

# 3D Horror Game Development Using Unity: Evaluation of Human Psychology Through Horror Game

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**Abstract**— Games are made for entertainment purposes and have become more relevant over time. Thanks to advances in technology, game development has become more efficient thanks to game engines such as Unity. With this technology, the author developed a 3D Horror Game called "Whispers of the Dark". This horror game is made to evaluate the players' psychological aspects. The creation of this game follows the Game Development Life Cycle gradually from Ideation to Deployment. Beta testing will be conducted online and will be done to get feedback from testers. This feedback helps the author to improve the shortcomings in the game. Most respondents to the survey gave a positive response to the game that had been developed.

**Keywords**—Game, Horror Game, Game Development Life Cycle, Unity, Psychology

## I. INTRODUCTION

The video game industry has evolved greatly in the past decades, impacting several fields such as entertainment, technology, and education. Multiple factors can cause this exponential industry growth, such as technological advancement, consumer preference changes, and the spread of digital platforms. One of the most important designs within video games is provoking the players' emotions [1]. Emotion is an important component in human interaction, problem-solving, and entertainment. The role of emotion in human interaction has been found and documented scientifically for centuries.

The growth of the game industry also offers new chances for careers and innovation. Game development studios, ranging from indie developers to AAA developers, have rapidly grown and become global economic powers. The appearance of virtual reality and augmented reality technology has opened an innovation in the gaming experience. The impact of the game industry even spread to fields that might not immediately be expected, such as art, storytelling, psychology, and computer science.

In the field of entertainment, the video game industry is a very dominant sector that can even surpass the film and music industry in income numbers. One example is in the USA in 2019, where video games generated 36.9 billion USD of income, exceeding the combined income of box office and music sales [2]. Video game global income is projected to reach 159.3 billion USD by the end of 2021, which marks a significant growth trend [3]

The increase in video game relevancy has made it an integral part of education, offering an interesting and interactive learning method in the form of gamification. Research has shown that video games can effectively increase cognitive skills, decision-making skills, and even mental health [4].

Horror is a category within video games focused on themes of fear and suspense. These games aim to frighten players and are primarily driven by storytelling and visual elements, rather than gameplay mechanics like many other genres. The horror genre is significant in the gaming industry, boasting a large number of titles and a dedicated player community. Each year, the demand for more immersive horror experiences among fans continues to rise [5].

One reason that causes people to like horror games is the experience of fear [6]. These people taught that horror games are a fun experience. This is why the author wants to develop a horror game, specifically a 3D horror game using Unity.

The horror game, *Whispers of the Dark*, will be developed in Unity and played on the Windows platform. The game will be made step-by-step following the Game Development Life Cycle, starting from ideation/deconstruction, key resources, development, and prototyping. These steps will be repeated until the game is done. The goal of this game development is to make a game that can be played for entertainment and to evaluate the psychological aspect of the player when playing a horror game. Furthermore, this research explores how Unity can create horror game mechanics while studying players' emotional responses, offering potential novelty by incorporating game development and psychological evaluation. Focusing on real-time feedback, diverse player experiences, and detailed Unity workflows would offer impactful insights for game development.

## II. BACKGROUND

### A. Game Genre

There is various game available to be played for different type of people. Each of these game has different genre [7]. The following will explain some of the more popular game genre.

- Action: Game that focus on challenging physique, reaction time, and coordination between eyes and hands. Platformer, brawler, and shooter are such example of action games.

- Horror: Game that has a goal to scare and unsettle the player, which often include scary survival, eerie exploration, and psychology tension.
- Puzzle: Game relating to problem solving and challenging puzzle.
- Role-Playing Game (RPG): Game that focus on the character development. Mostly story-based and has levelling system. Subgenre include Action RPG, Turn-Based RPF, and MMORPG.
- Shooter: Game that focus on action using shooting method. Subgenre include First Person Shooter (FPS) and Third Person Shooter (TPS).
- Education: Game that is designed for learning and skill development, usually made as a learning method.
- Survival: Game that focus on resource management to survive in challenging environment.

