

GateWalkers – An Exploration into Player Experience With Virtual and Physical Components

GDEV60001 GAMES DEVELOPMENT PROJECT

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Abstract

Physical components in games are regarded positively by players who experience them when toys-to-life games were popular yet games which feature this mechanic are not commonplace. Is the actual impact on player experience understated or could there be other motivations behind the disappearance of this once popular mechanic. This paper explore explores research into player experience and peripherals in gaming supported through the development of an artefact with two variants comparing a mechanic that uses physical characters scanned by the player to the same mechanic implemented through the UI. These variants are then played by separate groups of participants with answers gauging the difference in their experience.

Introduction

Games have been played throughout human history and while the term *game* may have become mostly synonymous in the modern era with video games, most individuals and people as a whole start playing games through physical media such as board games. While some attempts to combine the two areas of gaming have been made through creating digital board game tables, these often result in simply a board game with a digital screen which can lose the most appealing elements of both styles of games.

The most desirable way to combine the two styles while preserving their best elements would be to have physical elements of a video game that tie directly into the games mechanics and play a key role in its gameplay, such as the “Toys-to-life” (Roberts, 2015) feature, which utilised physical figurines to interact with the game. Whilst many “toys-to-life” players reflect fondly on it today, some of the most notable titles are now discontinued, such as Skylanders (Activision, 2016), Disney Infinity (Disney, 2016) and Lego Dimensions (LEGO, 2016). Because of this, the concept itself may no longer be in the public eye, but titles such as Amiibo (Nintendo, 2025) are still being utilised on modern gaming platforms (Nintendo, 2025) where it is featured in games such as The Legend of Zelda: Echoes of Wisdom (Nintendo, 2024).

This paper hopes to explore whether the use of physical media has a positive impact on the player experience or if using a virtual mechanic elicits the same experience for the player. This will be achieved by utilising a puzzle game prototype which uses Near Field Communication (NFC) technology, a way of communicating between two devices over a short distance, to allow the player to swap active characters through a physical figurine. For this project the communication will be between a passive Radio Frequency Identification (RFID) tag, similar to an electronic keycard, and an Arduino, an open-source platform which utilises a programmable microcontroller as well as its own IDE to make many unique and personalised projects, to allow the player to interact with the virtual game.

Aims and Objectives

This paper aims to explore how physical components in games, namely those implemented in a similar way to physical components found in the toys-to-life genre with a deep integration into gameplay, impact the player experience. In hopes of achieving this aim this paper will pursue four research questions (RQ).

- (RQ1) What does research into player experience commonly cover and what are the most notable influences on players?
- (RQ2) How does research currently investigate the effect that physical components in games have on the player? This can be in the form of controllers, board games and other peripherals that may be implemented in games, how do these areas differ from video games with no physical components, is the player experience changed?
- (RQ3) How do game developers currently implement and design around physical components? Aside from the impact on player experience it is worth researching how these components have been implemented in the past by developers.
- (RQ4) Can an artefact be made which features a physical component that demonstrates a difference in player experience? If an artefact where one version implements no physical component and another version where the only change is that it now includes a physical component, would there be a clear difference in player experience?

Literature Review

Toys to Life / Other physical objects in games

Gaming is a very wide and diverse industry spanning from chess to cyberpunk fantasy adventures, and while both types come under the broad umbrella that is games, one of the best ways to categorise them is to separate them into physical and virtual. In this context a physical game refers to a game which is played using physical objects, such as the pieces in chess, or played through social interaction, such as Simon Says or tag. A virtual game refers to a game that is played in a virtual environment, usually a PC or games console, but also includes games which utilise VR. However, there are some games that breach these definitions and feature both virtual and physical components; in this paper, the main example that will be explored is the toys-to-life genre of games popularised in the mid-2010s. The toys-to-life genre utilised a feature for video games allowing players to scan a physical model of a character and to interact within the game.

People have been playing games using physical objects for most of human history, with the ancient Greeks playing Nausikaa (Tylor, 1879) or the ancient Mesopotamians playing the Royal Game of Ur, the oldest playable board game (Tam, 2008), whereas virtual games are a relative newcomer into the culture but have been popular since their arrival (Wolf, 2007). Games in the toys-to-life genre aimed to combine the tactile appeal of physical games with the limitless potential of virtual games, which, with games like Skylanders, resulted in an extremely successful franchise, according to Heikki & Sotamaa (Heikki & Sotamaa, 2014). Skylanders wasn't the sole example of this; Nintendo games still utilise the Amiibo feature in their most recent games.

The toys-to-life feature isn't the only example of physical components being tied to gaming; in fact, almost all games utilise a physical component, whether through physical items in real-world games such as chess or through a peripheral device in virtual games such as a keyboard or a controller. A peripheral device simply refers to any external device that can connect to a computer which adds functionality in some way; this will also be seen in this project, as the Arduino will be a peripheral device. Some games have their own type of peripheral device; these may not be needed to play the game but add a benefit to the player through using them. This is present in many racing games in that while they can be played on a keyboard and mouse or controller, using a racing wheel and pedals often gives the player greater control.

Peripherals are known to affect the player in positive or negative ways; a controller that is uncomfortable to hold or confusing to use will affect the player's experience or deter them from playing altogether, while a simple or unique controller is more likely to attract new players either through its novelty or by being easy to pick up and play (Schmorrow & Fidopiastis, 2019). This effect extends beyond controllers and impacts the visual elements of gaming peripherals (i.e., a monitor). In a study by Liu (Liu, Ip, Shum, & Wagner, 2014), they found that the vividness of interfaces has a positive effect on a player's enjoyment through its effect in often increasing a player's immersion in the game and that higher immersion correlates to higher player enjoyment.



Figure 1 - Guitar Hero Controller

Guitar Hero is a series of games that feature a unique peripheral that is required to play it (ref the game). The games in this series are rhythm games where the player simulates playing the guitar by pressing buttons to match the notes on screen. The peripheral for this game is a controller the size and shape of a guitar featuring 5 chord buttons and a “strum” button. Having a peripheral like this for a game was very new at the time and was able to attract a lot of new players through the simple and recognisable design, which contributed to the game's success and cultural impact (Droumeva, 2008).

Player Experience

Games are nothing without their players, and what keeps players coming back to gaming is the player experience. Defining player experience can often be subjective, as each player values different aspects of gameplay. Some players may purely value a realistic game that encourages complete immersion, while another player might only value the mechanics of a game; the University XP breaks down what player experience is into motivation, meaningful choices, balance, usability, aesthetics, and fun (Eng, 2019). The main aspects of the player experience that will be tested and explored are usability, which focuses on the core mechanics of the game, and the aesthetics, as well as the action that the players can take, as this project aims to explore how having a physical object that the players can see and touch will affect their experience.

All game developers aim to improve the player experience for their respective games, and there are many different strategies for doing so. Some may focus on usability and understanding how to incorporate player testing and its findings into the pipeline of game development (Isbister & Schaffer, 2008). Whereas others may choose to explore the effects of motivation and a player's meaningful choices on their experience and how identifying with the avatar may affect the player's actions (Wei, et al., 2025). And some focus on the aesthetic qualities of games and how *juicy* embellishments to a game may improve the experience (Hicks, Gerling, Dickinson, & Vero, 2019) without changing the mechanics or narrative direction of the game. In this context, 'juice' refers to the extra visual and audio effects in games (such as particles and screen shake) that aim to create a more enjoyable player experience by giving more feedback to the player.

