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Cross-Platform Combat: Analyzing Player Experience Differences Between Mobile and PC

Master's thesis in Computer science and engineering

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Abstract

This study focuses on the experience difference in cross-platform combat and explores the differences in player operation experience, feedback perception and satisfaction on PC and mobile terminals under the same combat system structure. By building a horizontal 2D action game demo, the game mechanism is kept consistent on different platforms, and only the input method and UI interaction are adjusted to eliminate the influence of other interfering variables. The study adopts a mixed method, combining preliminary questionnaire surveys, custom development of demos for the project, three rounds of field trial tests and subsequent data analysis, to systematically evaluate the player experience from five dimensions: accessibility, operability, satisfaction, immersion and inclusiveness. The results show that even if the core mechanism is the same, different platforms still have a significant impact on the player's operation fluency and emotional feedback in terms of input accuracy, interaction rhythm and UI layout, especially in terms of skill release, strike perception, rhythm control and other aspects. Different preferences are shown. This study not only provides a theoretical framework and empirical basis for the design of cross-platform game combat systems, but also puts forward a series of optimization suggestions to help developers more effectively improve the consistency of operation experience and player satisfaction on multiple platforms.

Keywords: Cross-platform games; combat system; skill system; user experience; input mechanism; human-computer interaction; operation feedback

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1

Introduction

1.1 Background and Importance of Combat Design

Combat design is an important aspects of video game development, influencing not only player engagement but also overall enjoyment and retention. Well-designed combat systems create a sense of immersion and flow, allowing players to develop strategies, master mechanics, and feel a sense of accomplishment. The combat experience can shape the narrative impact of a game, reinforcing themes of challenge, survival, or empowerment.[1]

Throughout the evolution of video games, combat mechanics have exhibited significant variations in both complexity and platform implementation, shaping player engagement and overall gameplay experience. Some games, such as Soul Night[2], employ simple button-mashing mechanics, where players execute attacks using minimal controls. While such systems enhance accessibility and cater to casual players, they may lack the strategic depth that some players seek. Conversely, highly intricate combo-based combat systems demand precision, mastery, and a deep understanding of mechanics, often appealing to experienced players who enjoy skill expression and complex decision-making.

However, beyond combat complexity itself, the platform on which a combat system is implemented can significantly alter the player's experience. Games played on PCs often benefit from precise input mechanisms, such as keyboards and controllers, allowing for greater mechanical depth and responsiveness. In contrast, mobile gaming relies on touch controls, which may introduce limitations in input precision but offer a more accessible, on-the-go gaming experience. These platform differences may lead to varying levels of player engagement, satisfaction, and perceived difficulty, even when the core combat mechanics remain unchanged. Prior research on multi-platform playability, such as the study analyzing Fruit Ninja across Xbox and mobile platforms, has shown that despite identical core mechanics, the player experience varies significantly due to differences in interaction methods, screen sizes, and device affordances.[3] The study highlighted how task completion times and ease of control differed across platforms, emphasizing that usability, input precision, and user expectations play a crucial role in cross-platform game design.

This research aims to investigate how the same combat system is perceived and

experienced differently on mobile and PC platforms. By examining player responses across five key dimensions—Accessibility, Playability, Satisfaction, Engagement, and Inclusivity—this study seeks to develop insights into how platform-specific factors influence combat system design and player acceptance. The findings will contribute to a deeper understanding of playability in multi-platform games, building on established frameworks for analyzing cross-platform experiences. Furthermore, the results will provide game designers with guidelines for optimizing combat mechanics across multiple platforms, ensuring a balanced and engaging experience tailored to different player demographics.

1.2 The Role of Platform in Combat System Experience

One of the biggest differences between PC and mobile gaming lies in input mechanisms. PC gamers typically rely on precise input devices such as keyboards, mice, or controllers, which allow for complex mechanical depth, responsive controls, and intricate skill execution. Mobile gamers, on the other hand, interact with games through touch-based inputs, which may introduce precision limitations but improve accessibility. These differences in control schemes can lead to varying levels of engagement, satisfaction, and perceived difficulty, even when the underlying combat system remains unchanged.[3]

To better understand the influence of platform-based differences, we can examine existing cross-platform comparisons:

- PC-Optimized Combat Systems: Titles such as Dark Souls[4] and Devil May Cry[5] are designed with precise inputs and fast reaction-based mechanics, relying on responsive button presses and multiple key combinations.

- Mobile-Optimized Combat Systems: Games like Brawl Stars [6]simplify controls for touchscreen-based interactions. They often display buttons or virtual joysticks directly on the screen, offering auto-targeting, simplified attack sequences, and gesture-based actions to compensate for the limitations of touch controls.

- Cross-Platform Combat Systems: Some games, such as Fortnite[7] and Genshin Impact[8], are available on both PC and mobile. They usually use different control methods on mobile and PC, so player experience are varies due to different control schemes, screen visibility, and UI adjustments.

