

Exploring Interpersonal Touch-Based Interaction and Player Socialization in Prism Squad: GO!

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ABSTRACT

The value of socializing in collocated multiplayer video games should not be underestimated. Inter-player interactions such as joking, bantering and strategizing all contribute towards creating rewarding and memorable gameplay experiences for the players involved. In this paper, we introduce *Prism Squad: GO!*, a cooperative, three-player video game which is designed to encourage and cultivate these enjoyable social interactions between players. *Prism Squad: GO!* promotes inter-player interaction through “interpersonal touch” – the physical act of touch shared between two or more players. To succeed in *Prism Squad: GO!* requires players to work together by interacting with their teammates.

In this paper, we motivate the novel application of interpersonal touch in video games, and present a detailed description of *Prism Squad: GO!*'s gameplay mechanics which are currently based on a non-interpersonal-touch form of collaboration between players.

We also present the results of our thirty-player user-study on *Prism Squad: GO!* Our analysis of these results shows that *Prism Squad: GO!* was well-liked by study participants, particularly because of the way it encourages teamwork and collaboration amongst players.

Keywords

Games, gaming, touch, cooperation, interpersonal touch interaction, teamwork, color, Wii, human-computer interaction

1. INTRODUCTION

The medium of video games is rapidly evolving. Whereas video gaming was once seen as passive and largely antisocial activity, new games – and new ways of playing – are quickly changing this outmoded perception. Consoles like the Nintendo Wii, alongside games like *Wii Sports* and *Rock Band* are transforming video game consoles into a hub of social activity. Although video-gaming has traditionally been the domain of young males, this too is quickly changing. More and more young females, mothers, fathers, and even grandparents are becoming gamers too [13]. Video gaming is increasingly gaining acceptance as common social activity – one which is often shared between friends, families, and couples.

The emergence of video gaming as a legitimate social activity has

powerful implications for the design of video games themselves. Prior research into video games and the people who play them has shown how the people with whom you play can be just as important to your satisfaction as the game you're playing [10], [13]. Nicole Lazzaro called this phenomenon “The People Factor.” Creating games to take advantage of The People Factor requires designers to provide plenty of opportunities for inter-player interaction.

Motivated by the emerging trend of video gaming as a social activity, and the importance of The People Factor in creating enjoyable and memorable gameplay experiences, this paper presents *Prism Squad: GO!*, a three-player computer game (played using Nintendo Wiimotes and a large-screen video display) which encourages inter-player interaction through its use of interpersonal touch as a primary gameplay mechanic (Figure 1).

2. RELATED WORK

Interpersonal touch is defined as any act of bodily contact which occurs between two people. This broad label includes such diverse behaviors as handshaking, high-fiving, hugging, kissing and slapping. Interpersonal touch is common form of non-verbal communication among human beings, which can be used to convey both positive and negative intent. When used affectionately, interpersonal touch can demonstrate agreement, solidarity, togetherness, compassion and even love. When used maliciously, touch can convey hostility, intimidation and the threat of bodily harm.

With *Prism Squad: GO!*, our goal was to harness the positive aspects of interpersonal touch to draw our players closer together,



Figure 1 – A conceptual photo showing three players playing *Prism Squad: GO!*

and to enhance their enjoyment of playing together with their partners. This idea is supported by several studies examining how interpersonal touch shapes human perception in social interactions. In a study by Burgoon et al., experimental participants were paired with an experimental confederate to discuss and analyze a series of hypothetical, morally-ambiguous scenarios [2]. Participants were randomly divided up into “touch” and “no-touch” conditions; in the touch-condition studies, confederates would casually touch the participants three times over the course of the 5-7 minute study. Following the study, participants were given a questionnaire asking a series of questions about the attitude and desirability of their confederate partner. When the results of these questionnaires were tabulated, they presented “resounding [evidence of] touch [as] a potent communicative behavior” [2]. By and large, participants who had been touched by their confederates responded much more enthusiastically than those who had not: “The presence of casual touch was interpreted as expressing greater immediacy/affection, receptivity/trust, relaxation, similarity, and informality than its absence.” Touching confederates were also seen as more sociable and extroverted than their touchless peers. Similar studies conducted in restaurants [4] and libraries [7] have also shown how interpersonal touch can positively affect the perceptions of those being touched.

Several projects in the field of human-computer interaction have realized the emotional importance of interpersonal touch and have sought to integrate it into the designs of their interfaces. Many of these projects have been focused on the problem of restoring touch between partners who are physically separated.

