

# Presence and Engagement in an Interactive Drama

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## ABSTRACT

In this paper we present the results of a qualitative, empirical study exploring the impact of immersive technologies on presence and engagement, using the interactive drama *Façade* as the object of study. In this drama, players are situated in a married couple's apartment, and interact primarily through conversation with the characters and manipulation of objects in the space. We present participants' experiences across three different versions of *Façade* – augmented reality (AR) and two desktop computing based implementations, one where players communicate using speech and the other using typed keyboard input. Through interviews and observations of players, we find that immersive AR can create an increased sense of presence, confirming generally held expectations. However, we demonstrate that increased presence does not necessarily lead to more engagement. Rather, mediation may be necessary for some players to fully engage with certain interactive media experiences.

## Author Keywords

Virtual or augmented reality experiences, interactive drama, presence, engagement, qualitative study, cross-media study

## ACM Classification Keywords

H.5.1 Information interfaces and presentation (e.g., HCI):  
Multimedia Information Systems.

## INTRODUCTION

Games and narrative experiences that mix virtual content into physical environments have emerged in the CHI research community in recent years [2, 3, 6, 8, 14], continuing a general trend of looking beyond standard desktop interaction. Research thrusts towards more immersive

technologies such as Virtual Reality (VR) or Augmented Reality (AR) suggest a link between more embodied interfaces and increased feelings of both presence and engagement in the experience. The VR community has studied the concept of presence for years, seeking to understand how different immersion factors (e.g., rendering latency, animation quality, interaction techniques) affect a person's sense of being in a real space (e.g., [18, 24, 25]). However, aside from largely quantitative studies of task performance [28, 31], there has been relatively little work comparing the impact of different interfaces on user engagement. Without comparing similar, fully developed experiences across different media, it has been difficult to convincingly answer the research question: how does the feeling of presence created by immersive technology impact engagement with a game or narrative experience?

Our research explores the link between immersion, presence, and engagement using three different interfaces to *Façade*, a conversation-centered interactive drama. *Façade* is the first fully produced, real-time, interactive drama, combining autonomous characters, artificial intelligence (AI)-based story management, and natural language processing to place the player in a dramatic world. Through conversation, movement and emotive gestures, the player interacts with the characters Trip and Grace, and quickly finds herself entangled in the dynamics of their troubled marriage. For complete details of *Façade*, see [19].

In this paper, we report on a qualitative study of three different versions of *Façade*: original desktop 3D, desktop 3D using speech instead of typed text, and fully immersive augmented reality (AR) where the player wears a precisely tracked, video-mixed see-through head-worn display in a physical recreation of the *Façade* apartment, allowing them to walk, gesture and speak to the virtual characters Trip and Grace. The most striking result of this study suggests (contrary to our initial expectations) that while the more immersive AR interface increased most players' sense of presence over desktop interaction, heightened presence did not always lead to increased engagement. This is not an indication of a flaw in our AR implementation, or a sign that presence is generally bad. Rather, as we will expand on below, while AR heightened a player's sense of connection

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with their character, the other characters and the space, the immediacy of the interface appears to have interfered with several players' ability to experience the game as a "play space" [23]. These players preferred desktop interaction specifically *because* it is less immersive, making it easier to take on different personas and providing a safe distance from the emotionally charged drama.

Our work extends the body of research on immersive interfaces and qualitative studies of entertainment experiences by contributing the following:

- Presenting an experimental intervention designed to solicit subjective opinions about, and to note behavior within, interactive experiences;
- Using three different interfaces to understand how the type of mediation affects a player's feeling of engagement in an interactive experience;
- Showing that, despite current technical limitations, an AR interface can result in an increased sense of presence for participants (at least for dramatic experiences such as Façade);
- Reporting the counterintuitive finding that too much of a sense of presence can interfere with a player's engagement in an interactive game experience.

Though this study was performed in a laboratory setting, it is a qualitative study aimed at eliciting rich player reactions to a complex experience, not a quantitative, controlled experiment. We set up our *intervention* to allow players to contrast different interfaces to the same interactive drama; these insights were captured during open-ended interviews and observations of player behavior. We are aware that play "in the wild" may be different from that occurring in a lab setting, and we address this in the findings below.

## BACKGROUND

In this paper we empirically investigate the relationship between immersion, presence and engagement, using three different human-computer interfaces to the interactive drama Façade. Here we define these terms, as they are understood in the literature.

*Immersion* refers to features or qualities of the media technology that create sensory impact for the user. Media that surrounds a user (for example, consuming more of a user's visual field) is said to be more immersive. Many researchers have focused on isolating and quantifying the effects of particular variables of the interface, the so-called "immersion factors" (e.g., frame rate and passive haptics, [20]; aural effects, [15]; system responsiveness [26]; interface allowances for body movement [25], and many others). In this paper we also use *mediation* as an antonym of immersion; participants in our study experienced more immersion in the AR version and more mediation in the desktop versions of Façade.

