of gameplay and reactions, and an interview of players post-treatment. The interview focused on the thoughts and feelings of the player regarding the social experience as well as their perceptions of fellow players. Once the deception was revealed to the deceived players, the interviewer asked about their thoughts and feelings following the reveal of the condition in the placebo group. The purpose of this line of inquiry was to determine if the debriefing would change the players’ retrospective views of their player experience. For example, two of the areas of questioning explored whether players had any awareness of the deception and—in light of the deception—whether the identity of their teammates affected their enjoyment of the game. Participants indicated they were unaware of the deception involved in the study.

### DEBRIEFING THE BLIND FACILITATOR

One challenge with any study based on deception is the need to ensure the deception was effective. While deception may be effective in a discrete case for any one participant, different study conditions could not be sufficiently similar to provide a true measure of masked differences. Fortunately—alongside participants—in our study the facilitator of the experimental session was unaware of the deception.

To evaluate the success of our experimental design with respect to similarity of conditions, the blind facilitator was interviewed and debriefed. The interviewer asked the facilitator if he was able to differentiate between human and computer-controlled conditions after repeated exposure to the game and questioned his perception of the true hypothesis.

The blind experimenter was not aware of the presence of deception, but was able to identify points of suspicion in retrospect:

"I may have suspected something, but I always thought that they played AI and I didn't know any different."

In discussion, the blind experimenter notes, in particular, post-hoc suspicions based on aspects of competency, suggested in the preceding quote and expanded upon as follows:

"I remember a few occasions where I thought, the AI; why are they spreading out so much? Because I thought this is what humans do, but I don't know the game that well, so I don't know what the AI is really capable of. [...] You told me AI and I thought it was AI but they would just go off to the next screen and start shooting people and I thought well ok whatever. Sometimes, you told me humans and there were some of these [participants] who got stuck and they may have needed a little pushing in a certain direction and then I thought 'why are the guys not helping her?'"

### RESULTS

In our attempts to understand the in-game experiences associated with NPC-Ts, a consistent negative bias toward NPCs as confederates was observed. We found an immediate preference for human-controlled players, among all participants in the studies. Then—with respect to beliefs, behaviours, and outcomes—we wanted to understand the different perspectives applied to NPC-Ts and human confederates, especially the behaviours that are valued in both characters.

Interview data, field notes, and video observations were analyzed using open coding to extract low-level themes from the data [49, 48, 8]. Low-level clusters were agglomerated collaboratively by the researchers into ten central clusters: Negative Sentiment to AI, Anthropomorphism, AI Skill, Communication, Leadership, Teamwork, Social Expectations, Variable Human Skill, Playful Interaction, Romanticized View, Gameplay Behaviour, Person-Display Discourse.

From these thematic clusters, collaborative axial coding produced two over-arching constraining themes that unify the data: Power Dynamics and Social Obligations; and Humanism, Anthropomorphism, and Competency. We discuss each of these in turn in this section.

From our results, we combine our themes into two theories. One theory emerged from the players' attitudes towards the NPC-Ts. To the players, NPC-Ts were both valuable and disposable. Players perceived themselves as more important and we can see this power dynamic emerge from the data. In contrast, with human-teammates, players felt a need to negotiate more carefully. The second emerging theory is that of humanization of the NPC-Ts and the expectation of competence. Incompetence from NPC-Ts and humans was treated differently by the players. For an NPC-T to be perceived as human, competence was needed; however, when the participants were expecting a human player, they were more forgiving. The double standard of human versus NPC-T players was interesting because of the deception built into the study design.

### Power Dynamics and Social Obligations

The most obvious way humans distaste for NPC-Ts is articulated is the innate value assigned to these different characters in the game. In this subsection, we argue that NPC-Ts are viewed as a resource to be exploited whereas human confederates are viewed as collaborators. In analyzing these concepts, the view of NPC-Ts as resources reminds us of the social ranking perceived by players towards one another based upon skill. Mediating against this perception in human-to-human player relationships, the negotiation and compromise required by human confederates evolves into a social contract for players.