“inTouch” is a device constructed by Scott Brave and Andrew Dahley. It’s a pair of networked devices which are synchronized to behave as a one [1]. Each inTouch device is made up of three “rollers”, which can be rotated in-place by dragging your palms or fingers across the rollers. Whenever rollers in one device are moved, motors in the second device move its rollers to “replay” this movement, effectively propagating the user’s touch between the two physically-separated devices. This “twinning” behavior allows two remote users to simultaneously interact with what is essentially a single entity – allowing one user to feel another’s manipulations by resting their hand softly against the rollers, or to resist their partner’s movement by turning the rollers in the opposite direction. Because of its “subtle and abstract nature,” many users who tried the initial inTouch prototype agreed that the communication it provided was best suited to “intimate relationships” [1].

Florian Mueller’s search for a tactile and unobtrusive way to connect intimate partners separated by large distances led him to create a “hug vest” – a vest filled with pockets of air which could be rapidly inflated to simulate the feeling of a hug [12]. The hug vest was designed as a way for partners to discretely communicate affection – a way of privately reminding your partner that you are thinking of them without interrupting their ongoing activities. In Mueller’s early prototype, the hug interaction was unidirectional – one partner wears the vest while the other partner sends “hugs” wirelessly via a handheld PDA.

Interpersonal touch has also been sporadically used in the design of video games and other forms of entertainment computing. Interpersonal touch formed the basis for Jennifer Chowdhury’s “Intimate Controllers” – a pair of wearable video game controllers designed for intimate partners [3]. The eponymous intimate

controllers were a woman’s bra, and a man’s boxer-short. Each controller contained a set of embedded touch sensors. These controllers were designed to be used by couples as a way of encouraging intimate interaction between the partners as they played. Each player’s inputs are located on the opposite player’s body – the male player touches his partner’s bra, and the female player touches her partner’s underpants. These intimate controllers were accompanied by a video game entitled ‘*Get Lucky*’ Charms – a straightforward adaptation of Dance Dance Revolution, where players must touch their partner on the appropriate spot as colored symbols scroll from the bottom to the top of the screen.

Matchmaker by Cody Watts et al. is a two-player tabletop video game for couples, which incorporates the interpersonal gesture of handholding to emphasize its romantic theme [14]. In *Matchmaker*, players must work together to match up virtual people called “Peeps” by touching and dragging them together to form couples. As the game progresses, Peeps sporadically become depressed, preventing the players from using these Peeps to create matches. In order to cure the Peeps of their depression, players must hold hands and then touch the affected Peep. This restores the Peep’s happiness, and allows it to be matched up by the players once more.

Whereas inTouch, Mueller’s hug vest, Intimate Controllers and *Matchmaker* all sought to explore the romantic aspects of interpersonal touch between intimate couples, *Prism Squad: GO!* examines the use of interpersonal touch in a broader, more general context. With *Prism Squad: GO!*, we seek to explore how interpersonal touch affects players relationships as they play, even in the absence of romantic overtones.

3. PRISM SQUAD: GO!

3.1 Game Mechanics

Prism Squad: GO! is a two-dimensional shoot-‘em-up (Figure 2) where three players work together to protect the galaxy from an invading alien menace called the Spek’Tral.

The Prism Squad is made up of three members, known only by their codenames: Prism Red, Prism Yellow and Prism Blue. In *Prism Squad: GO!* each player controls one of these team members as they pilot their brightly-colored spaceships across the galaxy. Players control the movement of their ships using the pointing functionality of the Nintendo Wiimote. When the player aims their Wiimote at a location onscreen, the player’s ship will automatically move towards that location in a straight line.



Figure 2 – *Prism Squad: GO!*’s main game screen

Prism Squad: GO! is broken up into a series of stages, each of which is based around defending one of the planets in our solar system. In each stage, the “planetary objective” appears at the center of the stage, surrounded by a circular green halo which represents the planet’s health. During the game, enemies will attempt to attack the objective by crashing directly into it. Whenever an enemy collides with the planet, it explodes and the planet’s health decreases. As planets become increasingly damaged, pillars of smoke will erupt from their surface. When a planet’s health has disappeared completely, the planet has been destroyed and the players have lost the game.

The players’ goal in each stage is to protect their objective by shooting down incoming enemies before they can reach the planet. At any time, a player can shoot a colored laser from the nose of their ship by pressing the ‘B’ button on their Wiimote. Each ship produces lasers which correspond to the color of the ship itself. The color of the lasers is very important, because the only way for players to destroy enemies in *Prism Squad: GO!* is by matching the color of their laser to the color of the enemy ship.



Figure 3 – *Prism Squad: GO!*’s eight enemy types

In *Prism Squad: GO!*, there are eight different types of enemies (Figure 3). Meteors – the leftmost enemy shown in Figure 3 – are the game’s most basic enemy. They can be destroyed by a single shot from any player. The remaining seven enemies are colored UFOs. A UFO can only be destroyed by a laser which matches the color of the UFO itself. Lasers of any other color will be nullified by the UFO’s energy-shield, leaving the UFO unharmed.