However, improving the player experience is not always a simple task. Since the qualities that make up the player's experience are inherently subjective, when it comes to measuring the results of changes or receiving feedback, the questions would either need to be based on quantifying a concept such as fun or gather qualitative data, which may be hard to find a common result from. Players also come in many different shapes and sizes, and while one player may, for example, see a new *juicy* feature in a game as a purely positive addition, another player may find that their experience is now impaired, as they prefer simplistic games.

Another contributing factor to player experience that is present in this project as well as the games that served as its inspiration is novelty. Novelty can be explained here as the feeling of thrill derived from an unfamiliar experience; in this scenario this is evident through the switching mechanic which features a physical component as this is not a common mechanic for many games.



Figure 2 - Skylanders Portal Of Power with figurines

Novelty can be a strong incentive that entices players towards a game as people seek to experience new ways to play games and can lead to the player having a more memorable experience (Skavronskaya, Moyle, & Scott, 2020). With the availability of games growing increasingly larger there is a greater need for games to *stand out* to get noticed by potential players, through introducing a novel mechanic the player is more likely to have an enjoyable experience as it is a break from their routine (Merikivi, Tuunainen, & Nguyen, 2017).

There are some areas of player experience that lend themselves to the virtual games, either due to low barriers for entry or the capabilities of a virtual environment. An example of this might be that players have the ability to engage in ranked play without the need for travelling to competitions unless at high levels, which may be a source of motivation to engage deeply in the game (Mora-Cantallos & Sicilia, 2018).

Player experience in physical games

It is common to hear anecdotes of how it is a different experience to engage with the physical than the virtual, often avid readers will share how they are more engaged and immersed when holding a physical book than the electronic version. Board game enthusiasts are no different from this and will value the experience of playing a game such as Monopoly in person with their group rather than in a virtual space. It common for communities to form around these games ,often leading to personal

connections, the players of these games may also be seen as out-casts from society, further perpetuating their connection to these games and communities (Woods, 2012).

While video games are certainly a source which cultivates a community through which many gamers socialising with friends it is common for video games to have inherent incentives to play them, such as getting a new high score, exploring new content or unlocking the next area. This is less present within board games where the majority are designed around bringing people together through light competition and the average player sees the game itself as less important, instead the time spent with family or friends is the incentive to play (Ces, Mathilde, & Giraudeau, 2024).

A physical game may not necessarily have physical pieces as part of their gameplay, such as Trivia or deduction games which may have cards as just a medium to give players information, being able to play and move around appealing pieces is part of the appeal for many players. Players are more likely to be more inclined to purchase or play board games that have attractive designs or appealing physical pieces (Woods, 2012). As these components are owned by the player they are capable of abandoning the *set* rules of the game and use the board and pieces to play their own variation of the game with their own rules (Wind, 2026), giving the player a new form of ownership that is not possible in many virtual games as the developers often restrict how the player is able to move or what actions they can make and these rules cannot be ignored by the player.

Game Design

There are many different genres of games, each with their own design conventions and common practices, and while this section will focus on the design of puzzle games in both video and board games, it will also explore general areas of game design which are relevant.

Puzzle games are a well-established genre with its own dedicated fanbase, starting from simple well-known games such as Sudoku or solitaire, which are easy to understand and straightforward, to more bewildering games such as Superliminal (PILLOWCASTLEGAMES, 2019), which can be disorientating and confusing. It can be difficult to create a puzzle which engages the player since many puzzles in games are a way to hinder the player from reaching a goal, whether that be a key to unlock treasure or unlocking the next area of the game. A puzzle that is too simple can frustrate the player and hinder their experience through making the progression of the game feel condescending; an example of this would be a game that repeatedly forces the player to engage in “fetch quests” - which in its most basic form is the act of picking up an item to simply deliver it to someone - to progress, but a puzzle that is too intricate can detract from the overall game (Moore, 2016).

There are many games that feature puzzles without it being the main feature; these are often referred to as mini-games, as they act as almost an independent game within the larger game world. These can be seen in many game genres and in many different forms, from lockpicking in Skyrim (Bethesda, 2011) to fishing in Stardew Valley (ConcernedApe, 2016) to playing dice in Assassin's Creed: Valhalla (Ubisoft Montreal, 2020). Mini-games are often received in many different ways by players, from some finding them entirely pointless and never engaging in the mechanic (Frazer, Argles, & Wills, 2007) to those who spend more time playing the mini-game than progressing from the larger game they are a part of.

Designing with peripherals + UI

As the artefact for this project will have a small focus on UI (User Interface) and its impact on the player, it is important to see how similar mechanics have been implemented in previous games and investigate games that use switching between characters as a mechanic as well as how players interact with UI in games as a whole. While UI can refer to many different types of interfaces, from health bars to main menu screens, the broad area that this section will investigate is areas of UI that the player can interact with (i.e. buttons or gestures) as that will be used in the artefact for this project and the design conventions present when creating UI for games.

There have been some notable attempts at creating systems where the player can interact with the game through other means rather than a mouse and keyboard or a controller, a system which uses a player's voice, hands or body can be referred to as a natural user interface (NUI) (Pirttiniemi, 2012). A popular example of this is the Microsoft Kinect (Microsoft, 2024) which performed real-time gesture recognition and face tracking. This technology was implemented in various different games with various mechanics used, such as in: *Kinectimals* (Microsoft Studios, 2010) where the player could pet and command their animal, *Fable: The Journey* (Microsoft Studios, 2012) where the player could use different gestures to perform different spells or *Kinect Sports Rivals* (Microsoft Studios, 2014) where the player had to use full body motions to control their avatar.



Figure 3 - XBOX 360 Kinect

The Kinect and its NUI implementation is not present in the space of gaming today, with many potential variables ranging from the added cost of the device to it not being accessible to player who did not have the available space leading to its decline. One factor that should not be ignored is the occasional unreliability of its tracking leading to misinputs (Pirttiniemi, 2012) or failed actions causing frustration in players (Norman & Nielsen, 2010).

Novelty and familiarity

The novelty effect often refers to the temporary benefit to experience or memory recall when experiencing a novel experience. This study includes a mechanic that is not commonly present in games and as a result it is likely that the novelty effect will contribute to the player experience of the participants, because of this it is important to understand how to recognise and manage the novelty effect.

When a new experience is encountered it is more likely to form a lasting memory than if an individual experienced something that they encounter frequently, this was tested by Kormi-Nouri et al where participants took part in two tests where they were told to remember verbs and nouns, in the

second test they were told to do the same thing but some verbs and nouns were reused from test one (KORMI-NOURI, NILSSON, & OHTA, 2005). The participants were able to more easily recall the new words supporting the novel effect.