#### *Power Dynamics in Gaming*

Power dynamics have been discussed within social structure of game communities. Social relationships between players in game can be influenced by this differential [19, 18]. The results of the study highlight the power differential between human and NPC-Ts, where NPC-Ts are subordinate to the human player and their status as non-person negates the tools human players can leverage vis a vis other human players to mitigate against these different perceptions.

When analyzing players attitudes toward NPC-Ts, there are many positive aspects that NPC-Ts bring to the gaming experience. NPC-Ts provide shelter and protection, i.e. they can "watch your back". Given this idea of protection, the existence of NPC-Ts circumvents the trepidation experienced by players. Players essentially feel that, with their protectors willing to die for the sake of their goals, they can be more effective and aggressive in pursuit of those goals. In essence, the game is populated by human players with agency and NPC-Ts which are perceived to be a valuable resource for human players to exploit support and utilize to accomplish their ultimate mission. While NPC-Ts were viewed as a valuable resource, they were not viewed as peers and were not invested with decision-making authority.

We characterize behaviour toward NPC-Ts as nuanced benevolence because, while NPC-Ts were viewed as a resource, this is not to say that human players treated them completely as disposable. Many players adopted the perspective that it was useful to support NPC-Ts, and, in particular, to try to keep them alive as long as possible.

"If you tell me 'Oh there's no people playing!' I still feel kind of obligated to pretend they're people because I'm

thinking that they're my allies and they're probably going to help me out later; because if I get hurt they help me out, right."

"Objectively they're not going to help you that much, and essentially they are just walking ammunition boxes. But for a sense of character, or atmosphere, they're people right. Sure they are controlled by AI, but they're not completely devoid of any meaning. So I'm going to kind of keep them alive or whatever."

However, there remains a distinction. Players may feel varying levels of obligation to help human-players versus computer-controlled players, essentially expressing more willingness to leave computer-controlled players for dead. Human players exhibited a willingness to sacrifice a NPC-T where they would feel guilt taking the same actions were the player human.

"A couple times I reflected on the game, and I'm like: 'Oh this is just so generic that I'm playing a level with AI for some data collection.' But if I would've known they were people I probably would've felt more like [...] you know the team needed me, like I needed to actually [...] I guess you could say play more seriously."

While this nuanced benevolence exists, the fact that NPC-Ts are not human results in some subtle differences in how these characters are perceived. Consider the following statement from a discussion on NPC-Ts:

"They're programmed to help you, which your friends would probably do I assume."

A superficial analysis of this statement might seem, at first, to articulate a similarity between NPC-Ts and human confederates. However, a second read of even this single quote highlights a profound difference. NPC-Ts are programmed to help you; friends "probably" would. Friends, human players, have agency and choice about helping you. This distinction between choice and obligation came up in many interviews around the difference between human and computer-controlled teammates. We probed this difference to understand why the distinction was important even with low-skilled teammates, and users highlighted the experience of their co-players.

"If you were to say there's just AI playing, I still feel the obligation, just not as strongly. If there's an actual human player, I'm ruining someone else's experience."

This, in turn, led us to examine how the larger obligation to other human players evolved.

#### *Social Obligations*

The concern with other players' experiences noted above for human teammates highlights the obligation that exists between human confederates within a game, the negotiated compromise needed to preserve in-game experience for others. This obligation was expressed clearly by one participant in our study.

"So, again, having teammates to help you out[...] It kind of feels the same as when I go into a match of Battlefield with AI teammates. Like where I don't really know much about them, 'Oh there's somebody over there doing their

own thing.' I kind of feel the same thing with Left 4 Dead, in a situation at least. If I was playing with people it would be much different. [With AI] it was kind of like[...] They're a separate entity. Okay, I'm here, but you know, I'm going to be doing my own thing, maybe get into trouble, and they're probably going to help me out because they're nice." "I guess if you have other people around you, especially in an atmospheric game like that, [...] I feel kind of safer. You know somebody else can screw up and you're like oh I feel good I helped them. Then if you screw up it's like ok that helps it's all good, somebody helped me out."