While previous studies have explored combat system complexity, fewer works have focused on how platform differences impact the same combat mechanics across different devices.[3] This research seeks to investigate how player experience, engagement, and performance change when playing the same combat system on PC versus mobile.

1.3 Research Objectives and Expected Contributions

This thesis will employ a structured framework to measure and analyze the impact of platform differences on combat system experience. The research question of the project is:

What are some of the ways in which platfrom difference impacts on players combat experience

The study consciously excluded non-core variables such as character death, complex enemy AI, skill cooling, resource collection mechanism, narrative content. The reason for this design is:

- Control variables to ensure that platform differences are the only independent variables.
- Reduce strategy interference and focus on operation perception and feedback experience.
- Reduce learning costs and improve the pertinence and effectiveness of player feedback.

These exclusion strategies ensure that the effects of platform differences can be accurately observed and quantified in controllable and clear interaction scenarios.

The research will include:

- Prototyping two identical combat systems—one for PC and one for mobile—to compare player interaction, responsiveness, and engagement across platforms.
- Conducting player testing and feedback collection using surveys, gameplay metrics, and structured interviews to measure player perceptions of combat experience across devices.
- Analyzing the collected data to identify key differences in usability, engagement, satisfaction, and playability between PC and mobile combat systems.
- Providing insights for game developers to optimize combat system design for cross-platform games, ensuring a balanced experience regardless of platform.

By achieving these objectives, this study will contribute to cross-platform game design research and player experience analysis, offering practical recommendations for game developers who aim to create seamless and enjoyable combat systems across multiple devices.

2

Background

2.1 Evolution of Research Focus

This study originally aimed to investigate how combat system complexity affects player acceptance, with a focus on analyzing how different levels of complexity influence accessibility, engagement, and satisfaction. The initial plan involved developing prototypes with varying levels of complexity and evaluating how players reacted to different combat mechanics.

However, during the preliminary research phase, a Likert-scale questionnaire was distributed to players to gather insights into their preferences regarding combat mechanics. The collected data revealed that a significant number of respondents, especially Chinese players, prefer playing games on mobile devices rather than on PCs or consoles. This finding suggested that the choice of platform plays a critical role in shaping player experience and combat system usability, potentially influencing player engagement more than combat complexity alone.

Based on these insights and in consultation with my advisor, the research focus was adjusted to explore how the same combat system is experienced differently on PC and mobile platforms. This revised study investigates whether input methods, UI design, screen sizes, and platform-specific constraints influence how players interact with and perceive combat mechanics. By shifting from complexity as the central variable to platform-based experience differences, this research aims to provide insights that are more applicable to modern cross-platform game development.

2.1.1 Inspiration for the topic and personal observations

In my personal gaming career, I have long observed significant differences in cross-platform experience. For example, although League of Legends and League of Legends Mobile share the same intellectual property, they are essentially two different games, with no data interoperability, and targeted adjustments have been made to hero skill design and map structure. However, works like Honkai Impact 3 and Genshin Impact have achieved almost completely identical content and account interoperability between PC and mobile terminals, with only slight changes in the operating experience due to different hardware input methods.

These phenomena have aroused my strong interest: when the content remains similar or even consistent, how big is the experience change caused by the differences in

platform input and interaction? Do platform factors have a decisive influence on players' operating experience, satisfaction, and sense of participation? Based on this thinking, I finally came up with and established a research topic with the theme of "Analysis of Cross-Platform Combat Experience Differences", aiming to deeply understand the mechanism of platform characteristics shaping the game experience through systematic comparison and empirical testing.

2.2 Research Hypotheses

Before formally conducting playtesting, I proposed several preliminary hypotheses based on the prestudy questionnaire and my development experience.

First, given that the two platform versions of the Demo in this study are completely consistent in terms of combat system, level structure, and skill design, it is expected that player feedback will focus mainly on differences in operational feel and interface experience, rather than differences in the content of the gameplay itself. In addition, since most respondents have relatively little experience in combat games on mobile platforms, it is speculated that they will spend more time adapting to the operation mode of the mobile Demo, which may affect the initial experience fluency and rhythm perception.

In terms of interface layout, due to the limited screen size and the need for operation buttons to stay on the screen, the mobile terminal may occupy a large amount of visible area, causing information obstruction and mis-touch during combat, further interfering with the player's operational judgment and immersion. In contrast, the input on the PC side is more flexible, especially in terms of skill release, with the help of the keyboard, multi-finger simultaneous control can be achieved, and the operation path is shorter. On the mobile side, it is necessary to expand the skill bar by clicking the skill switch button additionally, forming a significant difference in the interaction process. This paper speculates that this difference in operational burden will be reflected in the user's subjective feedback on the convenience of skill release.