The novel effect also refers to the brief unstained attraction to new things; this can be seen when new attractions experience a surge of attention and visitations when they first open but dwindle as the attraction become less novel (Soebbing, Mason, & Humphreys, 2016).

While novelty may provide brief prosperity its counterpart familiarity can also be linked to positive outcomes as individuals have improved recall of items that they are familiar with and are aware they are going to be asked to remember them in advance (Poppenk & Köhler, 2010).

Education, Health and Other

Video games:

In regard to their effect on health video games have been subject to contradicting research, with some finding that playing video games results has a negative impact on an individual's mental or physical health (Brunborg, Mentzoni, & Froyland, 2014). While other research shows that the impact to health can be quite positive (Primack, et al., 2012). The main differencing factor between the effects is the time spent playing video games with excessive playtimes being associated with the negative effects.

Due to their virtual nature video games are a very accessible media, players are able to use many different controllers or even their phone to experience games. This means that a new audience of players who may not have been mobile enough to be involved with the community aspect of board games who can now join and contribute fully remotely (Anderson, 2024).

Game controllers:

Many game controllers require an average level of dexterity and fine motor skills to operate, making these game controllers occasionally inaccessible to disabled or elderly players. However, due to the motor skills required to use many game controllers they have found use in the medical field for providing rehabilitation to patients, using a game controller is more accessible and affordable to facilities and patients rather than the expensive clinical systems. In terms of rehabilitation there have been studies which use Guitar Hero as well as its unconventional game controller to help rehabilitate individuals impaired from a stroke such as the research done by (Taheri, et al., 2012) who used a robotic device to provide finger therapy to patients after a stroke, which was tested using Guitar Hero.

Other types of physical game controller will likely also be successfully integrated into the rehabilitation of stroke sufferers such as the Wiimote. Brown et al fashioned the Wiimote into a glove that could be used to track patients' interactions in scenarios mimicking real clinical rehabilitation movements (Brown, et al., 2009), being able to use this type of controller for rehabilitation gives the clinical facility more options for tracking movement as new games can be developed for the controller.



Figure 4 - Prototype Wiimote glove

Board games:

Board games have been around for a very long time, and while many are played for social interaction there are many that encourage cognitive effort to play (such as Chess). Board games are often introduced to people at a much younger age than when they may experience their first video game, because of this board games are often where children may encounter their first experience with *abstract* rules, rules that may only be applicable under certain conditions or temporary. In a study by Ramani & Siegler (Ramani & Siegler, 2008) aimed at replicating and further investigating a previous study that explored the education effects of board games played by children, Ramani & Siegler showed numerical board games can increase a child's ability at numerical tasks and these changes persisted for at least 9 weeks later.

While children may be more susceptible to the educational effects of board games, that is not the only audience that benefits from them. Playing frequent board games has related to being a preventative measure for dementia (Nakao, 2019). The nature of board games can often be more accessible to the elderly and children as there is a lesser need for fine motor skill than those needed to play video games and skill or progression in board games is often not tied to your ability to handle or control the pieces.

Outside of the benefits to an individual's health or early education board games have also been used as a medium to provide education to adults. Khazaal et al compared 3 groups of smokers (a board game group, a psychoeducation group and a control group), the board game group played *Pick-Klop*, a trivia-style board game which had cards that asked questions relating the history, effects, treatments and many other areas involved in tobacco and smoking addiction. The group who played *Pick-Klop* showed improvements and increased cessation rates (Khazaal, Chatton, & et al, 2013).

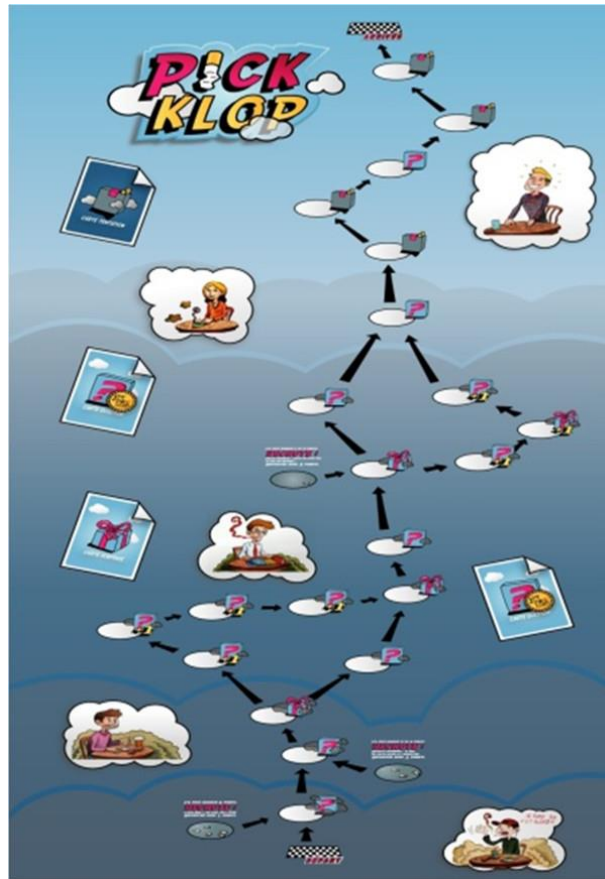


Figure 5 - Pick-Klop game board

Research Methodologies

This section will cover the methodology used when attempting to establish a relationship between physical components in games and their effect on player experience, the methodology for developing the artefact and the methodology relating to gathering and testing participants will be separate in this section.

Development

To properly test what impact the mechanic has on their experience the artefact will need to include a heavy focus on the mechanic that will differ between the versions that are experienced by different groups of participants. This mechanic is how the player swaps characters in the game, to ensure that this mechanic is used heavily the artefact will be a puzzle-style game that requires different characters be used to progress.

To create the physical scanning mechanic that will be a focus of this research an Arduino will be used to read the ID of tags that are compatible with its RC522 component, the IDs are read as a string which can then be passed through the serial port. This string is then picked up in Unity and compared against previously stored strings, if it matches any it then calls the function in the player controller and passes the relevant character type. The Arduino was later enclosed in a 3D printed case to keep it protected and stable on the desk during test.

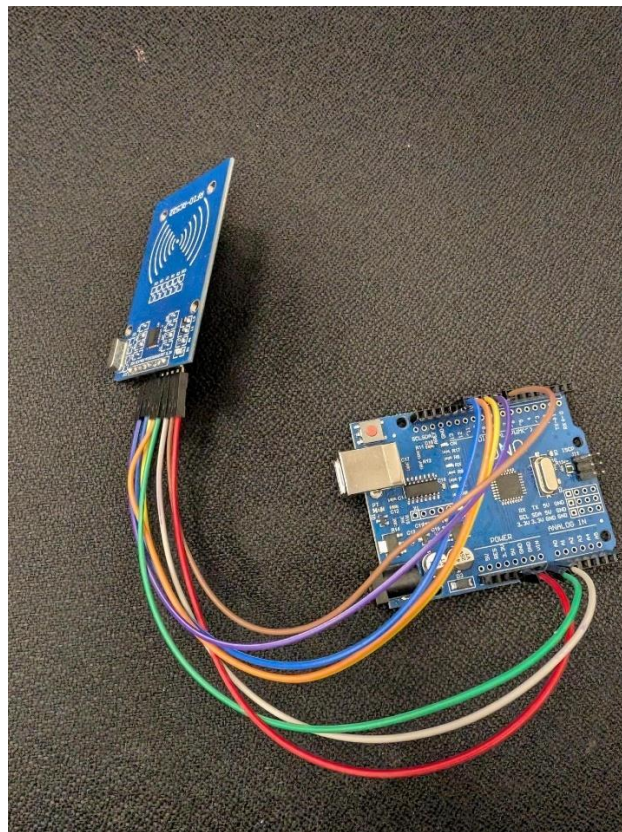


Figure 6 - Arduino and RC522 used during development and testing

To create the illusion of scanning the character into the game as well as making it clear to the player what character they were swapping to, free assets were sourced from the Unity asset store, and the models were then 3D printed. The previously mentioned tags were then glued to the bottom of the character models as seen in the figures below.