Between human players, there exists a social agreement that describes expected behaviours. Essentially, to continue working together, compromise between parties is necessary, be that compromise one that arises via discourse and consensus or one that arises through the will of the majority. There is an expectation that human confederates must be collaborators, not solely confederates.

While all players perceived the connection with and mediation required between human players, there were challenges. These challenges included the obligation placed on a player by other human players (and the potential benefit to playing with NPC-Ts when players perceived their skill as being insufficient), and the desire to occasionally violate social norms to create disruption.

First, mismatched skill levels were a significant challenge when navigating the obligation to human confederates. Players who felt their own skills were not comparable felt that social expectations on them were too high. They worried about feeling judged for their skills. They felt others would resent their errors. They also perceived a need to seek forgiveness when an error was made.

"It's fun to play on your own and feel that 'Oh my gosh I can be the best one that I can be!' With my friends it's like, yeah no, I'm not the best one here."

Insufficient skill articulated itself as a benefit to NPC-Ts for those players who felt their skills were too low.

"Because then if I mess up, the computer doesn't get mad at me [...] People get mad at me if I mess up! So you don't have to answer to [computers]."

In contrast, more skilled players found that the lack of ability to create social obligation on the part of NPC-TS hurt the game experience, leaving them feeling unable to punish, pressure, or yell at the NPC-Ts in an effort to improve their performance.

"Uh, if I was playing with people I would've yelled at you more because yelling is part of the fun."

A second challenge observed in our data regarding the social contract between players involves a practice colloquially known as "trolling". Humans are not always good collaborators. When playing a game with a human teammate and setting up the social contract, the player must remember there is a negotiation that is involved to set up collaboration but there is a trepidation that the player faces: Will this human cooperate



with me? Humans are not as biddable as computer-controlled teammates, they may play pranks, act unexpectedly, or be silly.

"[I prefer] multiplayer with friends. Um, multiplayer with friends and single-player are kind of tied, it's just that usually I like to play with friends. And the reason I like that more than playing with strangers or many people online is just because I have a good kind of relationship with my friends so it's always fun to just be ridiculous."

"Humans are always more chaotic and a bit more silly so I feel the unpredictable factor, like what makes humans a bit unpredictable. I like that."

One participant trolled players in our experiment. This participant believed that they were playing with humans and made certain by looking at the 'pings' to other players, despite the instructions that communication tools were **not** allowed by the experimental protocol. Afterwards, they disrupted gameplay and ditched the team. When interviewed, they stated that 'pings' are only done with human players. The person checked because with AI they would not have taken the same actions. This participant prefers to play with humans because they enjoy creating chaos among human players; they would not derive the same enjoyment from doing so with the AI:

"I saw that the people were human, so I wanted to [mess] with you guys[...] Bots you know, they're not real. People are real, so when you mess with people it's funnier."

The fact that our study was a deception study also provides for interesting insight into the behaviour of human players with respect to NPC-Ts. As one example, one participant was informed that they were playing with a NPC-T, despite the fact that they were playing with a human confederate. This player rejected NPC-Ts, freely overlooking, abandoning, or shunning the NPC-Ts. In debriefing the participant reacted to the reveal that they were playing with human confederates with an acknowledgement that their behaviour was incorrect, "Uh, I just assumed. Go figure!". Others, particularly in the case where they were told AI but were actually playing with humans, expressed similar sentiments, using terms like "oops" and "oh well" to express post-hoc acknowledgement that they would have behaved differently. Participants deceived in the inverse direction (told human, actually AI) also noted how the perception that teammates were human altered interpretation of behaviour of NPC-Ts in gameplay.

"Because they were supporting their team members [...] It didn't seem like they were out for themselves. They seemed more like a team kind of."

Overall, this acknowledgement further illustrates the quid-pro-quo expected between human-controlled confederates versus the relatively reduced value that can be ascribed to NPC-Ts.