*Presence* refers to a psychological state, specifically the subjective feeling of being transparently connected to a

media experience. Lombard and Ditton define the concept of presence as "the perceptual illusion of non-mediation" [18]. The concept of presence is central to an extensive body of theoretical, psychological and technical work (e.g., [4, 18, 24, 25]). Presence relates to the CHI tradition of talking about the "invisible" computer [22] or "seamless" interfaces [32], in that it speaks to the issue of striving for transparent technology. In response to this often-implicit goal of greater transparency, media theorists Bolter and Gromala have argued that true transparency is a myth, and that interactive art provides a counter tradition of compelling non-transparent forms of mediation [5].

Biocca draws out the distinction between *physical* presence (the sense of "being there"), *social* presence (the sense of "being with another body"), and *self* presence (the sense of "feeling one's own body") [4]. Social presence taps into a thread of research focused on identifying and creating humanistic attributions and emotions for artificial agents (e.g., [7, 10, 16]). Façade also employs autonomous characters to evoke social presence. Moreover, Biocca's distinction between "being there" and having a sense "of one's own body" also highlights one primary difference between VR and AR: in AR, the user already interacts in a real, physical place, removing the need for an interface for controlling a virtual body. A follow on study by Tang et al. comparing VR and AR showed that the mismatch between actual body and virtual body in VR can lead to a decrease in presence, and that AR allows for more natural body movements [29]. Also of importance to our work is the concept of *dramatic* presence, originally presented in Kelso et al.'s study of staged actors [12], referring to a user's sense of "being in a dramatic situation" due to the culmination of sequential events. Façade's narrative and story arc contribute to a sense of dramatic presence.

*Engagement* refers to a person's involvement or interest in the content or activity of an experience, regardless of the medium. The sense of presence is not required to feel engrossed in content; one can be *engaged* in a novel, in the sense of relating to a character or being intrigued about the plot. In the context of games, Turkle refers to the "holding power" of video games [30], while Huizinga defines the traditional notion of the "magic circle" as the boundary of the game in time and space; the game world is complete and separate from everyday life, and requires players to adopt a luxury attitude when stepping away from everyday life into a game space [11, 23]. Both concepts relate to our use of the term engagement with respect to games.

In the VR/AR presence community, it is common to assume that greater presence leads to greater engagement. Lombard and Ditton claim, "Presence implies a direct and natural experience rather than just the processing of symbolic data and is therefore likely to be more compelling" [18]. Baker et al. also support this link between immersion leading to presence and presence to engagement: "Immersion can contribute to a sense of presence, embodiment, and engagement with the virtual world that is rarely experienced

at the desktop” [1]. Our work takes an empirical look at the link between presence and engagement, and argues that presence does not necessarily lead to more engagement. Providing some mediation within a digital experience may be necessary for some players to achieve a sense of play.

Other researcher’s who have performed cross-media evaluations have generally focused on quantitative measures in task performance [28, 31]. The work by Fails et al. compares a desktop and tangible version of a non-task-based learning game for children [9]. Their evaluation focuses on issues of learning and usability, and does not address issues of engagement or presence.

We are interested in exploring the player’s experience in interactive dramas as well as understanding the effect of mediation. We chose to conduct in-depth qualitative interviews rather than rely on presence surveys [17, 33] and/or physiological tests [20] previously developed by the VR community. Most prior presence measures have been designed for VR; the focus on a participant’s sense of “being in a real place” is inappropriate for AR. Further, performing open-ended interviews uncovered the rationale and richness behind our participants’ subjective views.

#### FAÇADE PRIMER

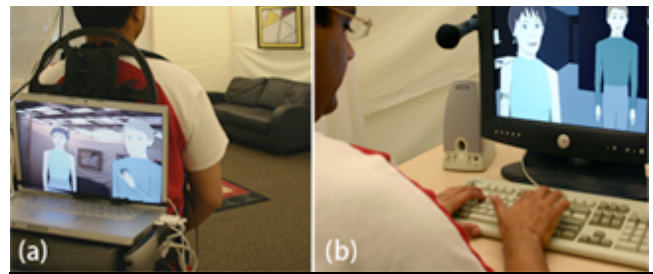
The interactive drama Façade is a hybrid entertainment form, somewhere between a game and storytelling. In this section we describe Façade’s story and the variations created for our cross-media study (desktop Façade is available for download at [www.interactivestory.net](http://www.interactivestory.net)).

#### Façade’s Story

As a friend invited over for drinks at a make-or-break moment in the collapsing marriage of the protagonists Grace and Trip, the player unwittingly becomes an antagonist of sorts, forced by Grace and Trip into playing psychological “head games” with them. The player, choosing her own name and gender, may react to the experience with hilarity or anger, or play a number of roles from councilor to devil’s advocate. Unlike most games, the players are not given a clear goal; the player invents goals for herself as the interaction with the characters unfolds.

In the intro sequence, the player hears a voice mail recording from Trip, inviting the player over for a visit. The game begins with the player in the hallway outside the apartment, where the couple can be overheard arguing. Upon entering the apartment, the player realizes that something is wrong. The façade of their luxury apartment and fancy drinks barely conceals the awkwardness between Trip and Grace. Soon the player finds herself in the midst of a full-blown marital breakdown where her actions and statements affect the outcome of the evening.

