I can handle it: a case study of hardware interfaces and gameplay

Suely Dadalti Fragoso* Mariana Amaro†

Universidade Federal do Rio Grande do Sul, Programa de Pós-Graduação em Comunicação e Informação, Brasil

ABSTRACT

This paper presents the results of a qualitative study of players' awareness of the mediation of gameplay by a hardware input device (gamepad). As a point of departure we adopt a definition of gameplay which places interfaces at the centre of the experience, but does not compromise the perception of other mediators and their interference in the process. We argue that indirect-mapping interfaces have their own advantages and can be the source of greater enjoyment in gameplay. Presentation of results is organized in 7 categories: software interface, movement in the gameworld, interaction with the gameworld, camera movement, materiality of the gamepad, corporeality of players and spatial awareness and perception. Results indicate that players remain aware of the hardware interfaces and of their own corporeality throughout gameplay. Rather than dematerialization and immersion, players experienced embodied presence and expansion of the gameworld towards the physical space.

Keywords: gameplay, gamepad, material interfaces, qualitative study, player experience.

1 INTRODUCTION

The experience of playing games is mediated by various factors and devices. There are material mediators (cards, dice, boards), semiotic *mediators* (images, words, syntaxes), intrinsic mediators (rules, beliefs, aesthetics) contextual mediators (political, economic, sociocultural), etc. Digital technology, itself a mediation, adds features of its own to games. The most distinguishing of these is the fact that digital gameplay takes place across different ontological realms: the physical realm, where the player is, and the virtual realm of the game. Hence the need for artefacts capable of translating between those instances of reality: hardware and software interfaces.

The role of interfaces is not merely to transport information from one device to the other, or meaning from the game to the player. As philosophers, physicists and even sociologists [29] have warned us, displacement always implies transformation. Located at the core of the webs of mediation of digital gameplay, hardware and software interfaces make playing the game possible, informing and conforming the experience of the player.

In this text, we present the results of a study of the mediation of gameplay by gamepad as a hardware input device. More specifically, our inquiry intended to identify the degree to which players are aware of this mediation and how they understand and relate to it. Qualitative approaches are adequate for capturing fine-grained aspects of players' experience [3][18][33][43] and case studies are specially suited for dynamic and ephemeral phenomena such as gameplay. The game chosen for our experiments was *Brothers: a tale of two sons* [49].

The paper starts with a brief review of the literature which informed the concepts of digital gameplay and game interfaces adopted in our study. This is followed by an explanation of our methodological choices, a description of the experiments and the presentation and discussion of the results

2 BACKGROUD

The word gameplay is widely and imprecisely used. In colloquial conversation, specialist media, and even in academia, its meaning varies from the designation of the mechanics of a game (the gameplay of *Brothers*) to a description of the experience of playing a game (gameplay was fun) or a recorded or streamed gaming session (broadcasted gameplay). Problems arising from these variations have been identified as early as 1998 [2]. Some scientific literature has identified gameplay with players, on the basis that playing starts with their actions and is focused on their experience [26][32][46][47]. Alternatively, other authors have argued for more attention to the game, as there is no gameplay without it [38]. HCI research on games oscillates between privileging the role of the player [12, 44, 48] and of the interfaces [35][45][50]. It is not unusual to find studies which only take into consideration one aspect of the game, for example its rules [34][52] or its representation on output devices, such as the images on the visual display [10][22][50].

A different perspective was adopted by [20], who defined gameplay in terms of multiple cycles of material and symbolic interactions through three "levels of spatiality": the gameworld space, the utterance space and the player space. The first and the second can be seen as a dismemberment of the virtual realm to which we have previously referred, with the gameworld being fictional, imaginary, and the utterance being its representation in words, sounds and images. The player space is, as the name indicates, the physical world in which the player exists. Traversing these different levels of reality is made possible by the translation performed by hardware and software interfaces. This sociotechnical approach combines two complementary points of view. In the first, gameplay is seen as a technical flow of information, a player-action- controller-console-game-screen-representation-player cycle. In the second, it is seen as a continuous semiotic interchange between the player and the game. Additionally, we take into account that neither the player nor the game are monolithic nor decomposable in discrete subunits. However, in most studies, the words "player" and "game" are used as synecdoches, as they do not refer to the whole but only one aspect, such as, for the player, physical body, motor skills, cognitive abilities, cultural background, and, for the game, rules, narrative, mechanic, aesthetics.

* e-mail: suely.fragoso@ufrgs.br
† e-mail: mari.amaroc@gmail.com

Based on these considerations, we define gameplay as a continuous flow of meaning between two heterogeneous and indissociable configurations, the player and the game, mediated by artefacts capable of translating across different ontological realms. This definition is strategic in that it places the mediation of the interfaces at the core of the gameplay.

2.1 Interfaces and Gameplay

As players and games, interfaces also are neither homogeneous nor an aggregate of discrete parts: isolated cables, wheels and plastic shells are not a mouse, as menus, icons and buttons are not a GUI. It is also not the same thing to observe them inert and to observe them in operation. When observed as mediators between players and games, as in HCI game research, attention is drawn to the interdependence between software and hardware interfaces. However, the complexity of gameplay frequently demands a choice of focus on one of them. This is not a problem, as long as their interdependence is also taken into account.