### Humanization and Competence

"It was still like a person, right? It still stood out as behaviour of what a person would do instead of AI who knows where people are and just \*he gestures a motion of shooting something\*"

Determining the humanness of a player's teammate was difficult for our participants. In part we see this through the success of our study design; participants rarely questioned whether their teammates were computer-controlled or human confederates, despite the fact that in one third of gameplay, players were being deceived. However, alongside the success of our deception study, we also saw that players anthropomorphized or humanized computer-controlled teammates.

On the other hand, while players humanized NPC-Ts, they did not expect competence from their NPC-Ts. As a further result, when computer-controlled teammates demonstrated any competence or skill they were regarded as more human. The perception (and, indeed the reality) is that NPC-Ts lacked the subtlety of a human-controlled player, demonstrated by their typical inability to lead and work in a team.

Within our data, we perceive a hierarchy of engagement. At the lowest level, NPC-Ts are not perceived of as people, but may have human-like qualities, a phenomenon known as Anthropomorphism. Some characters perceived to be NPC-Ts were actually human confederates playing in the game (because of our double-blind study). The sophistication of these NPC-Ts did, at times, lead participants to humanize their AI-controlled confederates. Finally, levels of gameplay skill with regards to strategy and leadership/teamwork were perceived to more fully indicate a human confederate was playing collaboratively with the gamer. We expand on this theme as follows.

### Humanization

Humanization of NPC-Ts was frequently observed in our experiment. Aspects of NPC-Ts such as the pre-programmed speech of the characters—statements of thanks, negative or positive reactions to game events, or encouragement to hurry through the game—enhanced the tendency of participants to humanize NPC-Ts, (i.e., made players feel more connected to the NPC-Ts). We were surprised that the pre-programmed speech was cited by some players as causing the feelings of humanness and not actual actions taken by humans. More specifically, rather than the actions of teammates, the reactions or interactions between participants and their teammates were most effective at encouraging humanization of NPC-Ts.

Because we were preserving parity between human and NPC-T conditions, there was no voice communication. Participants often cited the lack of voice communication as a factor that reduced the sociality of the gaming experience. The lack of voice communication made it hard to feel that either condition was different. Even in human-to-human play, however, the pre-programmed textual speech of the characters which may include statements of thanks, negative or positive reactions to game events, or encouragement to hurry through the game made players feel more connected to the NPC-Ts.

"The fact that there was some dialogue in there I think was a big one. So I could hear someone telling me to get into a room that I couldn't get into. And reminding me, I think that they heard things around the corner..."

Alongside anthropomorphic attributes, the fact that NPC-Ts were teammates provided a further encouragement for participants to humanize the NPC-Ts. For example, multiple partici-

pants felt that the computer-controlled and human teammates had personalities and play styles; In one case, one participant in our study felt that one player was defensive, one was aggressive, and one held back.

"I could almost see which behaviour they were acting in. Like Zoey had the aggressive behaviour, Louis had the whole defensive behaviour and was constantly behind, and Bill [he means Francis] was kind of in the middle there. So[...] like I could definitely tell who was showing which characteristic."

In this case, the participant was deceived. Initially she was told that the NPC-Ts in the game were human players. At the end of the game, after the truth was revealed, that they were actually AI (and would not have different tendencies), the same participant stated, "I still hold to my point that Zoey knew where she was going, Francis was in the middle, and Louis kind of held back."

Some players spoke aloud to the NPC-Ts. Interactions ranged from a short-lived "Hi Francis" or "Aww Zoey" when observing teammates, to laughter and guilt when NPC-Ts complained about incidents of friendly fire. One participant was healed by a computer-controlled ally, at which point they turned and said, "Thank you" to the experimenters. The participant was aware they were playing with computer-controlled teammates, yet was still compelled to direct their gratitude towards someone. This same participant expressed shock while nearly shooting their teammate in the process of learning the game's controls.

Participants would also react to dialogue spoken by avatars in the game. In one example, a NPC-T character in the game said, "Let's do it", prompting the participant to reply, "Wait what are we doing? Ok what do you people want me to do? I'm just going to start following you around", despite the fact that the participant was told (accurately) that they were playing with computer-controlled players.