Three interacting AI systems guide the experience. The natural language processing system interprets natural language input and physical actions from the player, maintains conversational contexts, and selects



**Figure 1: (a) AR condition, showing the player in the room along with Trip and Grace overlaid on a view of the room. (what the player sees on the head-worn display is visible on the laptop) (b) desktop Façade, used for KB and SB conditions (the microphone for SB is beside the monitor).**

conversational responses from thousands of prerecorded character lines of dialog. The autonomous character architecture manages the moment-by-moment goals of the characters, coordinates the joint performance of dramatic action, and drives the procedural character animation. The drama manager moves the story forward, through a growing crisis, climax and resolution, the three stages of a classic Aristotelean story arc. Designed to have replay value, each episode differs as the experience adapts to the moment-to-moment interaction of the player.

#### Variations of Façade

We initiated this project because we hypothesized that an AR version would allow us to investigate the impact of immersion (and hopefully presence) on a rich narrative experience. Moreover, since Façade is based primarily on social rather than physical interaction, it placed less emphasis on having perfect object tracking and complex gesture recognition than other potential AR experiences.

We designed our study to gather qualitative data about player experience, exposing participants to three different variations of Façade to facilitate a subjective contrast. We created the speech-based version of desktop Façade to tease out any confounds between speech interaction and embodiment (e.g. walking/gesturing). In the traditional version of Façade (*keyboard-based* desktop interaction, or KB), the player sits at a desktop machine, using the keyboard to type statements and navigate the space and the mouse to perform gestures, such as hugging the characters or picking up objects around the apartment (see Figure 1(b)). In *speech-based* desktop interaction (SB) the player uses the same interface to navigate and gesture, but rather than type, she uses speech to communicate. In *augmented reality* interaction (AR) the player also uses speech to communicate, but navigation occurs in an actual physical apartment built to match the virtual desktop apartment. In AR, the entire world is physical except for Trip and Grace, who are aligned with the physical space and superimposed on the world using a video-see-through head-mounted display (HMD) worn by the player (see Figure 1(a)).

In our interfaces for SB and AR, we utilize a “Wizard of Oz” to facilitate speech recognition. The wizard operator types in the player statements on a remote machine;

emulating speech recognition, the words then appear one by one at the bottom of the player's screen. This provides the player visual feedback that their statements are being recognized. In this study, we found that most players willingly suspended disbelief, never assuming a human operator was behind the curtain. (We explicitly did not tell the participants how the speech was being recognized, nor could they see the Wizard station.) Similarly, in the AR version, the same wizard operator has a set of buttons to trigger a limited set of gestures to match the desktop versions. For complete details and discussion of the AR Façade implementation, see [8].

We conducted a number of prior investigations of desktop Façade, including a short lab study [13], an examination of blogs dedicated to Façade<sup>1</sup>, and a (currently unpublished) online survey. The early lab study verified the effectiveness of retrospective analysis for gathering subjective player data following each game episode. The anecdotes gathered from blog entries and the online survey of 129 players provided insight into a range of interpretations and styles of play. Data from these studies informed our participant recruitment and the development of this study.

### STUDYING FAÇADE

Our intervention was designed to solicit subjective viewpoints about Façade's game play and to specifically allow participants to contrast three different variations of the interface. We acknowledge that we potentially sacrifice some of the more natural styles of play that only happen when players are at home alone or "fooling around" with their friends. However, to gain traction on the question of the impact of mediation on the play experience, we had to create special interfaces and instrumented versions of Façade; the AR version in particular required a specific physical set, expensive tracking equipment, and a head-mounted display. Fortunately, despite the lab setting, we did observe indications of natural play, as discussed below.

We recruited twelve participants through Craigslist.org and other local game forums in the Atlanta area. We succeeded in enrolling a range of genders (balanced 50/50), races, education levels, and ages (from 18 to 33 with an average age of 25.8). We also selected players with a large range of professions and prior experiences with computers, games and movies. In the end, none of the demographics appeared to factor into player opinion. Even if we suspected such an effect, it would require a much larger sample size to reach any significant conclusions.

Our study took place in a large, dedicated room with infrastructure for the three interface variations of Façade. One desktop machine ran the KB and SB version, while the

AR version ran on a laptop computer in a backpack carried by the participants. The study lasted about three hours and participants were paid \$10 per hour.

After signing a consent form, players listened to a brief explanation of Façade. Before each round of play they were instructed on the specific interface, including a short demonstration of possible gestures in AR (e.g. holding arms out in a hug motion). Each participant played Façade three times, once for each variation (making six possible orders, balanced out to account for learning effects). In addition to allowing participants to contrast the interfaces, having the participant play three times enabled us to understand how the player's strategy would change or adapt over time.

In open-ended interviews between each episode, we usually started with general questions like "so tell me about that experience," and then asked for additional details as the interview proceeded. Throughout each episode a researcher logged notable events, such as unusual player reactions, apparent conversation breakdowns, and visual anomalies. We dedicated part of each interview to reviewing these moments on a video monitor so that participants could reflect on their experience. A short questionnaire, provided after playing all three variations, asked participants to compare the interfaces and helped guide a final interview.