Game interface design has been predominantly informed by two paradigms. The first is motivated by an ideal of representational realism and avoids the superimposition of external elements to the gameworld. The second is more concerned with the risk of compromising the clarity and efficacy of the interface than with overlaid menus and health bars [25]. Attempts to minimize the interference of mediators to maximize the similarity between the experience of the game with that of real life are part of a tradition that predates digital games by hundreds of years. However, as argued by [6], the desire for transparency invariably implies a paradoxical increment of the technical mediation. For example, the alignment of the points of view of the player and the avatar in first-person games seeks to increase the sense of presence and facilitate immersion [13]. However, there are always interface elements that cannot be integrated to the gameworld, and the first person point of view can make their presence even more disruptive. The inclusion of HUDs as parts of the avatars' equipment is meant to be a solution to that problem, but the representation of the HUD itself is an added layer of mediation. Not surprisingly, HUD has become the popular designation for the layer occupied by superimposed interface elements in general [33].

Integration of the software interface to the gameworld is not necessarily the best design option. Previous studies have shown that external (superimposed) software interfaces have their own advantages, for example functionality, clarity and consistency [7][33]. Superimposed interface elements were also not considered disruptive unless they broke the internal aesthetical or functional coherence of the interfaces [18].

The ideal of transparency also appears in hardware interface design. VR head-mounted displays, multiple displays, haptic and kinetic input devices are examples of attempts to make real-world actions of players more similar to those of their avatars in the gameworld [17][24][40][50].

As happens with software interfaces, other factors can be more important than visual immersion or direct mapping. The increased sense of control provided by gamepads or keyboard and mouse can be the source of greater enjoyment than the approximations provided by motion-capture devices [31][37][39]. Familiarity with gamepads has been found to practically eliminate the advantages of wheel-like devices for racing games [35].

Mice, gamepads and other traditional and "unnatural" game hardware interfaces are still widely used, and their design principles have enough advantages for them to remain influential for a long time. Their lack of novelty is likely to be one of the factors for the reduced number of studies about their impact on gameplay. The study presented in this paper responds to that scarcity by concentrating on gamepads as mediators of the experience of play.

3 METHODOLOGY

The study presented in this paper examined the interference of hardware input interfaces on the experience of playing digital games. More specifically, we were interested in players' perception and understanding of the mediation of gamepads and how they respond to the devices interferences on gameplay. Quantitative approaches could be used to reveal overall patterns [27][31][37][39], but would not be capable of obtaining the in-depth, fine-grained type of results we were interested in. For these, qualitative methods have proven to be more adequate [3][18][43].

Qualitative research encompasses a variety of techniques, some of which have proven successful in previous studies of gameplay. Observation of play in controlled situations [18][21] or in players' natural gaming environments [9] can be recorded in video and audio. Think-aloud facilitates access to volunteers' impressions, but requires caution not to cause interferences, for example by slowing reactions down or making players abnormally aware of their actions [4][15].

These techniques tend to be complemented by questionnaires and interviews [18][21]. These can also appeal to players' memories of previous, uncontrolled gameplay experiences. Stimulated recall techniques are appropriate in this case [42]. Broad, generalized perspectives are appropriate for sociocultural research questions [19][23] but case studies are better suited for detailed observations of gameplay and its immediate context [3].

3.1 Case Choice

It would not be possible to understand how players relate to the mediation of gamepads in totally unusual situations, which would make gameplay too artificial. In principle, we were interested in the players' familiar experiences, such as playing at their own homes, but it would not be practical to move all the equipment required to understand the dynamics of gameplay to the house of each player to be observed. As an alternative, we attempted to give the experiment's space a domestic feeling, gave preference to commercially available, affordable equipment and made the procedures as informal as possible.

It was important to choose a hardware input interface which would not be abnormally intrusive and a game which subjects would consider absorbing and interesting. However, the interference of the device and players' response to it would be difficult to evaluate without some degree of estrangement. We needed a game that could be played with familiar equipment, but introduced some type of particular alteration in their use.

An ideal candidate was *Brothers: a tale of two sons* [49]. *Brothers* is a narrative adventure game for console, PC and, more recently, mobile platforms. It was critically acclaimed and commercially successful [8], but it is not so widely known that we would have difficulty finding research volunteers who had never played it. This condition was important for the required estrangement and interest in the gameplay.

Brothers' software interface is fully integrated to the gameworld, with few interferences such as instructions and warnings, mostly in the first stages of the game (for example, "hold triggers to interact" and "hold LB and RB to Rotate the Camera"). As the story advances and the players' involvement

with the narrative increases, the software interface practically disappears.

Figure 1: Brothers' gamepad scheme

Brothers' most innovative feature is the need to control two protagonists simultaneously, using the right thumbstick and triggers of the gamepad for one and the left thumbstick and triggers for the other (Figure 1). The combination of the full transparency of the software interface and the estrangement caused by this unusual requirement was decisive for our choice of *Brothers*.

3.2 Research Design and Procedures

The use of multiple data collection strategies is ideal in qualitative studies of dynamic processes such as gameplay: different strategies gather different types of evidence, allowing for a broader but more refined perception.

Data presented in this paper was collected in laboratory experiments, composed of 3 modules: profiling (questionnaire), playing (non-participant observation) and interviewing (semi-structured).

Participant observation and secondary data informed the experimental phase of the study. Informed by the literature, they provided starting points for the categories used in the result analysis.

3.3 Experiments

In qualitative studies, it is more important to work with an information-rich group than with a large sample. There is no need for statistical representativity, as the results of qualitative research are not meant for generalization. Particularly in the case of personal experiences, such as playing a game, it is better to work with a reduced number of volunteers and gain consistency and validity with more detailed results [11][41]. The size of our sample was further restricted by the length of the experiments: the volunteers played *Brothers'* first three chapters[3] and remained available for the interviews. The volunteers made available up to two hours of their time without any type of material compensation.