2.3 Types of Combat Systems Across Different Platforms

2.3.1 Early combat system

Early game battles were usually simple, and due to the low penetration of PCs, games were usually played on specific devices (game consoles or arcade machines). Game manufacturers, who were also game device developers, usually customized a set of operating buttons for different games, which meant that the buttons on a device usually only supported a few specific games on that device, and the objects controlled by the player had only simple movements and one or two attack methods. [9]

Tank[10], a 1974 console game. Citing Wikipedia's description, Tank is a two-player

maze game in which each player controls a tank and tries to shoot each other. The maze is a set of squares set at right angles to each other, with an empty square area in the center, which is the same when viewed from above; the shape of the maze is not symmetrical and is the same in different games. One of the tank sprites is white, the other is black, and the central area is filled with black X marks representing mines. Tanks can fire shells, and if they hit another tank, the shells will destroy the other tank; if the tank hits a mine, it will also be destroyed. The destruction of a tank will give the opposing player one point, during which the other tank cannot shoot, and then the tank will return to its original position. In this game, players can control three types of tank actions: moving, attacking and laying mines.

From today's perspective, such a combat system is very simple. However, with the upgrade of hardware technology and the emergence of game engines to integrate various game technologies, the game's combat has become more and more diverse, and different performances have appeared on different game platforms.

2.3.2 Combat Systems in PC Games

PC gaming has historically favored mechanically complex combat systems due to the availability of precise input devices such as keyboards and mice. These input methods allow for frame-perfect execution, intricate combo systems, and highly responsive interactions, making them ideal for games that require high skill expression and real-time decision-making [11]. Games such as Dark Souls[4] and Devil May Cry[5] exemplify this trend, as they require precise timing, multiple button inputs, and mastery over movement and attack execution, something that is more difficult to achieve using console or mobile controls [12].

Additionally, the PC platform allows players to customize buttons. Players can customize key remapping, macros, and adjustable mouse sensitivity to optimize control efficiency. These features enable highly personalized combat interactions, but they also contribute to a steeper learning curve, making accessibility a potential barrier for casual players or those unfamiliar with complex key mappings.

2.3.3 Combat Systems in Console Games

Most console games are currently operated through controllers, which usually do not have as many buttons as keyboards. However, since controllers are designed specifically for playing games, they can be customized by manufacturers to give players a richer experience. For example, the controller designed by Sony for PS5 can provide a series of special feedback such as lighting and vibration when used with games released by Sony. For example, in Astro Robot[13], a PS5 exclusive game, the controller will give feedback when performing some operations during the game, such as there is a scene where the player needs to pull out the plug. During the process of pulling out, the player needs to keep pulling the handle lever, and the handle will vibrate at a high frequency until the operation is completed.

The controller keys are not as rich as the keyboard, to compensate for the limitations of analog stick aiming, many console games integrate auto-targeting and aim-assist

features, which help maintain combat fluidity and usability[14]. These features ensure that players can perform precise attacks despite the inherent lack of precision compared to mouse-based aiming.

2.3.4 Combat Systems in Mobile Games

Mobile gaming has introduced an entirely different paradigm for combat system design, as it primarily relies on touchscreen-based inputs rather than physical buttons. Unlike PC and console games, mobile combat systems often sacrifice precision for accessibility, making them easier to play but limiting skill-based interactions [15]. Many mobile games, such as Genshin Impact[8] and Diablo Immortal[16] implement auto-attack systems and tap-based interactions to mitigate the constraints of touchscreen controls.

To accommodate smaller screen sizes and limited tactile feedback, mobile combat systems often feature larger UI buttons, auto-targeting mechanics, and adaptive difficulty balancing, ensuring that gameplay remains fluid despite the absence of a physical input device [3]. These adjustments help make combat mechanics accessible to a wider audience, particularly casual gamers who may not be accustomed to traditional action combat systems.

However, these design adjustments inevitably result in a trade-off between accessibility and mechanical depth, as mobile games often sacrifice precise input control in favor of streamlined, touch-friendly interactions. The lack of physical button feedback and the constraints of multitouch input limit the complexity of combat mechanics, making precise timing, combo execution, and advanced maneuvering more difficult compared to PC and console platforms [15]. While these simplifications enhance playability for casual gamers, they may also lead to reduced skill expression and engagement, particularly for players accustomed to high-precision, reaction-based combat systems [3]. As a result, mobile combat tends to focus on auto-assist features, gesture-based inputs, and adaptive difficulty, which, while effective in broadening accessibility, may not fully satisfy players who seek deeper, skill-based challenges.

2.4 Game Design Theory

One of the most influential frameworks in game design is the Mechanics, Dynamics, and Aesthetics (MDA) framework) proposed by Hunicke, LeBlanc, and Zubek (2004).[17] This model highlights the interconnection between a game's mechanics (rules and interactions), dynamics (how mechanics play out), and aesthetics (the player's emotional response). Studies using MDA have suggested that combat complexity should be designed to balance challenge and engagement[18].