Red, yellow and blue UFOs are called “primary” enemies. The colors of these enemies correspond to the individual colors of Prism Squad. To destroy a primary enemy, the appropriately-colored player must shoot it once with an appropriately-colored laser. Orange, green, purple and white enemies are called “secondary” enemies. Unlike primary enemies, which can be destroyed by a single player working alone, secondary enemies can only be destroyed by two or more players working in tandem. In order to produce the orange, green, purple and white lasers required to defeat these secondary enemies, players must combine their colors using *Prism Squad: GO!*’s color-blending gameplay mechanic.

Color-blending is the act of combining two primary colors to form a new, secondary color. Color-blending is a common technique for mixing inks, paints and dyes. In fact, most consumer-grade color printers have only three types of colored ink – red, yellow and blue – but by combining these inks in various ratios, it is possible to produce an entire spectrum of colors. Red, yellow and blue are not just the colors of Prism Squad, but the foundation of an entire theory of colors. In 1810, the German artist, scientist and philosopher Johann Wolfgang von Goethe “Theory of Colours”, a scientific treatise on the nature of color and light [8]. Goethe’s observations led him to propose what is today known as the RYB (“red, yellow, blue”) color model – a subtractive system of color, wherein the three color primaries red, yellow and blue blend together to create new colors. Goethe’s color wheel depicts (Figure 4) the three primaries, separated by the three secondary

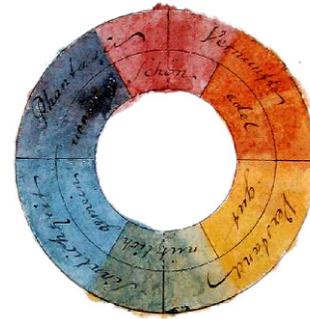


Figure 4 – Goethe’s color wheel

colors which they combine to create: red and yellow make orange, yellow and blue make green, and blue and red make violet.

This RYB color model forms the basis of *Prism Squad: GO!*’s blending mechanic. At any time during the game, if two or more players simultaneously hold down the ‘A’ button on their Wiimote, their colors will be combined according to the RYB model: red and yellow make orange, yellow and blue make green, and red and blue make violet. When all three players blend at once, their colors combine to make white. As long as the players hold down the ‘A’ button, each participating player’s ship will glow with their blended color and any lasers their ship produces will be of the blended color as well (Figure 5).

Much of the excitement in *Prism Squad: GO!* comes from deftly coordinating blends with your teammates to take on an ever-changing onslaught of colorful Spek’Tral ships. Needless to say this requires great coordination – but it also requires discretion: if all players try to blend colors at once, the resultant color will be white, and no player will be able to get the color they need. Sometimes, being a good teammate means stepping back and letting your partners blend while you wait your turn. By being aware of your partners’ needs and giving each player time to form the blends they need, you can ensure your team’s success.

3.2 Game Flow

Prism Squad: GO! is broken into a series of stages which follow the Prism Squad’s ongoing fight against the Spek’Tral. The game begins on Venus, where the Spek’Tral are first sighted, and then progresses to Pluto, Callisto, Mars, Io and the Moon, before culminating in a final showdown high above the Earth.

In each stage, the players’ goal is simply to “hold out” for the required time limit – to protect the planetary objective from harm

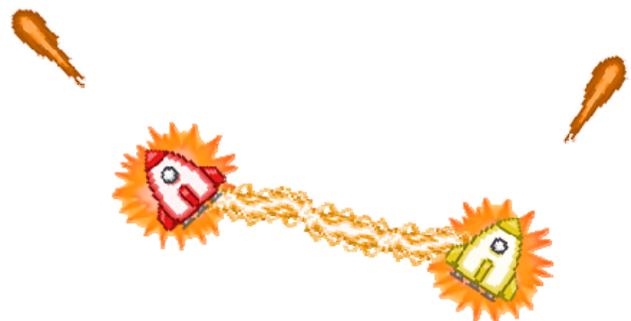


Figure 5 – Prism Red and Prism Yellow combine their colors to produce orange lasers

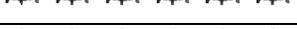
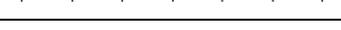
Planet	Time Limit (in Minutes)	Hits Allowed	Types of Enemies Appearing in this Stage
Venus	1:00	25	
Pluto	1:00	30	
Callisto	1:00	30	
Mars	1:00	30	
Io	2:00	40	
Moon	2:30	40	
Earth	3:30	40	

Table 1 – The seven stages of *Prism Squad: GO!*

until the Spek'Tral's attack falters. If the Spek'Tral can reduce the planet's health to zero before the time limit expires, then the players have failed – the planet is destroyed and the players will be given the opportunity to retry the from the beginning. However, if at the end of the stage's time limit the planetary objective still has some health remaining then the team has successfully defended the planet and they can advance to the next stage.