On the other hand, qualitative research requires a meaningful, purposeful sample, selected according to clear and specific requirements. We avoided variation in age group and level of formal education, and promoted different levels of game literacy and different levels of familiarity with the gamepad used in the experiments (Xbox 360). We also required that the volunteers did not have previous knowledge of the game *Brothers*.

3 The game has 9 chapters, counting the Prologue and the Epilogue.

The final sample[4] was composed of 4 players: 2 males and 2 females, between 21 and 30 years old, undergraduate students or recent graduates. Two were occasional players (1 only played in social events and 1 only in mobile platforms) and the other 2 were frequent players. One of these more experienced players was familiar with the Xbox 360 and the other with a different gamepad (Dualshock 3). During the interview, both manifested a preference for playing on PCs, with mouse and keyboard.

3.4 Settings

The experiments took place in a room with sofas, one of which was in front of a 42" wall mounted television set, 2 center tables with water and snacks, the console (Xbox 360) and the recording equipment (2 cameras, a webcam and iPad). The session started with a profiling questionnaire, with questions about playing habits. After that, players were invited for a quick game of *Joy Ride Turbo* [5] against one of the researchers, who tried to match the gaming skill of each subject. This warm-up was an opportunity to learn the controls of the gamepad and helped to establish an informal atmosphere.

During the gameplay with *Brothers*, the player and the television screen were recorded in video, with sound. One of the researchers observed and took notes, without interfering with the player.

Data extracted from the observation, recordings and notes of each experiment was organized in tables with columns corresponding to a) player's posture and movements b) events in the game c) player's audio. A small extract has been reproduced in Table 1 as an example. All interviews were transcribed.

Player	*Game (video)*	*Player*
pulls the triggers.	*The avatars hold the crank, but don't turn it.*	*"Go!"*
Tries to press all buttons. Seeing that there is no response, relaxes his hands a little	*The avatars release the crank, which does not move.*	*"Ok, let me think again"*

Table 1: Extract from the non-participant observation data

4 Results and Discussion

In this session, we present and discuss the results of our controlled experiments with *Brothers*. Our study was directed to the mediation of hardware input interfaces, and therefore the software interfaces were not the subject of the study. However, as previously discussed, hardware and software interfaces are interdependent. They operate in combination and the mediation of one cannot be studied without taking the other into account. With this in mind, we start the presentation of our results with the implications of the design strategy adopted in Brothers software interface, directed towards transparency. This is followed by the presentation and discussion of our results, organized in the following categories: movement in the gameworld, interaction with the gameworld, camera movement, materiality of the gamepad, corporeality of players and spatial awareness and perception.

4 Two other volunteers, a frequent player and an occasional player, with and without familiarity with the gamepad, participated in the preparatory sessions.

4.1 Transparent Software interface

Brothers' software interface is well integrated to the gameworld. The characters communicate in a non-existent language, but the narrative develops without subtitles. Instructions are given only on 3 occasions, in the form of written messages explaining how to interact with props, how to swim and how to rotate the camera (point of view). Everything else has to be inferred by the player, including the most unusual requirement of *Brothers*, which is the need to control the two main characters at the same time with the left and right thumbsticks and triggers.

Due to the transparency of *Brothers'* interface, the majority of the interaction possibilities have to be inferred by the players. This resulted in different interpretations: the vibration of the controller, for example, was understood by some volunteers as a sign of danger and by others as a simulation of the ground shaking. It also caused players to imagine the need for actions which were not required: for example, one of the participants always pushed the thumbstick in the right direction and pressed the triggers to jump between platforms, but the latter was unnecessary.

There are several puzzles to be solved in *Brothers*, some of which involved exploration of software and hardware interfaces. When in-game and out-of-game discoveries were necessary to overcome the same obstacle, the absence of explicit information about the integration between the interfaces was considered amusing by the player. For example, in one passage, the player must carry a prop and place it in a wheel in order to operate it, but there is no indication that this type of prop can be carried, or how to interact with the gamepad in order to do it. All players enjoyed this challenge. However, players were upset or irritated by the frequent need to explore the possibilities of the controller, particularly when the events in the gameworld were not consistent with the need to interact with the gamepad. One example is the need to jump between rocks to cross a river which, as an in-game puzzle, was considered fun, but the lack of indication that this required pushing the thumbsticks and releasing the triggers at the same time was not.

Brothers requires operations with 6 gamepad buttons, 4 of which are used to control the two avatars. There are many situations in which the game adopts a well-known grammar of modes of interaction: for example, opening gates, turning wheels and pushing/pulling leavers. However, *Brothers* introduces many types of interaction, one at a time, slowly building up complexity as it explores the possibilities of each of the 6 buttons to unusual levels. As the difficulty of the obstacles increases, there is need to use all 6 buttons nearly simultaneously, and each of them in a different way (push, pull, press, turn, etc.). Challenges involving high levels of coordination and skill with the gamepad were most often seen as sources of irritation. This was aggravated when the demand of physical ability was combined with exploration and discovery of unusual ways of manipulating the controls. On the other hand, players were satisfied with the novelty of modes of interaction discovered at the beginning of the game, as far as they remained consistent.

4.2 Movement in the Gameworld

The use of hardware interfaces to play involves tacit motor skills and "depends on a tight coupling between perception and action" [14]. However, as observed by Dourish [14], tacit skills involve semantic operations in addition to physical requirements. These semantic operations explain why the advantage of natural-mapping interfaces has been found to be smaller, or less meaningful, than expected [35].