Flow Theory is another key concept, describing an exhilarating state of mind characterized by total immersion and complete absorption in the activity itself. It describes how a person enters an optimal state of engagement when the challenge level matches their skill.[19] Even though this theory was not developed for game design, it was quickly referenced by game designers because the goal of the game is to make the player enter such a state. Games that achieve a balance between accessibility and

depth allow players to remain in the flow state, preventing frustration (too difficult) or boredom (too easy).

Some researchers found that combat systems in existing games are often either too simple and smooth, or complex and non-intuitive; and discussed the role of cognitive load in combat systems, etc.[1] However, it is rare to see articles that want to develop a set of standards to quantify the complexity of combat systems, and only focus on a small number of games. The development of combat system theoretical frameworks is also seen to better understand the combat system itself, but does not discuss the impact of the complexity of the combat system on players.[20]

2.5 Comparative Analysis of Combat Systems in Modern Games

Combat systems in video games have evolved significantly, ranging from turn-based mechanics to real-time action systems. Various studies have explored player engagement, cognitive load, and accessibility in different types of combat mechanics[17]. However, most existing research has focused on either a specific game or genre, without a direct comparison of how combat mechanics are perceived across different platforms.

2.5.1 Turn-Based vs. Real-Time Combat Systems

Turn-based combat systems were dominant in early video game history, providing a strategic and methodical approach to encounters. Many classic RPGs, including Honkai StarRail and Persona 5, utilize turn-based combat, allowing players to carefully consider their moves without time pressure. In both games, even during combat, players have theoretically unlimited thinking time once it is their turn to act.[21][22]

Aker et al. (2016) conducted a comparative study on multi-platform game mechanics, analyzing Fruit Ninja across different control schemes, including touch-based mobile inputs and motion controls on consoles.[3] The study found that interaction methods significantly affect engagement and usability, which aligns with the challenges of implementing real-time combat on different platforms. While real-time combat offers a more immersive experience, it can also create higher cognitive load, particularly on less precise control schemes like touchscreens [23].

2.5.2 Player Adaptability in Complex Combat Systems

Games with high combat complexity, such as Dark Souls, often require high precision, timing mastery, and deep mechanical understanding[4]. However, not all players enjoy high-difficulty combat mechanics, and some studies suggest that gradual skill progression systems can improve accessibility without sacrificing depth. This is also the best learning for humans recognized by flow theory.[19]

Additionally, some multi-platform action games, such as Genshin Impact and Fortnite, incorporate adaptive difficulty settings and auto-aim mechanics to allow players who have not played the game before to quickly get started [8]. Research on mobile-first combat mechanics suggests that players struggle with complex control schemes on touchscreen devices, leading to a preference for simplified combat mechanics that rely on tap-based or auto-attacking features[15].

2.5.3 Cognitive Load and Player Retention

Cognitive Load Theory [23] suggests that games with excessive mechanical complexity can overwhelm players, while those that introduce difficulty gradually through skill trees, tutorials, or guided mechanics enhance long-term retention and enjoyment. In mobile games, developers often use simplified combat controls, auto-attacks, and adaptive UI scaling to reduce cognitive overload. For example, compared to Diablo Immortal and the original Diablo PC version, its combat has been greatly simplified, adding automatic enemy detection, remote sensing control skill release and other simplified combat operation settings.[16]

Research on game controller usability found that first-person shooters on consoles implement aim-assist features to compensate for the lower precision of gamepad controls, a strategy similarly applied to mobile action games. [14] This suggests that combat system usability is not solely about mechanical complexity but also about how controls are optimized for each platform.

2.5.4 Differences from Prior Studies

While previous research has investigated combat mechanics, cognitive load, and engagement, few studies have directly compared identical combat systems as a whole across different platforms, instead, they just focus on a few games. Many studies focus on specific genres or mechanics within a single platform, rather than examining how player perception changes when the same combat mechanics are implemented on PC versus mobile.

This study aims to contribute by:

- Develop two similar battle demos, one for PC and one for mobile.
- Conducting empirical player testing to measure engagement, accessibility, and satisfaction.
- Identifying usability differences between PC and mobile combat systems, particularly in terms of input precision, responsiveness, and playability.

This research aims to explore how identical combat systems are perceived differently on PC and mobile platforms by work on real-world player feedback and statistical analysis, which will highlighting the impact of input methods, UI design, and control responsiveness on player experience. The findings will help game developers refine cross-platform combat mechanics, ensuring a balanced and engaging experience tailored to the strengths and limitations of each platform.