### B. Psychology in Game

When playing a game, there are various aspects of psychology at work such as experience, behavior, motivation, and emotion [8]. These aspects need to be evaluated to make a game that players can enjoy. In the game that will be developed by the author, some of the psychology aspect that will be applied will be explained next.

- Understanding psychological factor that motivates the players to keep engaged in playing the game.
- Understanding how the game design affects the player's emotions. This is needed so the game can offer a fun experience for the player.
- Understanding how the horror aspect of the game can induce fear and thrill to the player. Both of these aspects will be measured when the players play the game and from the player's testimony.
- Evaluation of the player's inhibition. Inhibition is a hindrance to human response when they face a situation that coerces them to make a decision. When there is less time to make a decision, humans oftentimes make a wrong decision [9].
- Understanding the factor that will make the player play the game excessively. Game addiction can cause problems for the player's social and emotional aspect [10], which the author wants to avoid.

### C. Game Design Document

Game Design Document (GDD) is a blueprint that explains the video game's detail and specification during the development process. GDD contains information about the game concept, game mechanisms, characters, levels, story, arts, sounds, and other elements that are important for the game design and development [12].

## III. METHODOLOGY

### A. Requirement Gathering

In the game development of *Whispers of the Dark*, the author will do the ideation process to determine what should be done to make the game well-received. There will be two methods that will be used to gather the necessary information

to start the game development, which is online beta testing and survey.

#### a) Online Beta Testing

Online beta testing is a method to test the game by a group of certain users before the game's release. The chosen players are experienced in either playing or making games. The result of this testing will be used as the baseline for the game development.

#### b) Survey

Survey is a generic method to gather information from other people to further the understanding of the individual's preference and opinion. The author performs the survey through Google Forms. The summary of the survey out of 34 respondents is that the main target audience of the game is 23-26 years old male that like to play video game.

### B. Game Development

To develop this game, the author will utilize the Game Development Life Cycle (GDLC). GDLC is a process to develop a video game, starting from the concept until the release of the game [11]. GDLC provides a clear process for making games. It helps organize tasks, improve teamwork, reduce risks, ensure quality, and manage costs. The process is flexible in iterative models and encourages creativity during planning. However, it can take a lot of time and resources. Challenges might include keeping the project on track, handling large teams, and keeping up with fast-evolving technology for a long-term project. To guide structured game development, GDLC covers the steps, methodology, and practice of creating a game. The following will explain the process of developing a game with GDLC.

- 1) *Concept and Pre-Production*: Game idea brainstorming, art concept creation, and the planning of the scope, budget, and timeline.
- 2) *Design and Prototyping*: Designing the game mechanism and visual in detail. The prototype will be used for testing the gameplay concept.
- 3) *Production*: The main phase of the game development, which includes coding, art creation, sound design, and level design.
- 4) *Quality Assurance and Testing*: Testing the game to find bugs and other problems which is done to assure the game's quality. Feedback will be gathered and further fixing will repeatedly be done.
- 5) *Marketing and Promotion*: Planning the marketing strategy and promotion to attract players' attention to play the developed game.
- 6) *Launch and Distribution*: Releasing the game to a distribution platform.
- 7) *Post-Launch Support and Updates*: Support, update, and patching that will be done continuously to improve players' experience and fixing occurring bugs based on the players' feedback.

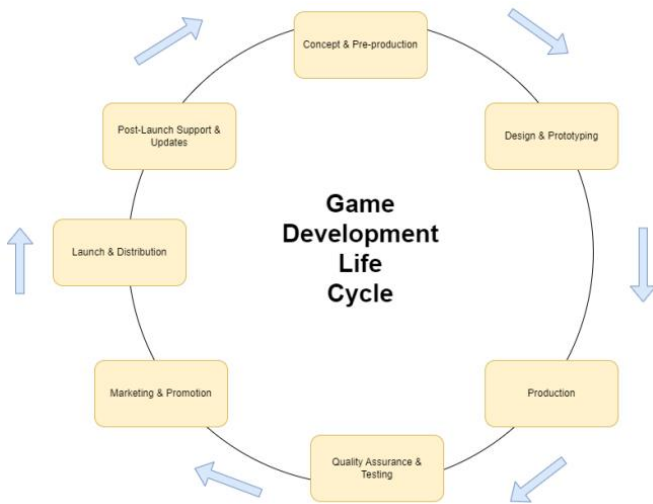


Fig. 1. Step of Game Development Life Cycle

Multiple tools will be used in the process of developing the game. Each tool has its own function such as coding, designing arts, and designing sounds.