We also collected quantitative data (player and character dialogue, body/head position and rotation, and AI processing logs), but because we do not have room here to present the full investigation, our primary analysis centers on the qualitative open-ended interviews. During the game episodes and interviews, we recorded video of what appeared on screen (or on the HMD in AR) along with video from multiple third-person perspectives to capture player emotions and physical actions. To analyze the large quantity of video interview and game episode data (over 36 hours), we transcribed the interviews and coded a long list of potentially relevant phenomena that we then categorized into major concepts using grounded theory principles [27]. The high-level concepts provided initial structure for a more detailed classification of the data.

### OBSERVATIONS OF AR FAÇADE

The AR experience was a novel one for all of our players. Therefore, to situate our findings and to help the reader understand how players perceived and approached AR, we first present some observations about the AR experience.

In our interviews, many players related the AR experience to a real-life situation, leading them to have higher expectations for the experience and for their involvement with the characters. While the AR version exhibited more technical bugs (due to the experimental nature of the hardware and software), several players interpreted these bugs as a part of the game and most players claimed a minor effect, if any, on the play experience.

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<sup>1</sup> Due to the popularity of Façade (over 300,000 downloads within the first year, winner of the grand prize award at the 2006 Slamdance Indie Game Festival, outstanding media attention, etc.) there are ample first-hand reports of player impressions of Façade play in more naturalistic settings.

### **Novelty and Unfamiliarity in AR**

The feeling of immersion in a mixed physical/virtual game space is not an everyday experience. Some commented on the novelty, saying, “It’s pretty cool...” (P6, after AR) or “It has the most potential” (P9, after all versions), while others saw it as uncanny saying, “It was kinda weird cause you are actually in a room with them” (P10, after AR).

In contrast, the standard desktop interaction felt familiar to many players. Player 3 said that “the desktop feels more comfortable to me... maybe if I had more time in AR I would feel more comfortable with that...” (P3, after all), while player 4 said, “it’s a certain amount of self-consciousness just sitting in a room talking to yourself...” (P4, after AR and KB).

For some players desktop interaction offered an advantage because the cursor could be used to scan the apartment: “I could easily find out what I could do by mousing over and clicking things...” (P7, after AR and SB). Where AR interaction provides the affordances of a physical space (as player 2 said after all three, “gravity is gravity”), desktop interaction offers effective and familiar affordances within the game-like context of Façade.

### **Immersion Raises Expectations**

When players were put in the AR version, the novelty and physicality of the experience elicited a set of expectations that seemed to build less on their prior experience with video games and other media, and more on their everyday experiences in real-life, as described by player 4:

*When you are standing in the real world with a headset on and you are interacting with them... it didn't feel like a video game as much as it felt like real life (P4, after AR and KB).*

The added body awareness made some players feel as if Trip and Grace should also have bodies (e.g., “like hugging... if there is no body there it doesn’t feel right... like I should have felt them when I reached out my hand”, P4, after all), and that player actions outside of pre-defined gestures should somehow impact the story.

Players also expected the characters to be emotionally deeper and more conversational, saying “they had more weight as characters” (P4, after AR) and “you feel like they should be even more humanistic... you feel like you are one of those characters and you should be able to interact even deeper” (P9, after AR).

### **Technological Anomalies Integrated into Story**

When players encountered a technology flaw in the AR version for the first time, we saw many players interpreting the bug as part of the drama, “at one point I thought Trip was standing on a table.... I was thinking he was fixing a picture... then I messed with the glasses and he came back down” (P2, after AR). When player 10 saw Trip stuck in a momentary path-planning loop he thought that it related to the social situation “at first I thought maybe he wasn’t sure if he wanted a drink or not” (P10, after AR). Often

technology anomalies were interpreted within the context of the story and then later reconciled as an actual bug.

For the most part, technology bugs in the AR version, such as imperfect graphics registration, tracker errors, and path planning glitches, were ascribed to the research nature of the experience. When we reviewed those moments in the interviews, players seemed to accept the unrefined technology, saying “It didn’t really affect me at all, negatively... I didn’t think about it. I was really paying more attention to the storyline” (P3, after AR) or “it didn’t really take away from it” (P7, after AR). These momentary “breaks” in presence appear to have had little long-term effect on the experience.

Moreover, the head-mounted display and backpack worn by players for an average of 18 minutes never became a point of conversation except when asked specifically, “HMD didn’t really bother me...” (P8, after AR). Most participants made the necessary adjustments to the AR experience “...it took a few minutes to get used to. Once I oriented myself, it was much more fun and engaging.” (P12, after AR).

Although 8 out of 12 players reported in the post-experience questionnaire that the AR version was a more challenging interface to learn and use, this did not correlate with players talking about problems with the AR technology or with their preferred interface. It appears that players preferred or disliked the AR version despite the limits of the technology, rather than because of them. In particular, the technological anomalies were peripheral to larger issues of interface familiarity and emotional distance from the drama, which we discuss below.