Prism Squad: GO! follows a gradual difficulty-curve, becoming more and more challenging as the team advances through the stages. The first stage, Venus, is designed to give the team an introduction to *Prism Squad's* basic gameplay mechanics before the notion of color-blending is introduced. The individual color blends are then introduced to players one-by-one over the course of the next three stages; this gradual introduction was designed to ingrain the color-combinations in players' minds, as the remainder of the game relies on the players' mastery of these combinations. Table 1 details *Prism Squad's* seven stages – it includes the name of each planet, the time limit for that stage, the number of hits a planet can absorb before it is destroyed and the types of enemies which will appear in that stage. For example, in the first stage (Venus) the team has to battle an assortment of meteors, as well as red, yellow and blue UFOs. The second stage, Pluto, is similar to Venus, except that orange UFOs will also periodically appear in the mix.

Each stage of *Prism Squad: GO!* features a briefing, a fight scene, and a conclusion. At the beginning of each stage, Commander Wolfgang – Prism Squad's valiant leader – will appear to brief

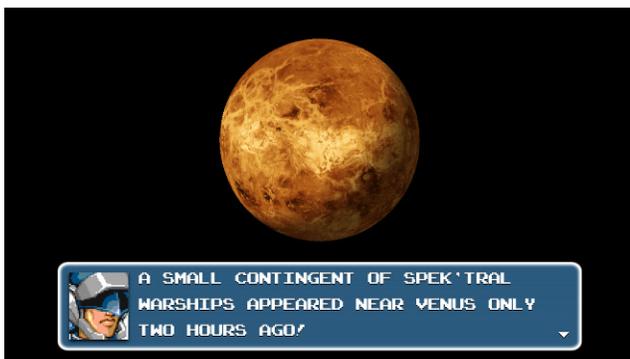


Figure 6 – Commander Wolfgang briefs the team about the coming mission on Venus

Prism Squad on their next objective. This briefing scene motivates the coming fight, and advances the plot of the game (Figure). Briefings occasionally also hint at which colors of enemies will appear in the forthcoming stage, giving players the opportunity to prepare their strategies before the stage begins. After Wolfgang's briefing, the game transitions to the fight scene. During this phase of the game, enemies will appear in a continuous stream from both the left and right sides of the screen, all of them traveling on a collision course with the planetary objective. In this phase, the players must steer their ships, shoot their lasers, and blend colors with their partners in order to protect their objective. If at any time during the fight scene the planet's health is reduced to zero then the scene will immediately fade to black and Commander Wolfgang will appear to chide the team on their performance. Players are then offered the chance to try the stage again from the beginning. However, if the team can protect their objective for the required amount of time, then a victory fanfare will play and Wolfgang will appear to offer his congratulations to the team. These congratulations are always short-lived though, as they are inevitably interrupted by an emerging crisis on another planet. This leads the team back to briefing room, starting the cycle over on a new planet.

4. IMPLEMENTATION

Prism Squad: GO! was written in C++ using a game engine of our own design. *Prism Squad: GO!* is rendered using OpenGL in conjunction with the freely available "GLUT" library. Sound and music playback is handled by the free software library, FMOD.

Prism Squad: GO! has been tested on a variety of PC configurations, but its target platform was a desktop PC running Windows XP with an Intel Core2 2.4 gigahertz quad-core processor, an NVIDIA Quadro NVS 290 graphics card and 3.25GB RAM. This system was connected to a 62" Flat-Panel SMART Board interactive whiteboard running at a resolution of 1360 x 768.

Prism Squad: GO! is played using three Nintendo Wii "Wiimote" controllers – one per player. The Wiimote is a one-handed remote control device with seven face-buttons, a directional pad, and a trigger on the underside. Each Wiimote also contains an embedded infrared camera which, when paired with a wireless "sensor bar", allows the Wiimotes to identify where they are pointing on-screen. Wiimotes connect to the host PC wirelessly over Bluetooth.

Although *Prism Squad: GO!* was designed to make use of interpersonal touch between players, the implementation of *Prism Squad: GO!* presented in this paper does not include a working interpersonal touch sensor. Detecting when two or more people are touching each other is a non-trivial engineering problem, and although our research made use of interpersonal touch sensing in *Matchmaker* [14] we do not yet have a reliable interpersonal touch sensing prototype for *Prism Squad: GO!* To address the lack of a working touch-sensor, the version of *Prism Squad: GO!* presented here uses a form of “simulated touch” in its gameplay. In this implementation of *Prism Squad*, the ‘A’ button on each player’s Wiimote has been designated as the “touch” button. Whenever two (or three) players hold this button simultaneously, *Prism Squad: GO!* acts as if those players are touching each other and blends their colors together. Admittedly, this method of simulating touch is imperfect because it eliminates the players’ need to physically interact with each other. However, it still serves as a point of focus for player-to-player cooperation. Thus, it still serves as a case study for how interpersonal touch can potentially foster cooperation between teammates. As of this writing, touch-sensing in *Prism Squad: GO!* remains an ongoing research effort in our group.