In our study all participants perceived clearly, directly and quickly the correlation between the movements on the gamepad and the events on the screen. They were also all capable of describing how they operated the controller and verbalize its relation to the results of their actions. However, the need to consider the coupling of hardware and software interfaces and express it in words for the think-aloud made players disruptively aware and became a disturbance. Other circumstances which made players unproductively conscious of their actions were the lack of familiarity with the Xbox 360 gamepad and the need to discover and learn unusual forms of interactions specific to *Brothers*. However, the pleasure of play was not compromised by narration or exploration that took place in the context of discovering how to interact with the gamepad and the gameworld in order to solve a puzzle. On the other hand, unconscious use of the controller often led to the interruption of the think-aloud.

Previously acquired tacit motor skills proved difficult to change. The 2 more experienced players performed better than others when the mode of interaction complied with the grammar they knew, but were the most confused about which side of the gamepad should be used for each of the brothers. They made noticeable efforts to rationalize and decide between the left and right thumbstick or trigger. In this regard, playing *Brothers* revealed to be more difficult for experienced players than for newcomers. As a result, less experienced players evaluated the experience more favourably than those who had more practice.

During the slower parts of the game, it is possible to move one brother after the other. All players noticed this and chose to do it at some point, but moving both at the same time accelerated progress and this appeared to be sufficient motivation for our volunteers. Specific strategies were developed to facilitate the task. For example, some players tried to align what they saw on the screen with the sides of the gamepad. It could be done by keeping the big brother always on the left side and the little brother always on the right. This was described in the think aloud and noticed in the confusion caused when it the position of the brothers was inadvertently inverted, for example, after a cut scene.

Another strategy consisted of disregarding the visual clues and simply perform the same action with both sides of the gamepad, independent of the circumstances. This was particularly visible when it caused disruptions between out-of-game actions and in-game events. For example, at a certain point one brother is hanging on a rope and the other must turn a wheel. One of the players moved both thumbsticks as if moving both avatars, disregarding the fact that the brother hanging on the rope did not move. When this player encountered a situation in which it was imperative to move only one of the brothers, she took one of her hands away from the gamepad and held it only with the hand used to move the avatar.

Although confusing less often which thumbstick moved which brother, less experienced players were more likely to adopt these alternative strategies. This facilitated their progress in the experimental session, which involved only the 3 first phases of the game, but would have created problems further on, as these players would arrive less prepared at the points when both brothers need to be moved simultaneously and differently.

4.3 Interaction with the Gameworld

Interaction with *Brothers* gameworld elements follows the same grammar of most games and therefore was not a challenge for the more experienced players. These players learned the differences between the abilities of each brother faster and more easily than others. The more experienced players also appeared to have been

more aware that it was the need to operate them at the same time and in different ways that increased the complexity and difficulty of certain situations.

Less experienced players had different reactions to the need to explore and learn how to interact with the world of *Brothers*. One of the participants had great difficulty understanding how to interact with the gameworld due to the lack of repertoire from previous gameplay. For her, not knowing how to proceed was nearly paralysing. Another player was not intimidated by the challenge. He appeared to be amused by the exploration of the in-game effects of his actions on the gamepad and was comfortable testing many possibilities in every situation. This player internalized the rules with greater ease.

One of the less experienced participants was particularly upset about the difficulty of interacting with the world as she wanted. In her opinion, the problem was not the design of the interfaces, but the level of skill required by the game. She understood that challenges of the ability of the player with the controller are a feature of *Brothers*, but was frustrated with "impossibily difficult" demands.

4.4 Camera Movement

The possibility of moving the camera is one of the few interactions explicitly described in *Brothers*. This appears to have been necessary, as none of our volunteers had discovered it before being warned by the written message. More experienced players did not expect it to be possible because in most games the camera is associated with the right thumbstick, which was being used to move one of the brothers. Players were not positive about using buttons to move the point of view.

The instruction on how to move the camera does not go beyond informing which buttons to press. This left much to be inferred, and players imagined additional requirements or restrictions. For example, one subject understood that it was not always possible to rotate the camera 360º. He considered this to be a consequence of the mode of interaction and did not explore further. As a consequence, he did not realize that the limit was due to the location of the camera axis, between the two avatars. Keeping the brothers near to each other increases the freedom of movement of the point of view, separating them reduces it.

4.5 Materiality of the Gamepad

The more players had to think about the interactions, the more the physical existence of the gamepad became intrusive. The unusual need to control the two avatars simultaneously was most disruptive, but other sources of disruption were more general.

Technical failures, for example, are particularly prone to call attention to the technical mediation [29]. We had problems with our gamepad at the beginning of the first and second experiments. Both participants were quick to notice that the little brother continued to move after they released its thumbstick, but their reactions were different. The more experienced player adapted quickly, suggesting that tacit motor skills are resilient when the circumstances demand small adaptations. The other struggled to compensate and asked for the controller to be changed.

Tacit knowledge is acquired through practice and repetition. We expected familiarity with the gamepad to be the most important factor in reducing the intrusiveness of the physicality of the gamepad. Our results concurred with this expectation in the extreme cases, with the player used to the Xbox 360 being the least disturbed and the player without previous experience with the controller the most conscious of its presence in her hands. Intermediate cases were inconsistent, with the subject with some experience with the Xbox 360 being more disturbed by its material features than the one who had practically never used it before. The difference appears to indicated a limit of the adaptability of tacit motor skills, as the intermediate player who found it more difficult to use the Xbox 360 was used to another controller, the Dualshock 3. This player attributed the frequent need to look at the gamepad in her hands to the position of the thumbsticks, which are parallel in the Dualshock 3 but not in the Xbox 360. When the circumstances demanded that the player discover and learn new modes of interaction, awareness of the materiality of the gamepad was not affected by the differences in familiarity with the controller.