## **FINDINGS**

To understand the interaction between presence and engagement, we have grouped our findings into four categories. First, to understand how players approach Façade and to illustrate the breadth of our participant group, we provide evidence that our players can be grouped into different play styles (story-players, deserters, meta-players). Next, we discuss how immersion in AR amplified several types of presence (physical, social, and dramatic), and how the increased presence in AR Façade may actually detract from the play experience by intruding on players’ need for distance from the drama. Finally, we discuss why more players thought the typing interface was easier than speech.

### **Different Play Styles**

Participants expressed a range of feelings, interpretations, and adaptation strategies, but in general, whether they liked or disliked the content, they found the experience to be compelling. Most players were intrigued by the characters’ personalities (although not necessarily fond of them). Players talked at length about their feelings towards the characters, calling them “amusing and tragic” (P3), “manipulative” (P7), “dysfunctional... high-strung” (P8). Most participants felt the characters seemed real in terms of their personalities (e.g. “they were not just one dimensional

	“Story-players”						“Deserters”		“Meta-players”			
Player	1	3	5	9	10	12	8	11	2	4	6	7
Gender	M	F	M	M	M	F	F	F	F	M	M	F
Age	29	23	24	30	18	33	23	27	24	25	29	24
Occupation	Physicist	Musician	Waiter/ Actor	Teacher	Student	Homemaker	Physical Therapist	Psych Student	Writer	Teacher	IT Consultant	Scientist
Order played	AR/SB/KB	KB/AR/SB	SB/AR/KB	KB/AR/SB	AR/KB/SB	KB/SB/AR	SB/KB/AR	SB/AR/KB	SB/KB/AR	AR/KB/SB	KB/SB/AR	AR/SB/KB
Ave. episode time	18.6	24.1	21.9	20.2	23.2	20.6	10.6	14.5	19.9	19.5	21.3	13.5
Most realistic	AR	AR	SB	AR	SB	AR	AR	AR	AR	SB	AR	SB
Most challenging	KB	AR	AR	AR	KB	AR	SB	AR	AR	AR	KB	AR
Easiest interface	AR	KB	KB	SB	SB	KB	KB	KB	KB	KB	AR	KB
Preferred interface	AR	KB	SB	AR	KB	AR	AR	KB	KB	KB	AR	AR

Table 1. Demographics, condition order played, average playing time across the three conditions, and answers to four key survey questions for the twelve players.

people...they seemed like they were real people with real problems”, P6), regardless of the particular interface.

While most players found the characters interesting, only half of the players became absorbed in the drama of Trip and Grace’s disillusioned marriage (for example falling into a counselor role), while others looked for ways to disrupt or avoid the situation, occasionally getting kicked out of the apartment. As a group, the twelve participants encountered most of the major story events. Although Façade does not have a winning condition, the ending most difficult to achieve, where Trip and Grace partially reconcile and thank the player for helping them, occurred in 6 of the 36 total experiences. They played an average of 19.0 minutes per episode with no substantial difference between interface versions (AR=18.1, SB=18.3, KB=20.6 minutes). Although there were some interface usability and technical issues, especially in the AR condition (discussed above), none were serious enough to prevent participation in the drama.

To compliment our grounded categorization of statements, we created an assessment to epitomize each player’s play style. From *how* they played, we identified three different player groups: players who were highly engaged in the drama (“story-players,” players 1, 3, 5, 9, 10 and 12), players who took the situation seriously, but hated being in the middle of an argument (“deserters,” players 8 and 11), and players who seemed at times ambivalent and disconnected from the ensuing plot, rather tending to explore the limits of the experience and the technology (“meta-players,” players 2, 4, 6 and 7). These player groupings are summarized in Table 1.

Inspecting the quantitative data revealed substantial differences in playing time between the groups; the interview data provides insight into why. “Story-players” were interested in getting to the bottom of the argument, and thus stayed involved longer, averaging 21.5 minutes per episode (SD 2.9). The “meta-players” stuck around for an average of 18.6 minutes (SD 4.5), but as they continued to play they seemed to get tired of the game, dropping from 21.5 to 19.0 to 15.2 average minutes per episode over three. In contrast, “story-players” maintained the same playtime across the three episodes (21.9, 20.9, 22.0 minutes) suggesting a sustained interest and a deeper engagement in the plot. The “deserters” were the only players to exit early,

doing it 4 times out of their combined 6 game episodes and averaging 12.5 minutes per play (SD 3.6).

Most importantly, while our grouping of players shows differences in style and playing time, these groups do not exhibit any correlation to players’ opinions about, or preferences toward, the interaction methods (AR vs. SB vs. KB). For example, some highly engaged “story-players” preferred AR, while others preferred desktop interaction.

### A Heightened Sense of Presence in AR

In general, we found that the AR version led players to feel more present with the characters, space, and story. For example, some players moved to avoid the characters or felt as if they should be able to touch the characters. Many players brought their enhanced sense of physicality into the dramatic moment, either through simple unconscious gestures or through improvisational acts. Some players talked about the sense-experience in general:

*When you are sitting at the desktop you are conscious of that, but when you are walking around over there (in AR) your senses are taken over... and because you are immersed in the environment, there is really nothing to distract you on the outside. That’s what makes it real” (P3, after all).*

Others commented on specific aspects of the AR experience, calling the movement “much more continuous” (P1, after AR and SB) and enjoying the possibility of “touching things...” (P12, after AR). The following sections explore how AR immersion contributed to different kinds of presence.