5. PRELIMINARY PILOT STUDIES

While developing *Prism Squad: GO!* we conducted a series of pilot studies as a method of refining and iterating our game design. These pilot studies were invaluable as a method for brainstorming new ideas, balancing game difficulty, and exposing areas where *Prism Squad: GO!* required further development. In total, more than 15 pilot studies were conducted with around 30 different pilot participants.

These pilot studies took the form of casual play tests conducted with visitors and members our research lab. Whenever possible, we chose to recruit participants who had never played the game before in order to get feedback from as many perspectives as possible. Occasionally, the designers would also participate in these pilot tests. During these playtests we encouraged testers to vocalize their thoughts while they played – after the playtests had concluded, we would discuss the major problems we observed while playing, and take turns brainstorming possible solutions.

Feedback from these pilot studies drastically altered the development of the game. *Prism Squad: GO!* was designed to explore the effects of interpersonal touch in a context that emphasized teamwork, unity and communication, and it was these core concepts which guided the pilot-testing process. Whenever a new feature was being tested, we were forced to ask ourselves: “How does this feature encourage interpersonal interaction? How does this feature promote teamwork?” If we could not answer these simple questions, then it quickly became clear that the feature in question needed to be reworked or removed.

6. EVALUATION

After conducting more than 15 pilot studies, we began a formal user study on *Prism Squad: GO!* For this study, we recruited thirty participants from on campus to come to our research lab and to play *Prism Squad: GO!* for themselves.

6.1 Experimental Design

In studying *Prism Squad: GO!*, our primary objective was to explore how the game’s use of interpersonal touch shaped its players’ experience with the game. Unfortunately, without a working interpersonal touch-sensor, interpersonal touch could not

be studied directly, and it so it became necessary to examine ancillary factors instead. In *Prism Squad: GO!* interpersonal touch was intended to serve as a form of tangible cooperation – a physical reminder of the players’ intangible bond as they fought and struggled as a team. Thus, in the absence of touch, we were very interested to see how the players’ teamwork and interdependence would express itself in their interactions with each other. We were particularly interested to see how players’ cooperative interactions would evolve over the course of the entire game. Although *Prism Squad* starts out as a very loosely-coupled game, as the game progresses it requires increasingly sophisticated teamwork to survive. We were curious to see whether players would perceive this change themselves and how it would manifest itself in the atmosphere of their group. For this reason, many of the items in our questionnaire were adapted from Fiedler’s Group Atmosphere Scale – a scale designed to measure participants’ attitudes towards their membership within a larger group [6].

Although this study was focused on primarily quantitative phenomena (teamwork, enjoyment) both qualitative and quantitative data was gathered. Quantitative data came from the game’s internal log files and Likert items on the player’s questionnaires, whereas quantitative data arose from our written observations, written items on the questionnaires, verbal interviews with the participants themselves, and video recordings of the participants playing *Prism Squad: GO!*

6.2 Participant Demographics

Participants for this study were solicited through faculty-mailing lists at our university, posted fliers on campus, and word-of-mouth. Although no effort was made to solicit particular groups within the university, the majority of our participants were graduate students, many of whom were members of the faculties of Computer Science or Engineering. Because of *Prism Squad: GO!*’s reliance on color, colorblind volunteers were ineligible for this study. However, no participants were turned away for this reason. Volunteers were required to sign up to participate in groups of three, so one can reasonably assume that the participants within a testing group were relatively familiar with each other prior to the experiment. In total, thirty participants – ten groups of three – took part in this study. Of these thirty participants, sixteen were female and fourteen were male.

6.3 Experimental Procedures

After introducing themselves to the participants, the study administrator would outline the study, including a description of the game, the post-game questionnaire, and the verbal interview. Provided there were no questions at this point, the administrator would then issue each participant a copy of the informed consent form, which they read and signed.

After the forms had been signed, participants were gathered before the large display, and each given a Wiimote. At this point, the administrator would launch the control demo – a limited version of *Prism Squad: GO!* which contains all the functionality of the real game, but no enemies. The program was designed to teach players to the rules and controls of *Prism Squad: GO!* before the experiment began. After each player had had time to familiarize themselves with the rules and controls of *Prism Squad: GO!*, the administrator would terminate the control demo and launch *Prism Squad: GO!* At this point, if all three participants had consented to be video-taped, the administrator would then turn on the video camera and begin recording. In total,

eight out of the ten groups consented to be video-taped. During the playtesting phase of the experiment, participants were asked to act naturally – to play to the best of their ability, and to act as though an observer was not present.