2.6 Research question description

The primary question this thesis seeks to answer is: What are some of the most impactful ways in which platform difference impacts on player's combat experience? While combat system design is often analyzed in terms of complexity and engagement, relatively few studies explore how platform-specific factors such as input methods, UI layout, and control responsiveness impact player experience. This research examines how identical combat mechanics are perceived across platforms, with a focus on five key dimensions of player acceptance:

- Accessibility – In this project, Accessibility means the difficulty for players to understand, learn, and effectively operate the combat system on PC and mobile. In other words, accessibility is the first threshold indicator to measure whether the platform interaction design can effectively support players to complete basic combat behaviors. Accessibility emphasizes whether players can quickly understand and master the combat system under the limitations of platform hardware and interface, especially on touch devices. Research shows that the interaction threshold is the decisive factor affecting the user's first contact experience, especially for non-core player groups. Clear input mechanism and interface layout will directly affect the game stickiness and abandonment rate. [24]

- Playability – The degree to which combat remains enjoyable and responsive across different platforms, considering factors such as input lag, screen layout, and control precision. Playability is a core criterion for evaluating the interactive fluency and operation feedback of the system during platform conversion. Input delay, control density and interaction misalignment in platform adaptation are often the fundamental sources of cross-platform game experience differences.[25] Playability also covers the degree of interference of response speed, input accuracy and visual layout on the operation rhythm.

- Satisfaction – The extent to which players feel accomplished and engaged after combat encounters, and how different input methods contribute to that experience. Satisfaction can represent the player's emotional evaluation and value perception of the combat experience, and is often related to the fit between the sense of achievement and system feedback. Satisfaction is also closely related to the clear mapping between operation and feedback. The control methods and combat rhythms of different platforms directly affect the player's subjective judgment on the fairness of the system and the quality of feedback. [26]

- Engagement – The ability of the combat system to maintain player interest, encouraging experimentation and strategic decision-making within the constraints of each platform. Engagement is the core psychological state of players paying attention, forming a sense of rhythm, and having a smooth experience during the operation process. Flow theory[19] points out that the degree of match between system challenges and player skills determines whether an "flow state" can be formed, and the difference in input mechanisms is the key platform

factor that affects this balance.

- Inclusivity – How well the combat system accommodates players of varying skill levels and play styles, ensuring that both casual and experienced players can enjoy the game regardless of platform. Inclusivity focuses on whether players of different skill levels and styles can have a positive experience on each platform. This is particularly critical on mobile terminals because their user groups are more diverse. Combat systems that ignore player diversity will reduce overall acceptance and long-term retention rates, said John L. Sherry.[27]

The reason for giving priority to these five dimensions is that, first, these five dimensions together constitute the complete path from "contact threshold" to "emotional identification" in user experience, covering the entire process from system learning to deep participation. Their selection is not only based on the general evaluation standards in the field of game design, but also combines the platform adaptation characteristics and the differences in player groups.

Secondly, compared with other possible indicators, such as art style preference, plot context, this study is because they are more directly related to the interactive logic of the combat system itself and can clearly reflect the specific impact path of platform differences on the experience. In addition, the above dimensions have been repeatedly mentioned and verified in many cross-platform experience evaluation studies, so they have high theoretical stability and empirical value.

This research contributes in several key ways:

- Bridging the Gap Between Platform Differences and Player Experience – Previous studies focus on combat mechanics within a single platform, but few explore how the same mechanics translate across PC and mobile. This study will provide insights into how developers can optimize combat mechanics to feel natural and engaging on both platforms.
- Providing a Multi-Dimensional Framework for Cross-Platform Combat Analysis – While many studies assess gameplay mechanics, engagement, and usability, this research introduces a five-dimensional framework that evaluates accessibility, playability, satisfaction, engagement, and inclusivity across platforms.
- Empirical Validation Through Player Testing – Most existing studies rely on theoretical models of game design, whereas this research will develop and test combat system prototypes on both PC and mobile, collecting real-world player data to validate usability differences.
- Insights for Multi-Platform Game Development – Existing research often focuses on either mobile or PC games separately, without considering the differences in player expectations and usability between platforms. By comparing player interactions across both, this study will provide actionable insights into cross-platform combat system adaptation.
- Practical Guidelines for Game Developers – By identifying how input methods, UI limitations, and screen interactions affect combat experience, this

research will help developers refine their combat systems to maximize usability, engagement, and satisfaction across multiple platforms.

Through this research, I aim to contribute to the understanding of how combat mechanics should be adapted for different platforms, equipping game designers with methodologies and frameworks to enhance cross-platform combat system design.

3

Theory

3.1 Theory used

This research integrates established theories from game design, player experience, usability studies, and cognitive psychology to analyze how platform differences impact the perception and playability of the same combat system on PC and mobile. This research only focuses specifically on real-time, action-based combat systems. Others like turn-based, strategy-heavy, or indirect combat systems, such as Civilization, HOI are explicitly excluded. The reason for this is that real-time action combat places a much heavier reliance on input precision, response time, and flow of interaction[28], which are highly sensitive to platform differences between PC and mobile devices. So, action combat systems allow a more clearer, more measurable comparison of how platform input schemes like keyboard, mouse, and touch screen will impact player experience. The key theoretical perspectives include:

1. Mechanics, Dynamics, and Aesthetics (MDA) Framework
   The MDA framework proposed by Hunicke, LeBlanc, and Zubek[17] is one of the most widely used models in game design. It breaks down the player experience into three interconnected components:

   - Mechanics: The rules and structures that define combat interactions, such as attack types, cooldowns, and resource management.
   - Dynamics: How mechanics interact with each other and the player's choices, including combo systems, timing, and enemy AI behavior.
   - Aesthetics: The emotional and psychological response evoked by combat, such as the satisfaction of executing a perfect counterattack.