#### *Competency Makes it Human*

The study design calls for the deception of the participant, allowing us to determine their opinions on human versus computer-controlled teammates. When their assumption that the blind-experimenter gave accurate information about their teammate was pressed, participants revealed information about the nature of their assumptions.

We found that humanness was determined based on levels of competence. Where computer-controlled teammates may have been humanized or anthropomorphized, they still did not reach the level of thought and subtly and richness in behaviour typical of humans. The more skill and competency playing the game a character demonstrated, the more likely a player was to begin to infer human tendencies.

Competency is a multi-faceted concept for our players. At the simplest level, players make the negative assumption that computer-controlled teammates are useless in times of need.

"[Humans are] the best, because at times I really needed saving, so I'm really glad I had a team of people and not like computers or robots or whatever; because yeah they really saved my ass."

However, alongside this low-level attribute of skill, more complex issues of self-preservation indicated a higher likelihood of human control for our players.

"Well I noticed sometimes they would move away from a dangerous area, which seemed a little weird. Like the thing that shot green stuff like they would move away from it after so they wouldn't get injured. Which I thought was a kinda unusual for an AI. [AI] just sort of 'Oh I'm getting shot now, might as well just die.'"

At the highest level, issues of skilled teamwork and leadership were significant indicators participants were playing with a human. NPC-Ts were perceived as being poorer team players with respect to working with others. Participants also looked to their companions for leadership. When given a leadership position, some participants felt this was proof that their teammates were not human. In other words, being ceded control leads participants to believe they were the only human—particularly when that control is ceded too easily.

Alongside skill within the game and skill at teamwork and leadership, communication was a large determining factor in the humanness and competency of a teammate. Instructions given by another player, reactions to the in-game actions (e.g., accidentally shooting another teammate), caused players to feel more sociable towards the teammate. Players cited speech as the determining factor towards feel sociable, despite the fact that this dialogue was pre-programmed and present in both human and computer-controlled conditions.

"Someone in there sounded like they had a crabby attitude, so that was kind of more real. It wasn't just that they all acted the same. They used names a lot so it seemed a little more personal."

Communicative competency, however, remains a big indicator for our participants of when they might be playing with human confederates. In particular, sarcasm and bile were perceived to be less likely from NPC-Ts than from humans, and when characters exhibited this type of speech, it increased the likelihood for deceived participants of post-hoc rationalizations that NPC-Ts were actually humans (i.e., participants could identify these actions as being indicative post-hoc of the deception though they did not identify the deception during gameplay).

## DISCUSSION

Better AI in games does matter, but can we answer the question whether it changed the relationship to NPCs within games, particularly NPCs who are our collaborators? We suspect the relationship will not change any time in the near future. To understand the limits of playing alongside NPC-Ts requires an understanding of the social dynamics of gaming and gamers.

There is a significant body of work that has studied gamer communities and the social dynamics of these communities both with respect to online interactions [13, 18, 63] and real-world perceptions [7, 43] of gamers toward each other. This past work has included studies of the dynamics of power and prestige within these communities. While some authors have focused on specific actions within the community [7], much of



the writing on status focuses less on specific acts of dominance and more on perceptions of pervasive empowerment.

Obviously, notions of pervasive empowerment are not new; they have simply been applied within the study of social structures in gamer communities. Historically, Foucault writes extensively on power structures and their maintenance, beginning with notions of power being perceived of as a “right” ascribed to specific individuals. He also comments extensively on the instability of power structures that are maintained by specific actions of individuals:

In certain societies, of which the feudal regime is only one example, it may be said that individualization is greatest where sovereignty is exercised and in the higher echelons of power. The more one possesses power or privilege, the more one is marked as an individual . . . . [However], neither the residual forms of feudal power nor the structures of the administrative monarchy, nor the local mechanisms of supervision, nor the unstable, tangled mass they all formed together [can maintain these pre-specified social hierarchies].

His argument culminates with the claim that societies maintain these hierarchies less through explicit action and more through pervasive interactions between people – discourse, common knowledge, pervasive behaviours. These results align well with studies of power dynamics within many communities, including gamer communities [7, 43].