a) *Unity*

Unity is a game engine that allows developers to make games or applications, including 3D games. Its flexibility and extensive development features made unity popular [13]. One of the important features that will be used for developing *Whispers of the Dark* is Navigation Mesh (NavMesh). NavMesh is a data structure that facilitates pathfinding, which will be used to represent the environment in the game that can be traversed. The other feature that will be used a lot is Trigger Area, which is used to trigger an event based on a specific colliding condition.

b) *Adobe Photoshop*

Adobe Photoshop is a graphic editor software developed by Adobe Inc. This software can be used for image editing and graphic designing. There is a lot of features offered by this software like layer, filter, and image manipulation, making it a multipurpose application for amateur to professional [14].

c) *Paint Tool SAI*

Paint Tool SAI is a software developed by SYSTEMAX that is used to make digital art and illustrations. User friendly and various tools make this software popular for artists.

d) *Figma*

Figma is a cloud-based designing tool that is used for a collaborative interface design. It can also be used to make prototype and vector graphics. With cloud, the same project can be done by a lot of users concurrently.

e) *FL Studio*

Fruity Loops Studio is a digital audio workstation software that is used to music production, recording, editing, and mixing.

f) *SketchUp*

SketchUp is a 3D modelling software that is used a lot for designing architectures, interior, environment, etc. This software lets the user create and edit 3D models intuitively with its user-friendly interface and accessibility.

g) *Blender*

Blender is a free and open-source software that can be used for interactive 3D modelling.

h) *Mixamo*

Mixamo is an online service platform that offers character and 3D animation collection to be used in 3D projects. Acquired by Adobe in 2015, Mixamo can make the process of animating character simpler using a wide variety of pre-animation available.

i) *VRoid Studio*

VRoid Studio is a software to model and design 3D characters that is developed by Pixiv. This application enable user to create 3D characters easily, specifically virtual avatars.

C. *Evaluation*

To make sure the game is ready to be released, evaluation must be done. There will be three methods that will be used to evaluate both user experiences and the game itself, which is Black Box Testing, online beta testing, and survey.

a) *Online Beta Testing*

Online beta testing is an evaluation method where there will be some people that will test the game in the development process. This evaluation will be done live through Discord, where the player will stream their game with the author. Live feedback will be noted.

b) *Survey*

Survey is an evaluation method to get feedback from people without any time or place constraint. The survey will be a digital questionnaire that is spread to some online community and social media [16].

c) *Black Box Testing*

Black Box Testing produces test cases unrelated to the software internal structure, but the software specification. In this testing, the author considers the game's goals, user's feedback, the possibility of failure within the program, and the possibility of the program usage [15].

IV. RESULT AND DISCUSSION

A. *Game Design*

*Whispers of the Dark* is a first-person 3D horror game that's designed as a tool to evaluate players' psychology. The game will be designed in Unity with C# programming language. The game will have an immersive gameplay with semi-realistic graphic and eerie ambiance. The concept design of this game will be explained as follows.

a) *Story Concept*

In *Whispers of the Dark*, the player will play as a female college student named Devi. In the story, Devi is kidnapped and brought to an unknown place, where she's awake in a scary forest. To survive, the player needs to help Devi to find items within the forest and exit the place.

b) *Setting Concept*

The setting of this game will be a spooky forest, with trees acting as walls that entrap the player character within. The atmosphere of the game will be foggy night. The enclosed place will be used as a maze that the player needs to navigate to find an exit.