   This framework is used in this study to categorize different levels of combat complexity and analyze how they affect player perception, enjoyment, and engagement.

2. Playability Framework for Multi-Platform Games
   Playability in multi-platform games has been a critical topic in game studies. Gameplay perception can change dramatically depending on the platform used [3]. Their findings highlight key factors influencing cross-platform playability:

   - Control Precision and Responsiveness: PC players benefit from key-

board/mouse or controller inputs, whereas mobile players rely on touch gestures, leading to potential differences in accuracy and ease of execution.

- User Interface (UI) and Screen Adaptation: Mobile games require larger UI elements and simplified layouts due to smaller screens, affecting visibility and reaction time compared to PC.

- Cognitive Effort and Learning Curve: Platform differences may alter the cognitive load required to perform actions, impacting learning efficiency and mastery of the combat system.

This framework is essential for this study, as it provides a structure for evaluating how platform-based playability affects combat system usability, engagement, and performance.

3. Cognitive Load Theory:
Sweller's Cognitive Load Theory[23] explains how players process information and learn new mechanics. Combat system complexity can lead to different types of cognitive load:

- Intrinsic Load: The inherent complexity of combat (e.g., learning attack patterns, timing parries).

- Extraneous Load: Unnecessary distractions (e.g., overly complex UI, non-intuitive controls).

- Germane Load: The cognitive effort that leads to skill acquisition and mastery.

This study evaluates how different combat complexities influence cognitive load and player learning curves.

4. Flow Theory
Mihaly Csikszentmihalyi's Flow Theory (1990)[19] suggests that optimal player engagement occurs when the game's challenge matches the player's skill level. Differences in platform mechanics can affect flow state by either enhancing or disrupting player immersion:

- PC combat systems offer precise controls and faster reaction times, enabling deeper skill expression and more competitive engagement.

- Mobile combat systems may lower mechanical difficulty due to touchscreen constraints, potentially making combat feel less engaging for hardcore players.

By analyzing how flow is maintained or disrupted across platforms, this study aims to determine whether platform differences significantly affect player engagement with the same combat system.

3.2 Application of Theories to The Research

Each theoretical perspective contributes uniquely to the development, testing, and analysis of combat systems in this study:

- MDA Framework: Used to structure combat prototypes and analyze how platform-specific differences affect mechanics, dynamics, and aesthetics.
- Playability Framework for Multi-Platform Games: Provides a methodology for assessing combat system usability across different input schemes, screen sizes, and UI layouts.
- Cognitive Load Theory informs the design of tutorials, UI elements, and progression systems to measure how combat complexity affects learning curves and retention.
- Flow Theory guides the analysis of player engagement trends across platforms and determines how control responsiveness and challenge balance impact immersion.

Through empirical player testing, this study will assess how PC and mobile players experience combat mechanics differently, focusing on accessibility, playability, satisfaction, engagement, and cognitive effort.

3.2.1 Testing Combat Complexity Through Prototype Evaluation

This research will develop two combat system prototypes—one designed for PC and the other for mobile—to examine how identical combat mechanics are perceived and experienced differently across platforms. A key aspect of this comparison will be the precision and responsiveness of controls, as PC players typically rely on input devices such as keyboards, mice, or controllers, which offer highly responsive and accurate interactions, while mobile players must navigate combat using touch gestures, which may introduce delays, misinterpretations, or input inconsistencies that alter the overall gameplay feel.[11] The study will also assess differences in user interface and interaction design, recognizing that PC interfaces can accommodate more complex HUD elements, button mappings, and shortcut keys, whereas mobile interfaces often require larger, simplified UI components and gesture-based inputs, which may impact the player's ability to execute actions efficiently.[11]

Additionally, the research will measure cognitive load variations across platforms, examining factors such as reaction times, error rates, and learning efficiency to determine whether certain input methods impose greater mental effort on players. It will investigate whether mobile players experience higher cognitive strain due to imprecise controls and whether PC players find more complex input schemes cognitively demanding but more rewarding over time. Lastly, player engagement and playability ratings will be collected through direct player feedback and questionnaire, allowing an evaluation of how players perceive enjoyment, frustration, and control satisfaction

in both versions of the combat system. By integrating these various factors into a structured empirical framework, the study aims to generate both quantitative data on performance metrics and qualitative insights into player preferences, ultimately providing valuable recommendations for designing combat mechanics that maintain playability and engagement across different gaming platforms.