After the participants had completed the game, the administrator would turn off the video camera, collect each player’s Wiimote, and issue each player a post-game questionnaire. These questionnaires included ten Likert items, and four short-answer written-response questions designed to probe the players’ experiences with the game. All Likert items were evaluated on a seven point scale ranging from -3 (strong negative response) to 0 (neutral or ambivalent response) to 3 (strong positive response.) Participants were asked to fill out their questionnaires independently of their group-mates in an attempt to protect their responses from possible conformity biases within the team.

When all three participants had finished completing their questionnaires, the participants and the administrator would sit down together for a semi-structured discussion. These discussions would also be recorded on video with the participants’ consent. These discussions were an opportunity for us to gain additional insight on trends we had observed during the gameplay period. During these discussions, the administrator would also take the opportunity to ask players for their insights into how the inclusion of interpersonal touch would affect *Prism Squad: GO!* When the discussion with the participants ended the administrator would turn off the camera and give each participant \$10 as compensation for their time.

7. RESULTS

In response to the questionnaire statement: “Overall, how would you describe your experience playing *Prism Squad: GO!*?” participants were very positive in their response. All thirty agreed that the game was at least somewhat enjoyable, with seventeen out of thirty participants describing it as “very enjoyable” (Figure 7.) On average, female participants reported slightly higher levels of enjoyment than their male counterparts with median ratings of 2.71 and 2.31, respectively. Although this difference was not quite statistically significant (a two-tailed Mann-Whitney U-test yields a p-value of 0.08), the suggestion of a disparity between the sexes is nevertheless intriguing.

These high enjoyment ratings are consistent with the comments participants wrote in their post-game questionnaires. When participants were prompted for any final thoughts on *Prism Squad: GO!* twenty-three of the twenty-six participants who chose to leave a comment summarized their feelings about Prism Squad in a complimentary manner, stating variously that it was: “[a] really cool game”, “a pretty cool concept [...] and very original”

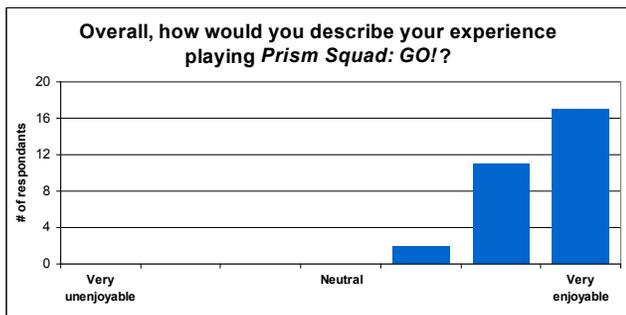


Figure 7 – Most study participants said that playing *Prism Squad: GO!* was very enjoyable

and “energetic and fun.”

Players also demonstrated affinity for the cooperative aspects of *Prism Squad: GO!* in their questionnaires. In response to the question “What did you enjoy most about *Prism Squad: GO!*?” twenty-three out of thirty participants mentioned some variation of the words “teamwork”, “communication”, or “cooperation” in their responses. Indeed, the impact of teamwork was unmistakable in our observations: as the game became tougher, and players were increasingly required to work together, we witnessed participants talking amongst themselves more and more. In fact, this increase in communication was not just limited to periods of intense gameplay; as a group worked their way through the game, we observed them idly chatting in the periods of calm in between stages and celebrating with relief after overcoming particularly difficult challenges.

These changes in the players’ behaviors did not go unnoticed by the players themselves. During the interview period, when participants were asked if their teamwork had improved over the course of the game, they agreed without exception. The following interview excerpt is particularly telling for the way it relates teamwork and communication:

- I: “Do you think that your teamwork improved as you played through the game?”
 All: “[emphatically] Yes.”
 P18: “Definitely.”
 I: “And why do you think so? How can you tell?”
 P18: “We started talking. Like, [when we first started to play] it was just quiet.”

Results from the player’s post-game questionnaires seem to support observations of talkativeness. Figures 8 and 9 reveal how participants described their group as a whole shortly after playing through *Prism Squad: GO!* The graphs reveal that, in general, participants perceived their groups as being very talkative, and very enthusiastic.

Participants also suggested a number of ways in which *Prism Squad: GO!* could be improved. Many participants suggested adding new content as a way of extending *Prism Squad’s* replay-value and lasting appeal – players wanted to see more types of enemies, more stages, new challenges, and varied graphics. We view such suggestions as a very positive sign: the participants’ desire to see *Prism Squad: GO!* expanded and evolved suggests that *Prism Squad: GO!* captured players’ attentions and engaged their imaginations. It also suggests that *Prism Squad: GO!*’s core gameplay is sufficiently robust to support future exploration. Examples of features suggested by players include adding additional levels, climactic boss battles and power-up icons.