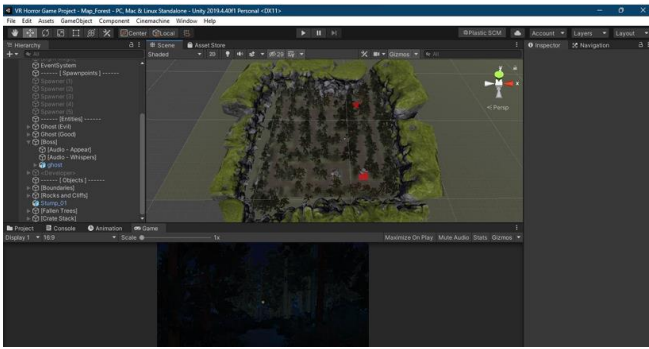


Fig. 2. Map Design

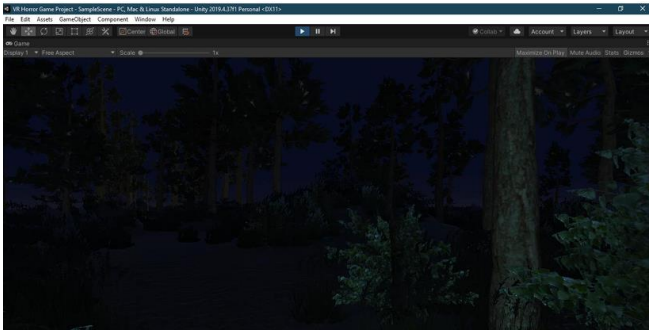


Fig. 3. Environment Design

### c) Character Concept

There will be two characters in this game, the main character that the player will control and a ghost entity that will be the main enemy. The main character is a female college student named Devi Blau, while the ghost entity will have an appearance of a woman possessed and overtaken by an actual ghost. The backstory of the main character is that she has just leave her campus very late and kidnapped to this place, while the backstory of the ghost entity is that she's a former kidnapping victim that failed to escape.



Fig. 4. Main Character Concept



Fig. 5. Ghost Entity Concept

### d) Gameplay Concept

The core gameplay loop is that the player needs to interact with the environment while being chased by the ghost. If the player is caught by the ghost, a jump scare will occur and the player character will be penalized. If the player successfully guides the main character to escape, the player wins.

### B. Game Implementation

Firstly, the game design and mechanism is prototyped. UI is made with Figma, while the rest is made with Unity. Some 2D and 3D model assets are also made by the authors to be used in game. These assets are made to avoid copyright issues once the game is published. There is also a soundtrack for the title screen that the author made in FL Studio.

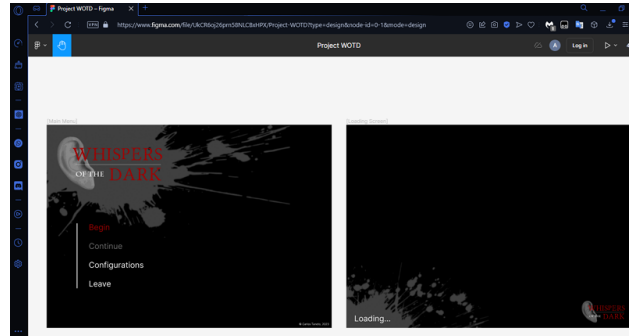


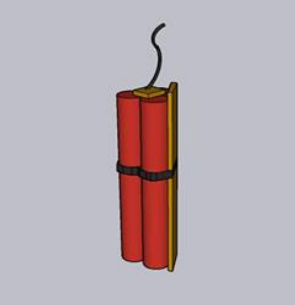





Fig. 6. UI Design

TABLE I. GAME ASSETS

Assets	Description
	3D model of a pickaxe made in SketchUp
	3D model of an old house made in SketchUp
	3D model of the main character, Devi Blau, made in VRoid Studio
	3D model of the ghost entity character made in vRoid Studio

<i>Assets</i>	<i>Description</i>
	3D model of the main character's passport made in VRoid Studio
	3D model of an opened crate made in SketchUp
	3D model of a dynamite made in SketchUp
	Map based on spooky forest made in Unity
	A fake note containing clues for in-game puzzle made in Adobe Photoshop
	The game's logo for the title page made in Adobe Photoshop

There are many features that has been implemented to the game. These features come from the author's concept and the players' feedback.