3.2.2 Applying theories in the final analysis

The final analysis will focus on comparing theoretical predictions with empirical player data, evaluating how the same combat system is perceived and experienced differently across platforms due to variations in input methods and interaction paradigms. By analyzing real-world gameplay responses, this study will assess whether established theories on game design, cognitive load, and player engagement align with the observed differences in usability, control precision, and player satisfaction between PC and mobile versions of the combat system. The goal is to determine how platform-based factors, such as physical buttons versus touch gestures, screen size, and interface layout, influence player perception, responsiveness, and overall playability.

4

Methods

4.1 Mixed-Methods Research Design

This study adopts a Mixed-Methods Research Design, integrating both quantitative analysis and qualitative user experience research to comprehensively evaluate how the same combat system is perceived and experienced differently across PC and mobile platforms. By combining objective gameplay performance metrics with subjective player feedback, this approach provides a holistic understanding of the impact that platform-specific differences, such as input method, UI layout, and control responsiveness, have on player experience. The inclusion of both empirical behavioral data and personalized player insights ensures that the research captures not only measurable differences in reaction time, error rates, and skill acquisition but also player preferences, frustrations, and engagement levels across different control schemes. This dual-perspective methodology enables a nuanced analysis of how platform-based variations shape usability, learning curves, and overall enjoyment, ultimately informing best practices for optimizing combat mechanics in cross-platform game design.

4.1.1 Quantitative Research Approach

The quantitative component of this study focuses on collecting structured data through in-game analytics and standardized surveys. This approach enables statistical analysis to determine patterns in player preferences and performance across different combat complexity levels.

4.1.1.1 Data Collection Methods

The Survey-Based Evaluation will utilize a Likert-scale questionnaire[29] to assess player perceptions of key factors, including Accessibility, Playability, Satisfaction, Engagement, and Inclusivity. The Likert scale is a widely recognized psychometric tool in educational and social sciences research due to its ability to quantify subjective experiences while supporting advanced statistical analyses. These characteristics make it particularly suitable for evaluating how platform-based differences influence player experience and combat system usability.

4.1.2 Qualitative Research Approach

The qualitative component of this study provides deeper insights into player experiences, focusing on subjective interpretations and contextual factors that influence player acceptance of combat complexity.

4.1.2.1 Data Collection Methods

- Semi-Structured Interviews: Individual interviews will be conducted with selected participants to explore their perceptions of combat mechanics, learning curves, and preferred levels of complexity. It is a research method between structured and unstructured interviews. In this type of interview, the researcher pre-designs a series of open-ended questions to guide the interviewee to discuss specific topics. At the same time, the researcher can also flexibly adjust the order of questions or delve into new topics according to the progress of the interview.[30] It has the following advantages: 1. The researcher can flexibly adjust the questions according to the interviewee's answers and delve into related topics to obtain richer information. 2. Through open-ended questions, the interviewee can freely express his or her opinions and experiences, so the researcher can gain an in-depth understanding of the interviewee's true thoughts and feelings. 3. During the interview, the researcher can discover important topics or viewpoints that were not considered before and conduct further discussions. 4. Compared with structured interviews, semi-structured interviews can collect more detailed and diverse data, which helps to fully understand the research problem. Since this project is a single-person project, it is difficult for one person to design the entire questionnaire to avoid omissions, and semi-structured interviews can help developers fill in the gaps and find new angles of thinking.
- Open-Ended Questions: Open-ended questions allow respondents to answer freely in their own words rather than choosing from preset options. This allows for a variety of responses and avoids bias from preset options. Respondents may raise perspectives or questions that researchers have not considered, which can help reveal new research directions or improve survey design. [31]

4.2 Statistical Data Analysis

Collected data will be analyzed using descriptive and inferential statistical methods this project is using is Correlation analysis, which is a statistical technique used to measure the strength and direction of the relationship between variables, making it particularly useful for understanding how different elements of platform-based gameplay interact [32]. In this study, correlation analysis will be applied to analyzing player experience differences between mobile and PC.

The analysis will address the key questions: What are some of the most impactful ways in which platform difference impacts on player's combat experience. This project will provide a data-driven understanding of how platform differences influence combat

system perception by integrating both statistical and qualitative analyses. These findings will offer practical recommendations for game developers, enabling them to optimize combat mechanics for different platforms while maintaining a balanced and engaging player experience.

4.3 Prototyping Method

In addition to the hybrid research method, this project introduced the Evolutionary Prototyping method in the development and testing process. Evolutionary prototyping is a method of gradually improving the system through repeated iterations, emphasizing the continuous modification and optimization of the prototype based on actual use feedback, rather than completing all functional development at one time. [33] This method is highly consistent with the needs of this study, because the mid-term feedback from the player experience test has been iteratively optimized for the control logic, UI layout, skill switching mechanism and feedback system of the combat system.