### Physical and Self Presence

The effect of being immersed, of being in a physical space, allowed people to feel more a “part of the action” or *in* the game. As player 6 related, “You feel part of things because you’re walking around the room instead of just looking at the screen...It felt like you were in the action instead of just observing” (P6, after all). Several players talked about the experience of feeling “in it” (P12, after all) or in a “realistic” environment (P4, after AR). Player 12 felt “less like an eye in the sky” (P12, after all) contrasting her experience in AR with a more disconnected view on the desktop. Player 9 described desktop interaction similarly, saying “even though you are looking at it in first person, you are still thinking about it in third person” (P9, after all).

Reflecting back on differences between physical presence in VR versus AR, participants were not talking about being “there”; they were already in a real place. They would talk about feeling “conscious of my body” (P7 after AR and SB) or believing the experience more “because you are actually doing the actions and actually speaking...” (P9, after AR), supporting Biocca’s findings of self presence in AR [4].

### *Social Presence*

In comparison to desktop Façade, players were more conscious of the social aspects of the situation, and some of the players went so far as to physically react to the characters as they would in a real social situation. The effect of a having “life-size” characters (P11, after AR) led some players to feel “more connected to them” (P12, after AR). Player 2 at one point felt as if she was “in the room with them” as Grace was sharing her feelings.

After playing the AR version, several players would bring up specific conversation cues or other social conventions. Player 10 postulated, “if they wanted me to say something they would look at me...” (P10, after AR), similar to player 2’s observation of the ebbs and flows of conversation, “when I tried to talk when they are talking it just disrupts the flow... it’s a little bit easier to wait for a break” (P2, after AR). Other players pointed out other social conventions and whether they met or violated expectations, such as interpersonal distance (“they didn’t get as close (in AR)... on the (desktop) computer I would have to back away” (P8, after AR)), greetings and farewells (“normally people say some sort of salutation” (P2, after AR)), and drink pouring protocol (“he was holding two drinks, but I wasn’t just going to reach over the bar and take it because it might seem rude (laughing)” (P2, after AR)). The fact that several players note interpersonal distance, despite the fact that we did nothing to alter the motion-planning algorithms between versions, points to the future possibility of contrasting specific, measurable social cues between interface versions. (If anything, the smaller field of view of the head-worn display should have required more head motion, and made the characters feel closer, not farther.)

Players would often use their arms and hands in unconscious non-verbal communication, for example holding their arms out, palms down and telling Trip and Grace to “just relax” (P10, during AR) or stepping back from the characters and holding her hands up in front of her body, as if trying to shield herself from the awkwardness of the situation (P7, during AR).

Although each run of Façade has many commonly occurring story moments, a crucial moment occurs when Trip and Grace first break into an all out fight and one of them storms out into the kitchen. If the player was in the

way, we often witnessed the player quickly step out of the character’s path in the AR version (but not in the desktop version). When players reflected on that moment, they talked about the crazed emotional state of the characters, saying, “I was like whoaaa, she’s pissed! (laughing)...so I was just trying to get out of her way” (P12, after AR) and “...I thought I made them a little bit angry (smirking) and that Grace might make a run at me” (P10, after AR).

Interestingly, only a couple of participants mentioned the fact that the characters are cartoon renderings against a real backdrop, saying, “they seemed more animated than human” (P1, after AR). The cartoon appearance of Trip and Grace appeared to be a good fit, keeping us out of the “uncanny valley”, the idea introduced by Mori to explain why human emotional reactions towards robots decrease as robots are made more humanlike (but not exact) in appearance and motion [21]. In other words, Trip and Grace’s non-photorealistic appearance may have strengthened social presence, rather than decreasing it (just as one would predict from Mori [21]).

### *Dramatic Presence*

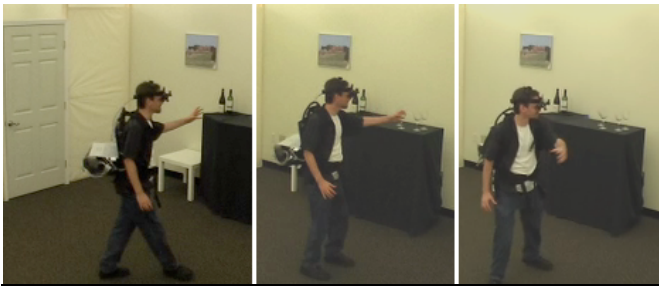
Although there were indicators of dramatic presence regardless of the interface in comments such as “you weren’t kidding about drama...” (P9, after KB), the immersion and physicality of AR heightened the feeling of being connected to a dramatic scene. For some players, the feeling of connectedness in AR heightened as the tension rose between Trip and Grace, leaving one player feeling “cornered” (P4, after AR) and another feeling “trapped between them” (P5, after AR).