One of the players attributed her "dislike of videogames" to previous experiences with gamepads, which she thought counter-intuitive. We expected the problem to be aggravated by the artificiality of the experimental situation and *Brothers'* high demand of motor skills. However, the player considered the controlled experienced more pleasant than her previous attempts to play with consoles. In her opinion, this was due to physical differences between the Xbox 360 and the other controllers she had used. In her opinion, our gamepad was less intrusive due to the position of triggers and buttons, making the experience of playing the game enjoyable. The ergonomic inadequacy of the controllers used by this player in previous experiences had discouraged her from playing games in general.

4.6 Corporeality of Players

Non-participant observation and video recording of the playing sessions meaningfully increased our perception of the events that took place in the physical world during gameplay. We could observe details of how players positioned and moved their bodies and of how their actions and reactions related to in-game events. For example, all of our volunteers started to play sat in an upright position and relaxed as the gameplay developed. Relaxation always started by their shoulders and progressed to their arms and legs, eventually reaching the whole body. When most relaxed, only the hands and eyes of the players remained active, suggesting that the same condition would not have happened with motion-based interfaces. However, the pleasure of these moments appeared to be at least as important for the experience of the game as the excitement of a new danger, or the achievement of solving difficult puzzles.

Posture alterations were invariably accompanied by an increase of concentration in the game and decreased awareness of their physical surroundings. As their body relaxed, the frequency of their verbalization reduced and the think-aloud was spontaneously interrupted[5]. Not surprisingly, these changes were accompanied by performance improvements. However, it is not possible to say whether volunteers played better because they had forgotten the experimental situation, the materiality of the gamepad and the position of their bodies, or vice-versa. Relaxation was interrupted to variable degrees by the introduction of new challenges.

During the interviews, players were asked to describe their corporeal sensations during gameplay. Nearly all referred to physical discomfort, specially pains and tiredness in the eyes. Despite the signs of abandonment in the more relaxed moments, no one made reference to feelings of uncorporeality. When directly inquired, all participants said they were aware of their bodies all the time. The references to pain and the return to

[5] We chose not to interfere, sacrificing the continuity of the think-aloud to preserve the spontaneity of these moments.

unrelaxed postures suggest this was true even at the peak of involvement with the game.

Tension and pain were particularly strong in the hands and were attributed to holding and handling the gamepad for more than hour. Even the subject who was enthusiastic about the ergonomic design of the Xbox 360 always relaxed her hands, held the controller with one hand or let go of it at times, especially during the cut scenes. The speed and consistency of this behaviour suggests that the participants were aware of the artefact in their hands at all times. Cut scenes were also taken as opportunities to perform other actions unrelated to the game, with players arranging their hair, eating or drinking. These movements usually started at the beginning of the cut scenes, indicating that players had been aware of their bodies and their bodies' needs during the gameplay.

All participants acknowledged the importance of cut scenes for the narrative of *Brothers* and understood that important events could take place in any of them. However, despite the fact that there was no sound narration, all used the cut scenes as opportunities to perform other activities and stopped looking at the screen, although only for brief periods. During interactive sequences they only looked away from the screen in special and rare circumstances. All volunteers said that they had become engrossed in the game story and all were aware that the cut scenes could not be repeated. They knew that, by looking away, they could miss important information about the adventures of the two brothers. In several occasions during gameplay, on the other hand, there was no danger and they could have stopped to eat or drink without any loss, but they did not look away or become distracted with other activities. This is a common behaviour, but we consider it contradictory, particularly in games with important narrative components such as *Brothers*.

The peculiar behaviour of one of our players suggested a possible explanation, according to which the reduction of attention during cut scenes in comparison to potentially interactive sequences is not due to lack of interest. At the start of every cut scene one subject moved his right hand away from the controller and arranged his hair, at times repeatedly, in what seemed to be a nervous tic. The same gesture was made during the interviews and we recall having seen it in all other circumstances, apart from during gameplay. Thus, the presence of this involuntary habit during the cut scenes was not abnormal, but its complete suppression during gameplay is indicative of a high level of concentration. In other words, players pay less attention to the cut scenes, but this does not necessarily mean that they have no interest in them. If this is true, the actions and movements observed during the cut scenes, including looking away from the screen, are signs of return to a normal level of attention, which, in comparison to the extreme concentration required in the interactive sequences, would feel liberating.

Players also demonstrated awareness of their bodies by using them to express their emotions, especially frustration. Our least experienced volunteers exhibited the most rampant reactions to failure, for example quickly shaking their feet in the air or throwing their bodies back on the sofa with their eyes closed. More experienced players made more discrete gestures, such as moving one of their hands away from the gamepad or sighing. Testimonies suggest that the difference in behaviour is due to the fact that experienced players already expected not to succeed at some point. For them, failure was an element of any game. This was not clear to the less experienced participants, who considered the struggle to solve a logic puzzle or to move the avatars through difficult obstacles extremely frustrating.

4.7 Spatial Awareness and Perception

Brothers' graphics do not intend to realistic, but the representation has sufficient depth and detail to be easily understood (Figure 2). All volunteers were comfortable with the spatiality of the gameworld and easily established correlations between the physical space where their bodies were and the virtual space they saw on the screen.

All players moved their bodies (or parts of them) as they wished the avatars to move. We understand this as a clear indication of projection of their own corporeality in the gameworld. However, it would be overreaching to take it as a sign of immersion, at least in the naïve sense of being metaphorically inside the game and surrounded by its reality [30][36]. Several authors have objected to this idea, predominantly based on theoretical reasoning or personal experience [20][28][47]. Empirical studies are more difficult to find [18].