Figure 7 - The physical models of the characters used when playing the artefact

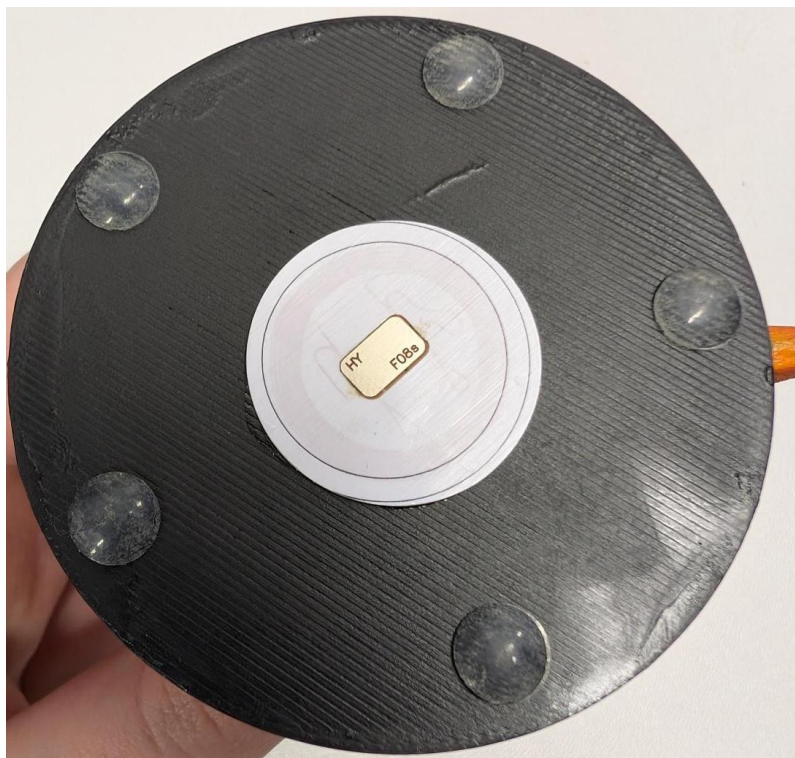


Figure 8 - Underneath view of the characters showing the NFC tags

Excluding the development the physical scanning mechanic, the remainder of the development for this artefact will take place within the Unity game engine. Unity was chosen due to documented and easily understood system for communicating with serial ports from the PC, as well as personal familiarity and experience.

The development of the UI used in the virtual version utilises Unity's UI Toolkit to be clear and easy to use for the participants. The intended result for the UI was for participants to quickly understand which character each of buttons relate.



Figure 9 - The character swapping menu present in the virtual version

The puzzles featured in this game are kept to a basic standard as to not confuse or overwhelm the participants, examples of the puzzles used include: pressure plates that must be activated with the correct character type in a specific order, blocks that must be cleared in the correct order as the correct character and walls that can be cleared by shooting them as the correct type of character. These puzzles ensure that the participant has a reason to regularly swap characters while also maintaining a degree of engagement for participants irrespective of the swapping mechanic.

Participants

This study uses A/B testing which is where participants are split into two groups experiencing two variants, A/B tests are often used to evaluate user-experience since results can easily show the effect of the changed variable. A/B testing was chosen as to avoid any potential impact that playing through both versions of the demo may have on player experience since the player will develop a familiarity for the systems present.

In this study group 1 will be testing the variant with no physical component and can be regarded as a control since their variant functions as most regular video games would, group 2 will be testing the variant with the physical component.

There are no prerequisite conditions required for participants to take part in this research meaning that no screening was required. To gather participants, volunteer sampling is used through public advertisements posted in university spaces as well as basic information regarding the study being shared after university classes, it was aimed to gather roughly 10 participants so that participants can be split into two groups of 5. Due to the nature of this sampling, it is likely that there is bias present in the results as participants who reached out to take part are likely already familiar with toys-to-life games and recognise the content.

Once gathered the participants were sent further information on what was involved through an information sheet and then were asked to fill out a consent form before taking part. As the artefact connected to this study has a physical component the system used to separate the participants into groups could not be random as only those with availability to test the in-person physical version should be allocated to that group, this was done through asking participants directly if they were available to test in person, those that agreed were given dates and times to play the demo within university labs.

The overall sample of the study has limitations present; the small sample size and bias from volunteer sampling may mean that the results may not be generalizable as the participants who took part in the study may not reflect the average person, all participants who took part are also all students who study various disciplines of game development meaning their experience may not represent the experience of an individual who has zero experience in game development.

Questionnaire

After each participant has played through their respective version of the demo they will be asked to engage in a questionnaire, the questions will be mostly derived from the Game Experience Questionnaire (GEQ) (IJsselsteijn, Kort, & Poels, 2013). The GEQ is a questionnaire that is designed to be taken immediately after the game-session and is separated into three sections each designed to gather information regarding the player experience. The questionnaire in this study will use questions from “*the core questionnaire*” (designed to gather information regarding how the participant felt while playing) and “*the post-game module*” (designed to gather information on what participants felt after they had stopped playing) which are sections in the GEQ. The questionnaire will be identical for both groups, but their results will be stored separately for ease of comparison at the end of testing.

Not all question areas from the GEQ applied to this study so questions relating to the story of the game or player skill were not included. The areas that were included were questions that assessed : positive effect, negative effect, flow, annoyance, challenge, reality and tiredness as these areas are related to player experience or are areas that may be effected through using a more cumbersome mechanic such as that present in the character switching of this demo.

The questions taken from the GEQ utilise a Likert scale, this is desirable as it can cover many areas of player experience while still being easy to compare. However, to gain deeper insight from these answers a question was added at the end of each quantitative section of questions encouraging participants to elaborate on their answers, this allows for data that may have been missed previously to be gathered.

Additional questions were added that were thought to give greater context to the participants experience. One such question that was added was asking participants how many times they switched characters during their playtime of the demo, this was a value that was tracked throughout and shown to the participant upon finishing the level. The desired outcome of this question was to compare the results from each group to determine if the increased complexity of the mechanic served to deter the player from utilising it when compared to the simpler UI variant. Another question that was added to the questionnaire asks participants if they have any experience with the

Toys-to-life genre, this information can be used to provide context on whether a participant's experience may be coming from nostalgia and familiarity or from tackling an unfamiliar system.