Our work, however, is not about human-to-human conceptions of power; instead it focuses on distinctions between NPC-Ts and human confederates. We find that NPC-Ts have both similarities and differences with human teammates. From the perspective of similarity, we find issues of competence that promote NPC-Ts as more closely considered peers by human players. Competence is also an important aspect of status and value within online communities, as explored by Ducheneaut et al. [13] in World of Warcraft guilds. However, players also noted the differences, including an inability to yell at or bully NPC-Ts in contrast to human players. In other words, with ranking between human players comes a need to preserve those ranks or ascendant individualism, and the mechanisms by which it is maintained. Mitigating against this social stratification—biasing the game too heavily toward one player or another—are issues of social contract that arise between human players. Human players know they need to preserve the enjoyment of other players to ensure they have teammates who continue to help them and play the game.

One significant difference between NPC-Ts and human teammates is the lack of need for a maintenance of power imbalance. When one’s teammates are NPC-Ts, there is an obvious expectation that the human player matters and the NPC-Ts serve a subservient role. Alongside this, because social hierarchy is automatically maintained, the interactions become more autocratic, more feudal, between human player and NPC-Ts. In our data, NPC-Ts were both cared for and disposable to players. This has similarities to the power structures of feudalism or monarchies as noted by Foucault, with the added reinforcement that the power imbalance does not need to be

preserved through specific action. The fact that the NPC-T does not resist makes these power differentials stable. We characterize this overall impression of interaction between human player NPC-Ts as quasi-feudalistic. The primary characteristic that differentiates role is a distinction in control and agency. In some ways, our observation of feudalistic impressions of NPCs aligns with results on utility characters, or alts, by Livingston *et al.* [27] in World-of-Warcraft. These alts were considered ephemeral, existing to satisfy a specific goal, whether short-term—for a raid, to quest with another—or long term—as a bank to store items of value. Rather than representations of self, alts were tools.

Can we and should we moderate these quasi-feudalistic aspects of the relationship between human players and NPC-Ts? We do note that the (lack of) humanness of the computer-controlled teammate was moderated by a hierarchy of humanization extending from NPC-Ts with anthropomorphic tendencies through to higher levels of competence leading to a greater likelihood of acceptance as a collaborator. Underlying all of these observations is the sense, throughout our data collection, that NPC-Ts matter: They enhance the gaming experience and add realism; they protect and support the human player; they respond and interact in ways that create atmosphere. This observation drives a set of design recommendations.

### Design Implications

We now leverage our observations of NPC-T behaviour to drive design implications and recommendations.

**Encourage altruistic quasi-feudalism toward NPC-Ts by rewarding humanization of the computer-controlled characters.** Players want to feel central to the game. Recognizing and celebrating altruistic feudalism can significantly enhance the centralization and importance of the human player. In the same way that fictional protagonists care for the “others” written into their stories without parity existing between parties [12, 44], games can reward behaviours where NPC-Ts are managed, guided, and valued. We hypothesize that magnifying the benefits of effective interaction between NPC-Ts and human player can foster attachment between human and NPC-Ts. For example, designers could make the NPC-Ts better collaborators depending on the positive interactions with the player. NPC-Ts could be more aware of their surroundings and provide better information, for example, if well treated.

**Simulate a social contract between NPC-Ts and human players.** Game designers could also simulate the development of a social contract between NPC-Ts and the human player. Obviously, the question of who will lead is already decided between NPC-Ts and humans, but justifying the decision based upon in-game actions makes the NPC-Ts appear to have more agency. Alongside the negotiation of social dynamics with NPC-Ts, one can further emphasize the relationship between NPC-Ts and each other during emotional in-game decisions. As one example, strategies involving sacrifice of a NPC-T could affect other NPC-Ts.

**Support Anthropomorphism and humanization of Computer-controlled teammates by encouraging reactive actions towards the narrative of the game.** We found

that players want to humanize NPC-Ts. Supporting this humanization tendency by making the computer-controlled teammates react to the situation in the games—shots taken by players, the need to hurry through a stressful area—connects the computer-controlled teammates to the player. In our data we see that these naturalistic reactions enhance the narrative of the game. Furthermore, games could seek to preserve information on past interactions or past missions that NPC-Ts have participated in with the human player. NPC-Ts who are killed could be replaced by new recruits. Overall, developing a shared history with a team of NPC-Ts could make more subtle the line between human-controlled and human-like.