Observing the AR game play, we witnessed many examples where the players’ intentionally used their bodies in dramatic ways. While some of these physical actions can be viewed as physical manifestations of social presence, as illustrated above, others were the result of a greater sense of being “in” the drama. For example, one player wanted to keep Trip from leaving at the end, and actually moved between Trip and the door and held her hand out defiantly:

*I was kind of using desperate measures... I didn’t know what actions would have an effect so I thought I would try anything... I wanted to keep him there because I thought they could still talk about things. (P3, after AR)*

An even more blatant example occurred when player 4 got frustrated with Trip and Grace during a fight sequence. The player said “Can I just drag you?” and tried to put his hand on Trip to pull him to the center of the room, and then he walked behind Grace and attempted to push her (see Figure 2). Later the player recalled that he thought “pushing them together would allow them to talk to each other instead of over the shoulder to each other.” (P4, after AR)





**Figure 2: Player 4 attempting to force the Trip character into resolving his issues with Grace. (Images used with permission.)**

Player 4 described the increased dramatic presence directly, drawing on his background in theatre and acting, saying that in AR “you would commit to the scene and to your character” (P4, after AR). Whether emotional reactions or improvisations, these physical acts do more than illustrate the natural affordances of AR; they illustrate the physical involvement in the dramatic moment, leading players to perform actions (such as trying to push and pull the virtual characters) that would not have happened unless they were immersed in the physical context, “on stage” so to speak.

### The Impact of Presence on the Play Experience

For some players, immersion and the sense of presence were exciting and novel, but for others the experience seemed to cross a comfort boundary, where they no longer felt as if they were able to play freely. Our qualitative data indicates that, contrary to the assumptions in the presence literature, an increased feeling of presence in Façade does not necessarily equate to a more engaging play experience.

Some players expressed a difference between “portraying” a character and having to “be” a character:

*You feel like the person in the game vs. portraying someone in the game (in desktop). You are supposed to be the person, but I think you believe it more when you are in the physical space, because you are actually doing the actions and actually speaking. (P9, after AR)*

Player 9’s preferred method of interaction was AR, consistent with his comments suggesting he wanted to be fully immersed in the drama. In contrast, some of these players explicitly wanted to *portray* a character on the screen, rather than literally *be in* the situation. For these players, this led to a preference for the mediated desktop interface and a desire to have more distance from the drama and more freedom to be someone else.

*Here (in desktop) you feel like you are playing a role in an environment and (in AR) you feel like you are the role. You can say some stuff (in desktop) that you might not say (in AR)... like you are somebody else. (P10, after AR)*

Player 4 also preferred the desktop interaction because:

*You get used to playing a character in their world on their level...It’s almost because it’s not as realistic. You can relax more. Goof around more...” (P4, after AR and KB)*

supporting his “meta-player” style of experimenting with the system. Where players 4 and 10 preferred desktop interaction because it allows them to escape into a persona or into a fantasy world, player 9 preferred AR precisely because it did make it more real, more dramatic.

### Comparing Speech and Typing

We included the speech-based desktop interaction to help us tease out the effect of speech alone (SB) vs. speech plus embodiment (AR). Despite the limitations of typing such as poor typing ability, spelling errors and the buffer limitation (criticized by some players because “you couldn’t type long... and it kept beeping at me, so I had to keep rewording my statements into something simpler” (P9, after KB)), the keyboard version of interaction was seen as the easiest to learn and use (8 out of 12 in the final questionnaire). This result contradicts with a “natural interfaces” argument that would predict that speech is preferred. Players gave a number of reasons for preferring the keyboard to speech.

For one, typing statements out provided an opportunity to reflect and visually process statements before they were entered, as expressed by player 2: “I am typing my words and I can see them, so it seems more concrete for some reason” (P2, after all). For player 9, the commitment inherent in speech interaction (i.e., the lack of ability to engage in meta-speech about the experience while playing) actually affected his game play, “when I first walked in I couldn’t find Grace and when I finally saw her, I just blurted out... ‘oh, there you are!’ (laughs), but I didn’t want to *say* that...I guess I wasn’t going to get any dialog to myself (laughs)...” (P9, after AR). Other players referred to the inherent delay between speaking and the words appearing on screen, “It was like my words had not caught up yet...like the computer had not yet generated what I said” (P12, after KB and SB). This lack of immediacy cannot be solved by simply using speech interaction instead of a wizard – similar delays would still exist and would be even more distracting with recognition errors.

Some players found it hard to listen while speaking, “I was concentrating on listening to them while speaking, while typing I could still listen while I was typing” (P8, after all). On the other hand, the speech interaction freed up players’ ability to move about and interact, summarized best by player 11, “When I type I can ensure accuracy, but I cannot walk and talk at the same time” (P11, after SB).