A further question that was added to the questionnaire was a summative evaluation of the participants experience within the demo; participants were asked to rate their overall experience on a scale from boring to engaged. This was added to act as a high-level overview of the difference in experience between the two groups which can be further supported by the more tailored questions inspired by the GEQ.

Results and Discussion

This section goes over the data gathered from the questionnaires filled out by the participants in this study. The participants who experienced the virtual version of the project (where the player switches characters through buttons in the UI) are referred to as group 1 and the participants who played the physical version of the project (where the player scans physical models to switch characters) are referred to as group 2. Groups 1 and 2 filled out separate questionnaires but all questions are identical.

This section is further broken down into each question where there are graphs showing the findings from each group and a brief discussion of what the results from these questions may show and how they support or contradict areas studied in the literature review.

Total number of character switches in the demo:

Group 1:

1. How many times did you switch character during the demo? (This is shown at the end of the demo)

4 Responses

ID ↑	Name	Responses
1	anonymous	41
2	anonymous	31
3	anonymous	39
4	anonymous	39

The mean number of times that participants in group 1 switched characters is 37.5 times.

Group 2:

1. How many times did you switch character during the demo? (This is shown at the end of the demo)

5 Responses

ID ↑	Name	Responses
1	anonymous	45
2	anonymous	38
3	anonymous	38
4	anonymous	33
5	anonymous	34

The mean number of times that participants in group 2 switched characters is 37.6 times.

Discussion:

The aim for this question was to investigate if the physical swapping mechanic would deter the player from utilizing it, this would result in there being a lower average number of times switched for group 2. However, this did not happen and the averages for both groups are approximately the same, with both groups also having individual participants who swapped more than others.

It is also worth noting that the group which had the participant that switched characters the fewest number of times was in group 1. This would suggest that the mechanic despite potentially being more cumbersome does not deter players from using it.

Previous experience with games that used physical scanning:

Group 1:

2. Have you previously played games that use physical components? (Games such as: Skylanders / Amiibo / Disney Infinity / Lego Dimensions)

[More Details](#)



All participants in group 1 had some experience with past toys-to-life games.

Group 2:

2. Have you previously played games that use physical components? (Games such as: Skylanders / Amiibo / Disney Infinity / Lego Dimensions)

[More Details](#)



The majority of participants in group 2 did not have past experience with toys-to-life games.

Discussion:

The aim for this question was to evaluate if the participants playing the demo had any experience with past toys-to-life games. If players were all familiar with games in this genre then it may skew results as their experience could be impacted through nostalgia or familiarity, however if players had no experience then their experience could still be impacted through not having a past understanding of using a physical component in gaming.

While participants were split between groups as randomly as possible (while accounting for their availability to test the physical version in person) it is unfortunate that the split between the experience level of the two groups is not more evenly distributed. Due to this unexpected split, the further results from these questions should be considered with regard to some participants from group 2 potentially facing a learning curve with the switching mechanic that may not have been present for other participants.

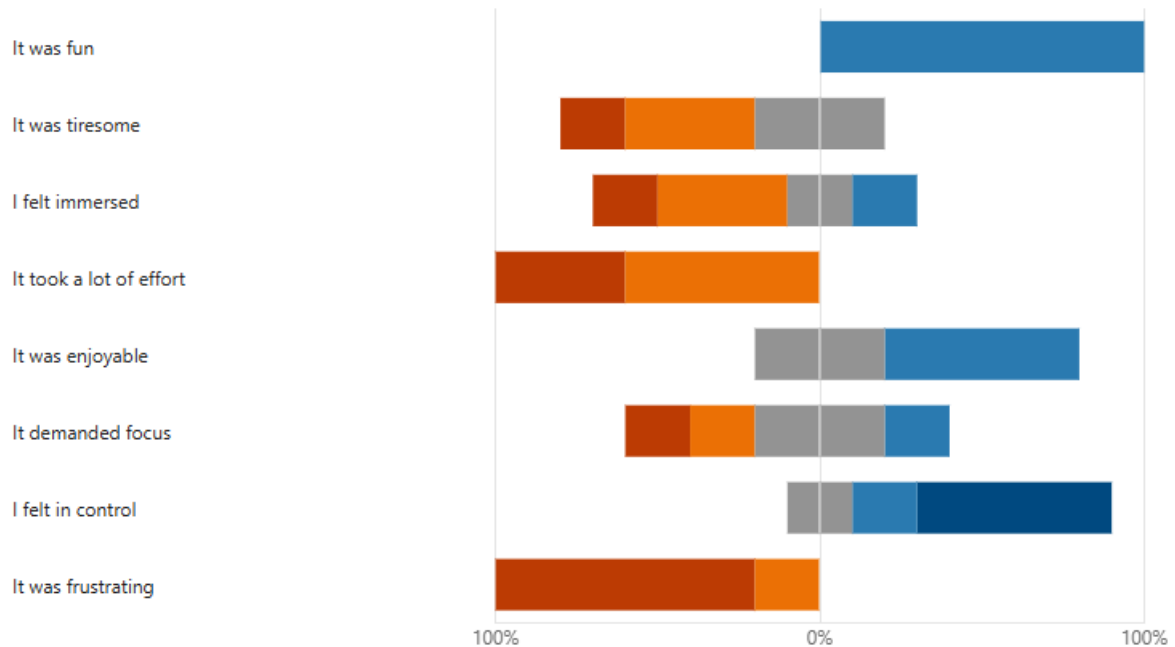
Directed player experience questions (part 1):

Group 1:

3. Please indicate how you felt towards the demo on the following scale

[More Details](#)