Figure 2: Brothers' graphic interface

The players who participated in our experiments did not move only according to the bodies of the avatars, but also according to the movements of the camera. They also did not choose one brother, but alternated between them. Despite controlling the two avatars simultaneously, some players used first person references to describe the movements of the avatars without distinguishing between them ("I went there" instead of "I pushed the thumbstick" or "the brothers went there"). This happened more frequently during gameplay than in the interviews, but concurs with the evidence presented in the previous session, indicating that players do not loose awareness of their own physicality even during the most engaging moments of gameplay. Hence, it is not correct to identify involvement with the game with disembodiment. However, some type of projection appeared to have taken place, only it was not the "jumping in" presupposed in the idea of immersion. Inquiries based on comparisons of the movements the players made with their bodies and the simultaneous events on the screen led to descriptions of the experience in terms of embodied presence or, as one player put it, "corporeal immersion". From the players' point of view, it was the game space that was projected towards the space where they were and not the other way round. In other words, rather than their own dematerialization and a movement directed to the gamespace, our participants reported experiences closer to an expansion of the fictional space of the world of *Brothers* towards their own materiality.

On the other hand, our volunteers paid little to no attention to the "utterance space" [20] or to the television screen where it was enunciated. This extreme unintrusiveness is likely to have been facilitated by the transparent software interface. Only one of the

players mentioned the game graphics during gameplay. When directly asked about it, two volunteers responded vaguely and one explained that she always expects the images "to be like in the cinema", despite knowing that games will not meet her expectation. However, according to her, the lack of realism of the game images ceases to be important as the "enchantment" of interactivity takes over.

Direct questions about the television screen led to comparisons between the experiments' settings and the spatial arrangement in which volunteers usually play. They were used to sit nearer to the screen, especially when playing in their PCs. It is possible to infer that these players are accustomed to playing in fairly small spaces, which would make the use of motion-based input interfaces and VR headsets complicated.

The greater distance between them and the screen was said to modify their experience of the game, and even their performance. They were unable to be specific in the description of what was different[6], but their perception converges with the literature, which indicates that this applies to all objects in the player's surroundings [20][51]. Concurring with this, the only house that did not have specific arrangements for playing videogames was that of the player who prefers mobile platforms. She only plays in consoles or PCs in social occasions and, therefore, should have been used to the presence of others and to be being observed while playing. This player appeared to be the least disturbed by the artificiality of the experimental situation or by the researchers, with whom she interacted continuously. These results suggest that the effect of spatial arrangements on gameplay should be measured against each player's spatial habits instead of objectively. In other words, what is meaningful is not the presence of specific elements, the light conditions or the distance between players and objects, but the difference between each of these conditions and the spatial arrangement in which each player is accustomed to playing.

5 Limitations and Future Work

The detailed inquiry of qualitative methods has the power to reveal previously unidentified aspects of the experience. On the other hand, qualitative research does not reveal patterns and its results cannot be generalized. However, they can be reproduced, as far as the sampling and experimental conditions were clearly and coherently defined. We intend to return to this experimental protocol in the future, preferably with increasingly larger samples. When the qualitative findings are sufficient, it should be possible to address the same questions in quantitative studies.

6 Conclusion

We examined the degree to which players are aware of the mediation of gamepads and how they respond to their interference in gameplay. The intention to collect fine-grained, in-depth information about personal experiences informed our option for a qualitative case study with the game *Brothers: a tale of two sons*. The results we wanted to obtain also informed the length of the play session. Decomposing the game in short units would not have led to the same results as observations of continuous gameplay. Our volunteers played for more than one hour each, under continuous observation.

Our concept of gameplay places interfaces at the centre of the experience, but does not compromise the perception of other mediators and their interference in the process.

Our results confirmed the interdependence of hardware and software interfaces and the need to take one into consideration when studying the other. *Brothers* software interface struggles for transparency, at times at the cost of functionality and clarity. With respect to the hardware interface, Brothers' design goes in the opposite direction. The game introduces singular modes of interaction and challenges which demand great motor skills and high levels of coordination. The need to explore and learn how the gamepad could be used was disruptive when not directly related to the in-game events. However, on several occasions the absence of instructions about the interface operation compromised the coupling. Actions which were not coherent with the overall grammar of interactions of the game also disturbed the experience.

The need for exploration and discovery guaranteed that players would be aware of the gamepad in certain passages. During periods of relaxation, players adapted the use of the interface according to their previous ability with that type of controller. However, inexperience with the controller was less prejudicial than tacit motor skills developed with different gamepads, which greatly hindered the fluency of one player.

Relaxation and engagement with the game improved performance but did not imply disembodiment. Players referred to a sense of continuity between the physical world and the gameworld which we identify with the translation operations performed by the interfaces. This was not immersion as traditionally defined, but an expansion towards the player: a materialization of the fiction rather than an experience of dematerialization.

7 Acknowledgments

This work was supported by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq).

References

[1] E. Aarseth. 2003. Playing research: methodological approaches to game analysis. In *Proceedings of Digital Arts and Culture Conference*.

[2] J. Banks. Controlling gameplay. 1998. In *M/C: A Journal of Media and Culture*, 1, 5. http://journal.media-culture.org.au/9812/game.php.

[3] P. Barr. *Video Game Values: Play as Human-Computer Interaction*. 2008. Ph.D. Dissertation. Victoria University of Wellington, New Zealand. www.pippinbarr.com/academic/Pippin_Barr_PhD_Thesis.pdf/.