Referring to Table 1, seven of the players preferred speech (either SB or AR) and five preferred keyboard interaction. For some, this preference had more to do with the need for distance from the experience, or a desire to be immersed in AR (as discussed above). For others, their preference related to what form of input they felt was “natural.” Some felt that speech was natural, as when player 6 states, “(typing) isn’t my natural form of communication... speech is, so there is nothing to constrain your conversation” (P6, after all). Player 9 said he felt “more freedom with what I said” (P9, after all). For players that preferred typing, some



were uncomfortable speaking to the computer: “I usually don’t play games and talk to my computer... it’s awkward... I’m comfortable with typing.” (P8, after SB and KB). Other players felt that when typing “I had more control” (P7, after all) and “(the characters) respond much better” (P1, after all). For others, typing allowed them to converse more freely because they felt they could type things with less penalty, as player 8 relates, “They don’t react to everything. So it’s worth a try... I could type something completely ridiculous just to see how they react...” (P8, after KB)

Whether players preferred typing or speech, their rationale points to their perception of what is more natural for interaction with the story. Some players were partial to the “freedom” (P9, after all) of speech, while other players favored the dependability and carefree interaction afforded by typing. These preferences, however, did not correlate with their style of play (from Table 1) or engagement in the story. Like the increased presence created in the AR interface, the more “natural” speech interface (whether desktop or AR) can interfere with player engagement.

## DISCUSSION

Our study’s most interesting finding is that an increased sense of presence in the immersive AR experience did not result in an increased sense of engagement or better game play for all players. While most players felt a heightened sense of presence in AR, only half (6 of 12) actually ended up preferring that form of interaction. Critically, some of the players preferred the desktop system, not because of limitations of the AR system, but rather because they deliberately wanted a sense of distance from the game in order to engage more comfortably with it.

Engagement with the story did not correlate with preferred interface; the “story-players” (those who were most engaged with the drama) were split on whether they preferred AR or desktop interaction. Player 3 provides an interesting case, because she was one of the most engaged players, saying things such as, “I feel really bad...oh man... I felt like I could have helped a little more” (P3, after KB) and later, after all three versions, sharing, “I liked the story... I was emotionally caught up in it, just like I would be if I was experiencing it in real life” (P3, after all). She spoke at length about feeling presence in the AR version; she physically acted out during dramatic moments; and said she wasn’t bothered by technology anomalies. Yet, she preferred keyboard-based desktop interaction. She felt confined in the AR interaction because AR seemed too realistic, intensifying the severity of the dramatic moments. However, even for the players who were not engaged with the story (our so-called “meta-players”), some of them (players 2 and 4 in particular) had greater difficulty feeling free to engage in meta-play in the AR version.

Increased presence seemed to make some players feel *too* close to the action, increasing the magnitude or gravity of the situation, making their actions carry higher consequences. In the context of the notion of a “magic

circle” that defines the boundaries of the game experience, these players seemed to be having difficulty creating a safe “circle” to escape to and “goof off” in [11, 23]. AR Façade puts people into a very realistic space and a real-to-life social scenario that may not provide the distance players need to really engage with it as a game. Players who might prefer to pretend to be someone else to endure the social setting of Façade had difficulty doing so. Assuming another persona in desktop Façade requires typing what they say; immersion in AR Façade implies the need to adopt the behavior of the persona as well, which is a very different kind of play experience (i.e., talking vs acting).

The socially uncomfortable situation created in the story content of Façade likely contributes to why some players found it difficult to engage at a comfortable distance. The disappearance of mediation may be less of an issue in other kinds of games, such as action-based perceptual games. More interestingly, the increased sense of consequence experienced in AR may offer a significant advantage when the application provides a scenario where engaging in meta-play (or “goofing around”) detracts from the intended experience, such as training situations.

The novelty of AR as a medium may also be factoring into these results. While players in desktop Façade are likely to approach the interactive drama as something between video games and film, our players seem to relate AR Façade more to everyday life. Comparing AR to reality raises expectations for player agency; if these expectations are not met, the player may feel disengaged. Current references to AR in popular media tend to imagine a seamless, undetectable integration of virtual content in the physical world, reinforcing this connection between AR and reality. In future work we’d like to explore how to design AR experiences that explicitly manage expectations.

Participants’ mention of specific social cues suggests a possibility for coding the game play video and making further calculations from the logs to quantify aspects of player interaction. For example, how often do players face the characters when speaking or spoken to? Or, how does the interpersonal distance between characters and players vary depending on the type of interface? Further work must go into defining and measuring the important concept of engagement, independent from presence.

## CONCLUSIONS

This study suggests that more “natural” or “transparent” interfaces, where the medium fades to the background, will not necessarily lead to a compelling game or entertainment experience. This finding supports recent discussions of “seamful” design and “coping with uncertainty” within the MR/HCI community [2, 3]. We studied two different dimensions of “naturalism” with respect to Façade—embodied naturalism (allowing a player to use their whole body, walk around, and place the characters in their full field of view) and language naturalism (speech vs. typing). The result in both dimensions suggests that “naturalism” is

not a clear first choice for many players, and that this result is not simply an artifact of our implementation.

Our findings emphasize that for some players, engaging play may require less “presence” in the play space. A deeper understanding of the relationship between presence, mediation and engagement will be needed as embodied experiences (like the AR version of Façade) become more popular. This study raises very interesting questions regarding the design of any augmented or mixed reality experience and challenges us to rethink the notion of presence as the ultimate goal of interactive entertainment.

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