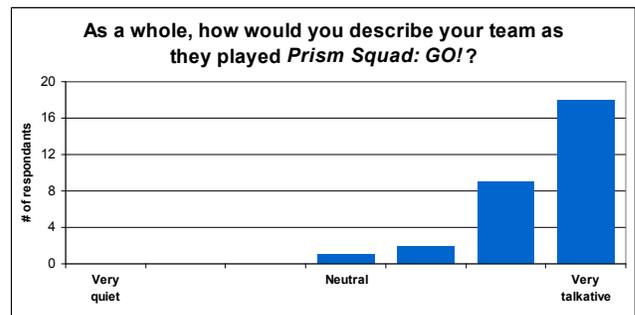


Figure 8 – The majority of participants said that their team was very talkative

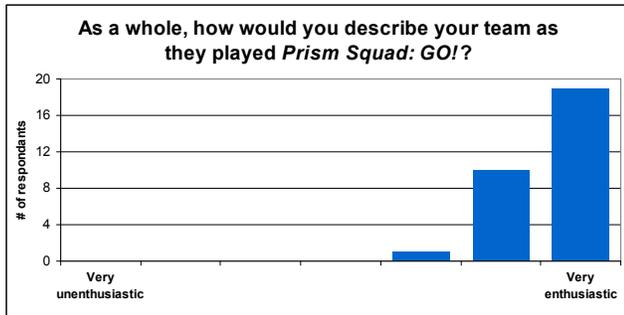


Figure 9 – By and large, participants described their teams as being very enthusiastic

Potential power-ups suggested by players included the ability to shoot multiple lasers at once, the ability to produce “rainbow shots” which would destroy any enemy, and one-shot nukes which would destroy all onscreen enemies.

Our study administrator concluded each experiment by the asking participants to describe how they imagined *Prism Squad: GO!* would change if interpersonal touch, rather than simultaneous button-pressing, was used to blend colors between partners. The participants’ responses to this question spanned the gamut from enthusiasm to reserved skepticism. Broadly speaking, most groups could see the allure of adding interpersonal touch. Many participants believed that interpersonal touch would make *Prism Squad* more fun, citing benefits such as enhanced physical expression, increased interaction with teammates, and increased awareness of the game state:

- I: “What if, in order to blend colors, two players had to touch each other. How do you think that would affect the game?”
- P18: “Easier.”
- P17: “Stronger feeling.”
- I: “Better feedback, you mean?”
- P17: “Yeah, because you’re feeling instead of just seeing.”
- P18: “Sometimes I [would shout] ‘Oh! Purple! Purple!’ but [my ship would] still [be glowing white]. But if I feel two people touching me, then I know [why my ship is] white.”

Participants also seemed to enjoy the idea of being able to act independently; to be able to force a blend by reaching out and touching a teammate or to shrug off a partner to stop an undesirable blend – something which simply is not possible through the button-pressing method. But although participants were generally intrigued by the idea of interacting with their partners through touch, many participants expressed concern that adding interpersonal touch to *Prism Squad: GO!* could introduce undesirable side effects. Many participants pointed to the inherent difficulty of positioning three players around a video display such that they could easily touch each other without interrupting their gameplay. During their playtest sessions, participants stood side-by-side in a row, each facing the screen. Though this configuration is well-suited for normal gameplay, many participants remarked that this layout would make it difficult for the players on each end to touch each other:

- I: “Say that you had to touch your partner you blend colors, how would that affect the game?”
- P11: “I think that’d be pretty sweet.”
- P10: “It might be a bit easier too.”

P12: “Well, [it] depends. Because, like, if [P10] was standing pretty far from me and we had to get in really quickly, I’d have to reach over [P11] and block his way, right? Then maybe that would make things uncomfortable for him and he couldn’t aim as well.”

Study participants also expressed concern over the social issues surrounding interpersonal touch. During their interview, a group of female players told me that while interpersonal touch could work between friends, its inclusion would damage *Prism Squad*’s ability to be enjoyed with new people:

- P1: “[If touch was involved] I can’t see playing with strangers; that’d be uncomfortable.”
- I: “But within your group, you think something like this could work?”
- All: “Yeah.”

Other social issues raised by participants dealt with the effects of gender on touch. Several study participants (both male and female) suggested that interpersonal touch might be considered invasive in male-male pairings.

8. DISCUSSION

8.1 Gender Differences in Prism Squad: GO!

Prism Squad was never consciously designed to appeal to one gender over the other, so it was surprising to see questionnaire data suggesting that *Prism Squad: GO!* might be more enjoyable to female participants than to males.