[4] S. D. Barbosa, B. S. da Silva. 2010. *Interação Humano-Computador*. Editora Campus, Rio de Janeiro, BR.

[5] BigPark. 2012. *Joy Ride Turbo*. Game [Xbox 360]. 23 May 2012. Microsoft Game Studios, Redmond, WA, USA. Played December 2015.

[6] J. D. Bolter, R. Grusin. 1999. *Remediation: Understanding New Media*. The MIT Press, Cambridge, MA.

[7] L. Breda. 2008. Invisible walls. Retrieved 10 April 2017 from http://gamecareerguide.com/features/593/invisible_.php?print=1

[8] J. Brightman. 2015. Starbreeze sells Brothers IP for $500,000. Retrieved 10 April 2017 from http://www.gamesindustry.biz/articles/2015-01-16-starbreeze-sells-brothers-ip-for-usd500-000.

[9] A. Brown. 2015. Awkward: the importance of re\exivity in using ethnographic methods. In *Game Research Methods: An Overview*. P. Lankoski, P, S. Björk (eds.). ETC Press, Pittsburgh, PA, 77-92

[6] For example, they responded vaguely that "saw the game in a different perspective" and that the distance "changed the focus".

[10] M. Carter, B. Nansen, M. Gibbs. Screen ecologies, multi-gaming and designing for different registers of engagement. 2014. In *Proceedings of Annual Symposium on Computer-Human Interaction in Play* (CHI PLAY '14). 37-46. https://doi.org/10.1145/2658537.2658686

[11] J. W. Creswell. 1998. Qualitative Inquiry and Research Design: Choosing Among Five Traditions. Sage Publications, New York, NY.

[12] A. Denisova, A. I. Nordin, P. Cairns. 2016. The Convergence of Player Experience Questionnaires. In *Proceedings of Annual Symposium on Computer-Human Interaction in Play* (CHIPLAY '16). 33-37. http://dx.doi.org/10.1145/2967934.2968095

[13] J. Y. Douglas, A. Hargadon. 2004. The pleasures of immersion and interaction. In *Electronic Book Review*. http://www.electronicbookreview.com/thread/firstperson/avecplaisir.

[14] P. Dourish. 2001. *Where The Action is*. MIT Press, Cambridge, MA.

[15] K. A. Ericsson, H. A. Simon. 1993. Protocol *Analysis: Verbal Report as Data*. MIT Press, Cambridge, MA.

[16] E. Fagerholt, M. Lorentzon. 2009. Beyond the HUD. User Interfaces for Increased Player Immersion in FPS Games. Master thesis. Chalmers University of Technology, Gothenburg. Available at http://publications.lib.chalmers.se/records/fulltext/111921.pdf

[17] L. A. F. Fernandes, V. F. Pamplona, J. L. Prauchner, L. P. Nedel, M. M. Oliveira. 2008. A Conceptual Image-Based Data Glove for Computer-Human Interaction. In *Revista de Informática Aplicada*, 15, 3. 75-94. http://seer.ufrgs.br/index.php/rita/article/view/rita_v15_n3_p75-94/4896

[18] S. Fragoso. 2014. Interface design strategies and disruptions of gameplay: notes from a qualitative study with first-person gamers. In *Human-Computer interaction: application and services*. Masaaki Kurosu. (ed.). Springer, New York, NY, 593-603. http://dx.doi.org/10.1007/978-3-319-07227-2_56

[19] S. Fragoso. 2014. Meet the HUEHUEs: A Sociotechnical Approach to Disruptive Behaviour in Multiplayer Online Games. In *International Journal of Sociotechnology and Knowledge Development*, 6, 3, 26-44. https://doi.org/10.4018/ijskd.2014070102

[20] S. Fragoso. 2015. The spatial experience of games and other media: notes from a theoretical-analytical model of representations of space. In *Comunicação e Sociedade. Braga*, 27. http://dx.doi.org/10.17231/comsoc.27(2015).2098

[21] K. M. Gerling, M. Klauser, J. Niesenhaus. 2011. Measuring the impact of game controllers on player experience in FPS games. In *International Academic Mindtrek Conference* (MindTrek 2011). 83-86.

[22] L. D. Grace. 2010. Critical Gameplay: Software Studies in Computer Gameplay. In *Proceedings of Conference on Human Factors in Computing Systems* 2010 (CHI '10). 3025-3030 https://doi.org/10.1145/1753846.1753910

[23] I. Fortim, C. de M. Grando. 2013. Attention whore! Perception of female players who identify themselves as women in the communities of MMOs. In *Proceedings of Computer Games and Digital Cultures Conference* 2013. 1-13. http://www.digra.org/wp-content/uploads/digital-library/paper_15.pdf

[24] A. Israr; S. Zhao; K. Schwalje; R. Klatzky, J. Lehman. 2014. Feel effects: enriching storytelling with haptic feedback. In *ACM Transactions on Applied Perception*., 11, 3, 1-17. http://dx.doi.org/10.1145/2641570

[25] K. Jørgensen. 2013. *Gameworld Interface*. MIT Press, Cambridge, MA.

[26] J. Juul. 2014. Gameplay. In *The Johns Hopkins guide to digital media*. M. RYAN, L. EMERSON, B. J. ROBERTSON (eds.). Johns Hopkins University Press, Baltimore, MD.