- Configuration menu where the player can set the game settings such as head bobbing, mouse sensitivity, field of vision, and brightness up to their preferences.
- Story cutscene that will be played at the start of the playthrough. This cutscene can be fast forwarded or entirely skipped.
- Survival elements such as sanity and hunger. Hunger will decrease overtime, and once it's empty, sanity will also decrease. When sanity drop to zero, the player loses.
- In-game time that doesn't correspond to real time. One hour in game equal to one minute in real world. The longer the player escape, the scarier event will be triggered.
- Pause menu that doesn't pause the game. Here, the player can access configuration menu or declare surrender. The game is intentionally made cannot be paused to increase the thrilling experience.
- Looting mechanism where the player can collect items to survive. These items can be accessed through inventory. Some items categories are consumable items that can counter the hunger bar and tools that is needed to destroy obstacle to make new path.
- Defeat and victory screen to show the outcome of the player's playthrough.

### C. Game Deployment

The finalized game will be promoted on Discord and itch.io, where the compiled game is shared with executable format. The download size has successfully been reduced up to three times smaller, making it easier for the player to download the game. The feedback received from the deployed game is noted to be implemented in the next version of the game.

Not every device can run the game *Whispers of the Dark*. This game is designed to run with minimum specifications as follows.

TABLE II. SYSTEM REQUIREMENTS

<i>System Type</i>	<i>Requirement</i>
Operating System	Microsoft Windows 11 Home Single Language
Processor	Intel® Core™ i5-8250U CPU @ 1.60GHz, 1800 Mhz, 4 Core(s), 8 Logical Processor(s)
Screen Resolution	1280 x 720 (16:9)
RAM	4.00 GB
Graphic Adapter	NVIDIA GeForce MX130

### D. Game Evaluation

#### a) Online Beta Testing

From the online beta testing, the author observe the player playing the game in real time. Many tester suggest to make the game more thrilling to cause more fear. Once these feedbacks is implemented, the author observe the increase in user experience. Each testers have different way to play the game, like speed run to the finish, enjoying the graphic, and exploring the entire map.

#### b) Survey

From the survey, it can be concluded that most respondents quite often play video games, mainly survival and RPG genre game. There is still quite a lot of horror game player, which is 36.7%. After playing *Whispers of the Dark*, most respondent like the game. There is also various feedback regarding the game, such as improve the audio-visual aspect, make puzzle with time limit, and more gruesome scenes.

### c) Black Box Testing

The following table is the result of the black box testing, with each test done five times.

TABLE III. BLACK BOX TESTING RESULT

Case	Result	Status
Movement	5/5 (100%)	Pass
Inventory	5/5 (100%)	Pass
Object Interaction	5/5 (100%)	Pass
Settings Synchronization	5/5 (100%)	Pass
AI Agent	5/5 (100%)	Pass
Timer	5/5 (100%)	Pass
Lose Conditions	5/5 (100%)	Pass
Win Condition	5/5 (100%)	Pass
Puzzle	5/5 (100%)	Pass
Item Interaction	5/5 (100%)	Pass
In-Game Menu	5/5 (100%)	Pass
Graphics	5/5 (100%)	Pass
Audio	5/5 (100%)	Pass
Gravity	5/5 (100%)	Pass

## V. CONCLUSION

Game marketing is still growing in Southeast Asia, which creates an opportunity for the author to contribute to the game industry. The game horror *Whispers of the Dark* has successfully been developed and deployed by following GDLC. The game is very connected with human psychology because of the horror genre, where the player can feel a thrilling experience caused by the eerie atmosphere, sanity bar, ghost chasing the player, and the choices that need to be made to escape. Implemented features include puzzles, timer, maze, obstacles, advanced AI agent, and survival elements. Testing shows that the game works as expected. The author suggests developing non-horror games in the future to attract

more players. With the rapid growth of video game development, the new game doesn't need to be made from scratch but uses the available game engine to save resources.

## AUTHOR CONTRIBUTION

C. Tanoto, M.H. Widiyanto, and J. Sandy contributed equally to the manuscript's conceptualization. C. Tanoto and J. Sandy handled the literature review, game development, and evaluation. M.H. Widiyanto supervised the research and provided critical revisions. All authors contributed to the final discussion and results analysis.

## DATA AVAILABILITY

The result of the research is available on this link:

<https://data.mendeley.com/preview/gz6pvdw9t7?a=80183c54-913d-4e2e-89fc-9d6fe7d3bf26>

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