Not at all Slightly Moderately Fairly Extremely

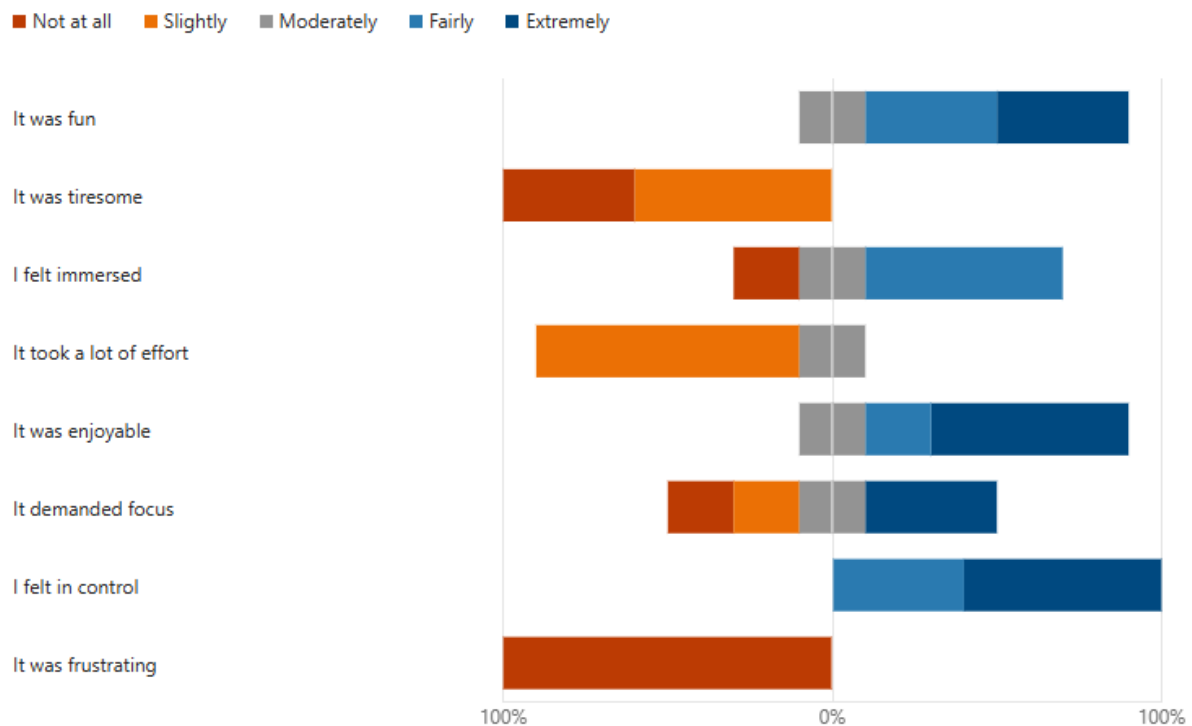


The most notable areas of this graph are that all participants found the demo to be fairly enjoyable, few participants were immersed and most stated that the demo did not require much effort.

Group 2:

3. Please indicate how you felt towards the demo on the following scale

[More Details](#)



All participants that responded to this question found that the demo was *not at all* frustrating, most participants found the demo to be immersive

Discussion:

The aim of this question was to break down the player experience with questions framed around the game experience questionnaire (GEQ). Breaking these areas down allows for a more in-depth exploration of what elements were affected through the use of the physical element.

The results from this question show some interesting differences in experience between the two groups, while all participants in group 1 found it to be *fairly* fun group2 had a larger range with some participants having a *moderate* experience and some have an *extremely* fun experience. This would support the research done into the novelty effect (KORMI-NOURI, NILSSON, & OHTA, 2005) and how it can be used to explain an increase in player enjoyment. This is further reflected in the answers to the enjoyment questions where most participants in group 2 found it to be *extremely* enjoyable while group 1 is mixed between *moderate* and *fairly* enjoyable.

The largest notable point of difference between the two groups is in their answers to immersion, while all participants in group 1 experience *slight* or *no* immersion most of the participants in group 2 responded with feeling a *fair* degree of immersion. These results would support the research into player immersion and the impact of tactile objects (Schmorrow & Fidopiastis, 2019).

Expanded player experience (part 1):

Group 1:

4. Please choose one section (or more) from the previous question and elaborate on your response(s) in more detail.

5 Responses

ID ↑	Name	Responses
1	anonymous	The immersion factor was slightly immersive because of the different dragons having different abilities which did their own separate things but the fact that i could see out of bounds and the lack of animations broke that a little bit
2	anonymous	it felt moderately tiresome because I had to bring the menu up for the switching rather than them being hot swappable
3	anonymous	"I felt in control" - I definitely felt in control in this game with its simple mechanics and easy controls
4	anonymous	The simple and straight-forward UI for switching dragons made puzzles that require several switches allowed for puzzles to be completed without the mechanic getting in the way, meaning the only effort required was in simple memory rather than looking away from the game screen.
5	anonymous	The slow walk speed was a bit frustrating and - while having to switch characters was fun from a puzzle aspect - it did get somewhat tiring to have to constantly switch dragons for 1 specific task (e.g. the cube tasks)

The participants in group 1 all elaborated on different areas from the previous question. Two participants commented on the UI menu for switching characters, participant 2 found it “tiresome” while participant 4 found it “simple and straight-forward”. Other participants commented on areas of the game not relevant to the research such as the lack of animations or walk speed.

Group 2:

4. Please choose one section (or more) from the previous question and elaborate on your response(s) in more detail.

5 Responses

ID ↑	Name	Responses
1	anonymous	I didn't feel frustrated by the demo at all due to the very straight-forward tutorialization of the abilities and mechanics as well as feeling focused and having fun because swapping between was really cool and I had to concentrate on remembering certain aspects.
2	anonymous	It was a little bit tiresome and take a bit of effort to keep looking at the models and moving my hand from the mouse to scan it but thats not necessarily a bad thing. Taking the action of physically doing it made it feel more rewarding and impactful.
3	anonymous	Placing dragons onto the platform made me feel very in control due to the physical actions, however some puzzles felt like there was too much switching back to back and could become more tiresome if the game was longer.
4	anonymous	I think the concept of using physical components to switch the characters is quite fun, though i do see how some people might find it tiring to do as its a bit hard to always have to look down and switch between them, which may take some people out of the fun loop.
5	anonymous	The idea of picking up a physical figure and then playing as that character has always intrigued me. This gives so much control when playing the game and when liking the character makes it so much cooler.

All participants refer to the character switching mechanic in their answer. A common theme that was elaborated on by the participants is *tiredness* with most participants responding theorizing that the mechanic would become more tiresome if the demo was longer. Other participants also commented on *control* sharing that the use of a physical motion to swap characters made them concentrate more.

Discussion:

The aim for this question was to allow participants to elaborate or explain their previous answers to give greater insight into how their experience was impacted. Since player experience is inherently a subjective area of investigation some participants may interpret questions differently and providing further detail to how participants interpreted the question can give greater clarity to the results. An example of how questions may have been interpreted differently can be seen in participant 2's response, while some participants may have understood effort to be a negative and undesirable trait in games, participant 2 elaboration explained that the increased effort created a more rewarding experience for them.

An interpretation of why the responses from participants in group 1 cover areas outside the research objective is likely because the demo plays like a "standard" game and participants did not focus on the switching mechanic. Since all the participants in group 2 refer to the mechanic in their answer it

further shows the difference that the novelty effect can have by directing players attention to new mechanics.

The comments from participants in group 2 focus on the potential *tiresome* effect that the mechanic may have if the game is extended, however when this is compared to the answers relating to *tiredness* given by both groups in the previous question it shows that group 1 were the ones who found the demo more *tiresome* this can be interpreted as the mechanic potentially losing the novelty effect towards the end of the demo.