[27] C. Klochek, I. S. MacKenzie. 2006. Performance measures of game controllers in a three-dimensional environment. In *Proceedings of Graphics Interface* 2006, 73-79. www.yorku.ca/mack/GI2006.pdf

[28] M. Lahti. As we become machines: corporealized pleasures. 2003 In *The video game theory reader*. B. Perron, M. J. P. Wolf (eds.). Routledge, New York, NY.

[29] B. Latour. 2005. Reassembling the Social: an introduction to Actor-Networking-Theory. Oxford University Press, Oxford, UK.

[30] B. Laurel. 1993. *Computers as Theatre*. Adison-Wesley Publishing Company, New Jersey, NJ.

[31] A. M. Limperos, M.G. Schmierbach, A.D. Kegerise, F.E. Dardis. 2011. Gaming across different consoles: exploring the influence of control scheme on game-player enjoyment. In: *Cyberpsychology, Behavior, and Social Networking*, 14, 6, 345-350.

[32] C. A. Lindley. 2002. The gameplay gestalt, narrative, and interactive storytelling. In *Proceedings of Computer Games and Digital Cultures Conference* 2002 (DIGRA 2002). 203-215.

[33] S.C. Llanos, K. Jørgensen. 2011. Do players prefer integrated user interfaces? A qualitative study of game UI design issues. In *Proceedings of Computer Games and Digital Cultures Conference* 2011 (DIGRA 2011). http://www.digra.org/digital-library/db/11313.34398.pdf

[34] F. Mäyrä. 2008. An introduction to game studies: games in culture. SAGE Publications, London, UK.

[35] M. McEwan, A. Blackler, D. Johnson, P. Wyeth. 2014. Natural mapping and intuitive interaction in videogames. In *Proceedings of Annual Symposium on Computer-Human Interaction in Play* (CHI PLAY '14). 19 - 22. http://dx.doi.org/10.1145/2658537.2658541.

[36] J. H. Murray. 1997. Hamlet on the holodeck: the future of narrative in cyberspace. MIT Press, Cambridge, MA.

[37] L.E. Nacke. 2010. Wiimote vs. controller: electroencephalographic measurement of affective gameplay interaction. In *Proceedings of Future Play 2010*, 159-166. 10.1145/1920778.1920801

[38] L. E. Nacke, C. Lindley. 2009. Affective ludology, flow and immersion in a first-person shooter: measurement of player experience. In *Loading* 3, 5. https://arxiv.org/pdf/1004.0248.pdf

[39] D. Napatov, S. J. Castellucci, I Mackenzie. 2009. ISO 9241-9 evaluation of video game controllers. In *Graphics Interfaces Conference*, 35: http://www.yorku.ca/mack/gi2009.pdf.

[40] V. A. de J. Oliveira, L. Nedel, A. Maciel, L. Brayda. 2016. Localized Magnification in Vibrotactile HMDs for Accurate Spatial Awareness. In *Proceedings of EuroHaptics* 2016. 55-64. https://doi.org/10.1007/978-3-319-42324-1_6

[41] M. Q. Patton. 2002.*Qualitative Research and evaluation methods*. Sage Publications, London, UK.

[42] J. Pitkänen. 2015. Studying thoughts: stimulated recall as a game research method. In *Game Research Methods: An Overview*. P. Lankoski, P, S. Björk (eds.). ETC Press, Pittsburgh, PA, 117-132

[43] W. Ribbens, Y Poels. 2009. Researching player experiences through the use of different qualitative methods. In Proceedings of Computer Games and Digital Cultures Conference 2009, 1-10.

[44] K. Rogers, C. Kamm, M. Weber. 2016. Towards player-centric adaptivity: interactions of gameplay behaviour and player traits in a survival game. In *Proceedings of Annual Symposium on Computer-Human Interaction in Play* (CHIPLAY '16). 269-276. https://doi.org/10.1145/2968120.2987725

[45] F. Roman, A. Maciel, L. Nedel. 2012. Improving Gameplay in First Person 3-D Games using Multiple Displays. In *ACM Computers in Entertainment*, 12, 2, 1:1-1:22. http://dx.doi.org/10.1145/2701657.2701653

[46] K. Salen, E. Zimmerman. 2004. *Rules of Play: Game Design Fundamentals*. MIT Press, London, UK, Cambridge, MA.

[47] H. Sommerseth. 2007. Gamic realism: player, perception and action in video game play. In *Proceedings of Digital Games Research Association Conference* 2007. 765-768.

[48] J. Sousa, R. Jesus. 2016. Exploring the behaviour of the player to change the course of a game. 2016. In *Proceedings of Annual Symposium on Computer-Human Interaction in Play* (CHIPLAY '16). 285-290. https://doi.org/10.1145/2968120.2987737

[49] Starbreeze Studios. *Brothers: A Tale of Two Sons*. 2013. Game [XBOX 360] (7 August 2013). Starbreeze Studios, Stockholm, Sweden. Played December 2015.

[50] C. T. Tan, T. W. Leong, S. Shen, C. Dubravs, C. Si. 2015. Exploring gameplay experiences on the Oculus Rift. In *Proceedings of Annual Symposium on Computer-Human Interaction in Play (*CHIPLAY '15). 253-263. http://dx.doi.org/10.1145/2793107.2793117

[51] L. N. Taylor, 2006. Platform dependent: console and computer cultures. In *The Players' Realm: studies on the culture of video games and gaming*. J.P. Williams, J. H. Smith (eds.). Jefferson: McFarland, 2007.

[52] N. Wardrip-Fruin, M. Mateas, S. Dow, Steven; S. Sali. 2009. Agency reconsidered. In *Proceedings of Digital Games Research Association Conference* 2009. 1-9. http://www.digra.org/digital-library/publications/agency-reconsidered/