**Encourage self-efficacy through supportive NPC-Ts.** The NPC-Ts and player's avatar in *Left4Dead2* converse with each other to indicate direction, healing of teammates, (im)polite exchange, and strategic planning. In this sense, the AI are creating the simulated feeling of togetherness. Participants reported feeling as if they were being supported or part of a group, even in the AI conditions. From the results of the study, we note that company of AI in a game setting can emotionally affect players, empowering and encouraging them. Supportive NPCs reduce trepidation and influence perceived difficulty. NPC-Ts could provide an engaging alternative to traditional methods of challenge mitigation; rather than weakening enemies or strengthening the human player, more competent NPC-Ts could serve the purpose of difficulty adjustment. A simplified form of this technique to empower the player has been used in the fitness game *Zumba Fitness* [G1]: Increased effort allows one to increase background dancers on one's screen. In this sense, as a player's skill progresses, their character and their adversaries do not change; instead, their team changes. Perhaps they have fewer teammates, for example, requiring increasing efficacy on the part of the human player.

**Consider lying by omission about the nature of teammates.** In the field of dynamic difficulty adjustment, DDA, one recent result notes that, if one uses dynamic difficulty to increase the parity between players, it is best to not directly inform players of its use [11]. Players can react negatively both when DDA is applied to their actions (because of the assumption of their incompetence) and when DDA is applied to their opponents (because it makes the playing field not level between competitors). This is true despite the fact that parity of skill enhances the playing experience. It seems that, most importantly, the parity of skill—from the perspective of both parties—must be an accurate reflection of actual skill levels.

Similarly, one open question for future work is whether ignorance of the nature of teammates as NPC-Ts or as human teammates matters as much as we sometimes think it does. Perhaps games can be less explicit in communicating the nature of teammates. In a virtual world, there are significant advantages to leveraging NPC-Ts to complete game teams, particularly early in the game. Over time, the nature of the different teammates will undoubtedly become clear, but, given the fact that our participants simply accepted the nature of the teammates and reacted accordingly during truncated gameplay argues that discretion may not be exceedingly negative.

## LIMITATIONS AND FUTURE WORK

This study did not test communication between players, but the primary goal of this study was to understand differing perceptions of human and NPC players. A large collection of literature already exists on side channel communication between human players and pre-existing relationships [54, 53, 55], and it may be interesting to leverage these studies to understand how we can leverage side-channels in future work.

Alongside communication, any game study is limited by the fact that only a finite number of game environments can be tested. We leveraged *L4D2* because it requires close collaboration with teammates, whether human or NPC-T. Collaborative games provide the best opportunity to bond with NPC-Ts and to develop positive impressions. Given the goals of our study, we feel our platform choice was appropriate. Although some of the design guidelines are hypothesized to apply to competitive or single player games, further research is necessary.

## CONCLUSION

Why do we care if our teammates are human or not? Superficially, one can simply say players are aware that the world they are in is artificial, but—with human-controlled characters—the game intersects the real world. This intersection means impressions created in-game can persist when playing with human collaborators. In other words, humans are just protecting their potential social capital, whereas with NPC-Ts that altruism will never be repaid intentionally. Of course, this perspective ignores the observations of trolling, of variable competency, and of altruism toward NPC-Ts on the part of some of our participants.

More aptly, generalizing from our themes of quasi-feudalism and social obligation, or humanization and competence, what we found could perhaps best be grouped under an assumption of human primacy in games [14], which recognizes the need for negotiation with humans and a valuing of striving with and against humans more than “others” in the game. Overall, given the transient nature of NPC-Ts, there is nothing wrong with this belief; we advocate in our design implications that celebrating the quasi-feudalistic tendencies of human players could be encouraged through game designs that placed effective collaboration and support of NPC-Ts as a more explicitly rewarded aspect of game design.

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