There is little hard data to suggest why female players would enjoy *Prism Squad* more – according to most other metrics, males and females were quite alike. In the absence of other explanations, we are inclined to believe that this discrepancy amongst genders is due to *Prism Squad*’s cooperative gameplay.

It is generally held that female gamers prefer cooperative forms of gameplay to the competitive gameplay typically favored by males [11]. Could it be that cooperative nature of *Prism Squad: GO!* endears the game to a female audience? In an interview period, a participant from an all-female group lent credence to this theory when she said offhandedly: “This game is better for girls – I don’t like playing alone. And, even if you’re bad, your teammates help you [to] win.” In another all-female group, one participant contrasted the cooperative aspects of *Prism Squad* against the abundance of competitive games on the market when she said: “[Playing *Prism Squad: GO!*] was different ‘cause, like, in a lot of video games you’re, like, against each other when you play, but [in *Prism Squad: GO!*] everybody’s on the same team. I thought that was really cool.”

Although it is impossible to reach any substantive conclusions at this point, we believe that the role of gender in players’ perceptions of *Prism Squad: GO!* would be an interesting topic for future study.

8.2 Interpersonal Touch

Participants were divided in their opinions towards the idea of using interpersonal touch interaction in *Prism Squad: GO!* Although participants were generally enthusiastic about touch’s potential to increase awareness and promote interaction between players, concerns over the social appropriateness of touch kept participants guarded.

Interpersonal touch is definitely not for everyone but we believe that, through careful design, the taboo social aspects of

interpersonal touch can be turned into positives. Consider the party game *Twister*, another multiplayer game which makes prominent (albeit incidental) use of interpersonal touch [9]. *Twister* is a very niche game – it is not the type of game which you would want to play with your boss or your grandma. But despite its niche appeal, *Twister* is a very popular party game, largely because its use of interpersonal touch. Playing *Twister* can be embarrassing, but the embarrassment is part of the attraction – by making a spectacle of yourself, you provide amusement for yourself and those around you. Games like *Twister* and video games like *Dance Dance Revolution* and *SingStar* have rose to fame by taking potentially embarrassing activities such as dancing or singing in public, and turning them into enjoyable party games. In some ways, we see *Prism Squad: GO!* as a digital successor to *Twister* – while it is not for everyone, we believe that it could prove to be a very popular party game in casual, coeducational settings. As one group of participants said in their interview:

P5: “I’d find it easy to play [*Prism Squad: GO!*] with strangers because.”

P6: “Icebreaker”

P5: “Yeah, it’s an icebreaker. It’s a way of communicating, it’s a way of working together.”

9. FUTURE WORK

Although interpersonal touch was planned to be a core part of *Prism Squad: GO!*’s gameplay, we – as of yet – have not yet manufactured a reliable method for detecting touch in *Prism Squad: GO!* While the absence of touch-sensing has not crippled enjoyability, it has placed restrictions on what can be learned from the game. Going forward with this research, our primary goal is to correct this by adding the missing touch-sensing functionality to *Prism Squad: GO!* As of this writing, our research group is considering an approach inspired by the workings of the MERL DiamondTouch – a touch-sensitive tabletop computer [5].

Immediately following the addition of touch-sensing to *Prism Squad: GO!* we intend to perform a comparative user study which compares players’ responses to both the touching and non-touching versions of the game. Such a study would have the potential to reveal the specific mechanisms by which interpersonal touch affects players’ thoughts and feelings. Will blending colors through touch make the game easier, or hard to play? Will increased physical contact lead players to feel closer to their teammates? Will touch interaction amplify gender differences amongst players? All of these questions could be explored through a comparative study on *Prism Squad: GO!* – and their answers would have significant implications for the designs of future games based on interpersonal touch.

10. CONCLUSION

In this paper, we have presented *Prism Squad: GO!*, a three-player, cooperative video game inspired by interpersonal touch interaction. *Prism Squad: GO!* is a game focused on teamwork and cooperation; in order to succeed, players must learn to communicate and negotiate with their partners through the mechanic of color-blending.

Through playtests, questionnaires and interviews, we conducted a thirty-person evaluation of *Prism Squad: GO!* In general,

participants reported that *Prism Squad* was a “very enjoyable” game, thanks to its uniquely cooperative gameplay. Participants showed a marked enthusiasm towards playing, and demonstrated their enthusiasm through spirited conversation with their partners while they played.

Although a method of detecting touch between players does not yet exist in *Prism Squad: GO!*, based on players’ reactions towards the suggestion of including interpersonal touch in *Prism Squad: GO!* we believe that – if used among friends – interpersonal touch could further enhance the cooperative aspects of *Prism Squad* which players enjoyed.

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