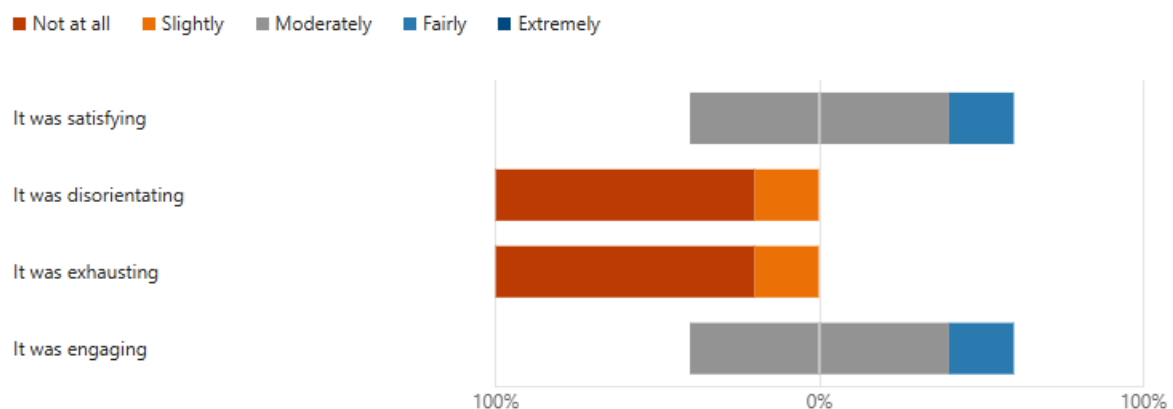
Participants from group 1 also commented on the physical action that was required to swap characters and attributed it to greater control and immersion, this would support research into physical objects and how they can improve experience for players by being a novel experience (Skavronskaya, Moyle, & Scott, 2020).

Directed player experience questions (part 2):

Group 1:

5. Please indicate how you felt towards the demo on the following scale

[More Details](#)

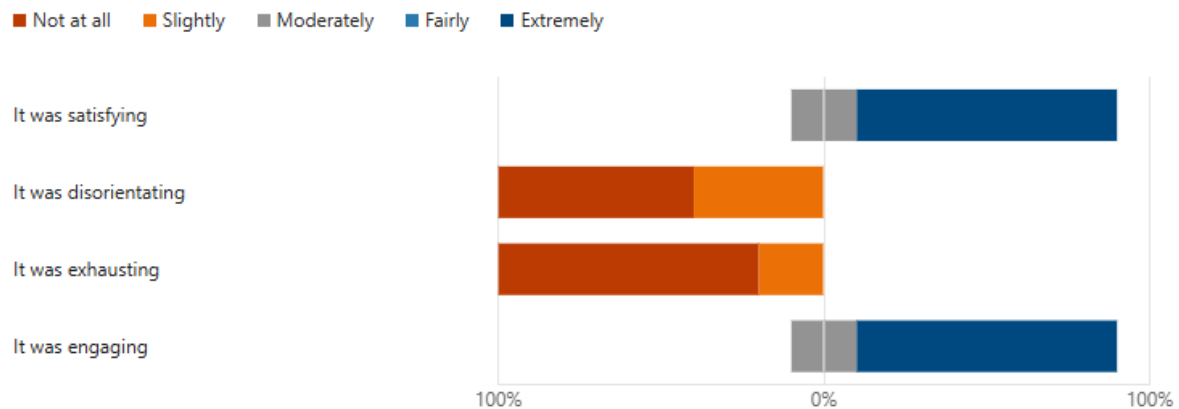


Most participants in group 1 found that the demo was *moderately satisfying* and *engaging* and mostly not *disorientating* or *exhausting*.

Group 2:

5. Please indicate how you felt towards the demo on the following scale

[More Details](#)



The participants for group 2 found that the demo was *extremely satisfying* and *engaging* and did not have a *disorientating* or *exhausting* experience while playing the demo.

Discussion:

Similar to question 3, the aim of this question was to break down the player experience into more targeted areas of investigation. These areas were asked separately because they are based on a separate section from the GEQ and allows another opportunity for players to elaborate on their answers with more limited areas to elaborate on to provide more points of comparison between the two groups.

The participants in group 1 and 2 had similar experiences in regard to *disorientation* and *exhaustion* but had starkly different responses for *satisfaction* and *engagement* this can be connected to the participants previously sharing that the physical action required and the mental effort that was required to perform it correctly was engaging and fun.

Expanded player experience (part 2):

Group 1:

6. Please choose one section (or more) from the previous question and elaborate on your response(s) in more detail.

5 Responses

ID ↑	Name	Responses
1	anonymous	It was pretty satisfying to complete the puzzles
2	anonymous	I had to actually think about the puzzles which made them engaging
3	anonymous	"It was disorientating" - This game in my opinion wasn't disorientating at all having a simple level that was easy to navigate around
4	anonymous	The ease of swapping dragons allowed for a seamless experience, allowing me to focus on the level and its details increasing engagement.
5	anonymous	The puzzle were engaging but not enough variety to keep my full attention.

The responses from participants in group 1 mainly comment on the design of the puzzles and level of the demo, with only one participant commenting on the mechanic for swapping characters.

Group 2:

6. Please elaborate on one (or more) of your responses to the previous question in more detail.

5 Responses

ID ↑	Name	Responses
1	anonymous	I didn't feel disorientated because it was very straightforward as previously mentioned, and I didn't feel exhausted swapping between or completing puzzles because they were very engaging, hence my answer to the last point.
2	anonymous	The only reason it was slightly disorienting was because i would pick up the wrong dragon, or put the dragon back down in a different order.
3	anonymous	Dragons on platform are very fun and satisfying alongside the help of the animations for switching looking really cool. That also kept my engagement up. The game was too short to be exhausting.
4	anonymous	The transition between the dragons was fairly fast and satisfying, the demo was pretty linear which didn't leave any room to get lost.
5	anonymous	Since I had to pick up a character to play it felt more of a engaging game.

Participants from group 2 all commented on the character swapping mechanic with some also referring to the puzzles present in the demo.

Discussion:

As partially stated in the discussion of the previous question, the aim for this question was to give participants fewer areas to elaborate on when asked to elaborate on their answers, thus ensuring that there would be an overlap in responses from participants which can be used to find common themes and reoccurring elements.

Similar to the responses in the previous qualitative question (question 4) out of the participants in group 1 only few commented on the mechanic for swapping characters whereas all of the participants from group 2 included it in their responses, this can be interpreted as the mechanic having a more memorable effect,

Whereas participants in group 1 responded with their engagement being tied to the puzzles and their complexity in the demo the participants in group 2 connect the physical movement and satisfying feeling of placing the character on the platform to swap characters.

Participant 2 in group 2 commented on the disorientation that they experienced during the demo and explained it through needing to manage the physical models but may potentially be linked to the results found in question 2 where some participants did not have experience with games that used physical components in their mechanics.

Summative player experience:

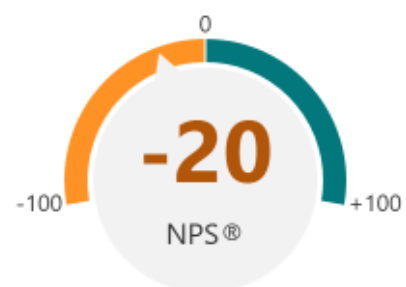
This question uses a Net Promoter Score (NPS) which asks participants to describe their experience from bored to engaged, participants whose experience leant towards the bored extreme are referred to as *detractors*, those who leant towards to engaged extreme are referred to as *promoters* and those who fell in the middling range are referred to as *passives*.

Group 1:

7. Overall would you describe your experience I while playing the demo.

[More Details](#)

Promoters	0
Passives	4
Detractors	1



The average score for overall player experience from participants in group 1 is -20, which is mostly middling with a slight lean towards negative. Most participants responded passively with results in the middle while one participant responded negatively.

Group 2:

7. Overall would you describe your experience while playing the demo.

[More Details](#)

Promoters	4
Passives	1
Detractors	0



The average score for participants in group 2 is highly positive with only one participant responding with a value in the middle.

Discussion:

The aim for this question was to gauge the difference in player experience on a range from bored to engaged between the two groups, without directing the participant to specific areas such as immersion or frustration. This question accomplished its aim from its clear separation of results gathered from the groups.

There is a very clear difference in overall experience between the two groups with group 2 reporting having a very engaging experience with the demo. This further supports research into the novelty affect (Skavronskaya, Moyle, & Scott, 2020) and how it can be used to engage players, as well as research into game controllers and their effects on player engagement. These effects combined resulted in group 2 having such a vast difference in experience than group 1 despite the only difference present in the demo being the mechanic through which the player swaps characters.

Conclusion

While physical components in games, with gameplay reliant mechanics such as the one investigated in this study, may not be re-entering the gaming industry anytime soon, it is important to understand the effect that they can have on players. This understanding can be used to develop new systems to further engage players or provide greater hindsight when reflecting on the history of the toys-to-life genre.

This dissertation set out to investigate how physical components can influence the player experience. To start this investigation, research was gathered surrounding the history of board games and the influence of controllers as these areas could provide a base for understanding how physical components can be integrated into gaming. As research was gathered surrounding this area it became clear that physical components can refer to a broad range of elements and can not only influence player experience but influence areas outside of the gaming industry as well, through providing more accessible options or rehabilitation for those with limited dexterity.

The findings from the research done as part of this study support the claim that physical objects can have a positive influence on player experience, this can be seen through not only the increase in immersion reported by the participants but additionally the difference in the overall experience that was reported by those in group 2.

The initial expectation of what the findings from this study would show was that some negative effects to players were expected due to the mechanic requiring players to take their hands away from the keyboard and mouse. However, these negative effects were not only not found but were juxtaposed by the findings with participants in group 2 reporting similar levels of frustration and exhaustion to those in group 1.

It is notable that when researching into potential effects on the player experience when regarding uncommon mechanics such as the physical component, it is likely that the novelty effect can contribute to a temporary boost in engagement from players. The testing done in this study does not take the novelty effect into account and any potential further research should mitigate this effect by comparing participant experiences after a longer time frame of playing the demo where the novelty present in the physical mechanic will potentially begin to wane.

The findings from this study into player experience can have implications beyond providing context to the success of the toys-to-life genre. As seen in the qualitative responses in each group all participants in group 2 elaborated commented on the physical component while group 1 discussed a range of areas relating to game design. This can be useful for game designers who may want to find new and interesting ways of engaging the player while keeping systems already familiar and present in place since this mechanic and ones similar to it can be easily added without encroaching on other systems.

When reflecting on areas of further study it would be interesting to explore whether these mechanics are sustainable in an industry setting, as this could be another explanation for the why toys-to-life genre declined so steeply. It is worth contemplating how needing to acquire physical figures to attain gameplay features may deter potential players through either the potential cost or space needed for storage, since all participants had both the physical scanning device and scannable characters provided for them this was an area not explored. It is also interesting to consider how using several different physical characters required per player to receive the full intended experience may be viewed in modern gaming communities as the global culture is more environmentally conscious than it was when the toys-to-life genre was at its most popular.

Gaming is an industry that will ever continue to evolve and experiment with new ways of improving the player experience, while not all experimentations will result in new technology that develops into its own established area of gaming, such as can be seen through the rapid pace at which virtual reality (VR) became its own genre and remains common place for many players. There will continue to be more types of physical components developed for games through controllers, game-specific peripherals or potentially new inventions that have not been developed yet, with each new development continuing to pave the way for the next experiment. In a culture where the player experience is growing ever abstracted in favour of reliance on virtual features it is key to remember the positive influence that a virtual-physical hybrid experience can have on players.

Recommendations

The recommendations made in this section are separated into participants with advice on how sampling and testing can be improved to gain more ideal results, and game design with recommendations on how the design of the demo may have impacted the findings of the study.

Participants

As discussed in the conclusion there are elements of the testing done in this study that do not mitigate the effect that novelty may have on the player experience, while novelty may be a driving factor for why players are attracted to physical components in games the difference in experience while accounting for the novelty effect may give results that have a greater application to a real world scenario.

The sampling done in this project contains bias through the use of volunteer sampling which potentially resulted in a higher representation of participants who were already aware of the toys-to-life genre than may be representative of the general player. Participants were also primarily gathered through university spaces which resulted in participants who have experience in various disciplines of game development, future research should be done to eliminate the effect that experience in game development may have on the player experience of this project.

Game Design

The artefact that was created for this project used a puzzle-style design due to its simple way of forcing the player to repeatedly use the switching mechanic. However, utilising this mechanic in other genres of games may have varying effects on the player experience, future research into how this mechanic can be used in different game genres should be done to evaluate whether game genre has an influence on how this mechanic affects player experience.

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Appendices

Appendices is information referred to in the main document. It is not included in the word count.

Do not put results here: only the raw data should be presented in an appendix. Other materials that may be included in an appendix includes, for example, blank questionnaires, copy of written tests used.

Remember do not include anything in an appendix that has not been referred to in the text.

Appendix 1 – Figures

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Appendix 2 – Questionnaire

GateWalkers - Player Experience Questionnaire (Physical Component Version) (2)

When you submit this form, it will not automatically collect your details like name and email address unless you provide it yourself.

1. How many times did you switch character during the demo? (This is shown at the end of the demo) 

The value must be a number

2. Have you previously played games that use physical components? (Games such as: Skylanders / Amiibo / Disney Infinity / Lego Dimensions)



☐ Yes

☐ No

3. Please indicate how you felt towards the demo on the following scale 

	Not at all	Slightly	Moderately	Fairly	Extremely
It was fun	☐	☐	☐	☐	☐
It was tiresome	☐	☐	☐	☐	☐
I felt immersed	☐	☐	☐	☐	☐
It took a lot of effort	☐	☐	☐	☐	☐
It was enjoyable	☐	☐	☐	☐	☐
It demanded focus	☐	☐	☐	☐	☐
I felt in control	☐	☐	☐	☐	☐
It was frustrating	☐	☐	☐	☐	☐

4. Please choose one section (or more) from the previous question and elaborate on your response(s) in more detail. 

Enter your answer

5. Please indicate how you felt towards the demo on the following scale 

	Not at all	Slightly	Moderately	Fairly	Extremely
It was satisfying	☐	☐	☐	☐	☐
It was disorientating	☐	☐	☐	☐	☐
It was exhausting	☐	☐	☐	☐	☐
It was engaging	☐	☐	☐	☐	☐

6. Please elaborate on one (or more) of your responses to the previous question in more detail.



Enter your answer

7. Overall would you describe your experience while playing the demo.

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Bored

Engaged

8. <https://randomwordgenerator.com/>

Please enter a randomly generated memorable word

Please keep track of this word in case you may later want to remove yourself from the study

Enter your answer