The advantage of using evolutionary prototypes is that it can not only quickly verify the core assumptions in the early stage, but also flexibly respond to problems exposed in actual testing.[33]

4.4 Tools and platforms used

In order to ensure development efficiency and research quality, this project uses a variety of professional tools and platforms, as follows:

- Overleaf is a cloud-based LaTeX editing platform that supports version control and multi-person collaboration. It is suitable for high-standard academic writing and typesetting needs and is widely used in the editing process of academic papers, technical reports and other documents.
- Google Scholar is a free academic search engine that can retrieve academic literature covering multiple disciplines. It is often used to obtain relevant research results, build theoretical frameworks and consult cutting-edge research trends.
- Unity is a mainstream cross-platform game development engine that provides a variety of development functions including physical simulation, animation system, and user interface interaction. It has good cross-platform adaptability and is suitable for building interactive experience research prototypes on different terminals.
- ChatGPT is a large language model developed by OpenAI. It has natural language generation and understanding capabilities. It is often used in content generation, language optimization, auxiliary programming and education and training. It can provide intelligent support in the research and development process.

- Grammarly is an automatic grammar detection tool that can automatically detect whether the English written by the user has grammar, spelling, punctuation and other errors.

5

Time Plan

5.1 Timeline diagram

The following table illustrates my time plan:



Figure 5.1: Timeline

5.2 Ethical issues

This study follows strict ethical guidelines to ensure fairness, transparency, and respect for participants.

5.2.1 Informed Consent

All participants will be required to provide informed consent before taking part in the study. They will receive a clear explanation of the study's purpose, procedures, potential risks, and their rights as participants. The voluntary nature of participation, with the right to withdraw at any stage without consequences. Also, there will be a description of the study's objectives and data collection methods. There will be an assurance that their data will be anonymized and stored securely. And I will tell them my contact details for any inquiries regarding the study.

5.2.2 Data Privacy and Anonymity

To protect participants' privacy, all collected data will be anonymized and securely stored. No personally identifiable information will be linked to their responses. Only aggregated results will be used in analysis and reporting.And any raw data will be deleted after the study concludes to ensure confidentiality.

5.2.3 Psychological and Emotional Considerations

Given that this research involves gameplay testing, potential stress or frustration related to complex combat mechanics should be considered. For example, some players may struggle with high-complexity combat systems, leading to negative gameplay experiences. And testing multiple combat systems in a short time may lead to fatigue or confusion.

To mitigate these concerns, the project will ensure enough time for finishing all the demos and questionnaire to prevent fatigue and allow participants to opt-out of any session if they feel uncomfortable.

5.2.4 Fair Participant Selection

Participant recruitment will aim for diversity in player experience levels to ensure a balanced dataset. Recruiting players with varying gaming backgrounds to avoid bias. And I will Ensure a fair representation across different skill levels and demographics. Avoiding selection bias by using randomized invitations instead of targeting specific player types.

5.2.5 Avoidance of Coercion or Undue Influence

All incentives (if provided) will be non-coercive, ensuring that participants do not feel obligated to take part. The study will ensure incentives do not pressure participants to complete all tasks if they wish to withdraw.

5.2.6 Ethical Approval and Compliance

This project will also comply with institutional and international ethical research standards, which GDPR and other data protection laws will be considered for participant privacy.

1	2025/1/20	2025/2/10	Research combat system theory
2	2025/1/20	2025/2/24	Research relative work
3	2025/1/20	2025/2/24	Writing planning report
4	2025/2/17	2025/2/24	Design and distribute the questionnaire before developing the demo
5	2025/2/24	2025/3/3	Research and decide on the UI layout to be adopted, and the specific design of the two demos
6	2025/2/24	2025/3/2	Study and decide the differences between the two demos, including the design of auxiliary functions, hitting feel, etc.
7	2025/3/3	2025/3/9	Develop the character and enemy attribute for both demo
8	2025/3/10	2025/3/16	Develop the character skills and effect
9	2025/3/17	2025/3/26	Testing and refine the demo
10	2025/3/27	2025/4/3	Develop the operation and UI of the mobile demo
11	2025/4/4	2025/4/11	Develop the operation and UI of the PC demo
12	2025/4/8	2025/4/11	Questionnaire for the first testing
13	2025/4/12	2025/4/19	Sendfirst demo and receive feedback
14	2025/4/12	2025/4/28	Improve demo based on feedback
15	2025/4/25	2025/4/28	Design the questionnaire for collecting the feedback
16	2025/4/28	2025/5/11	Distribute questionnaires to collect feedback
17	2025/4/28	2025/5/11	Arrange the data and draw conclusion
18	2025/4/28	2025/5/25	Writing Thesis report

Figure 5.2: Time table

6

Process and Execution

6.1 Project design intention and personal positioning

With the continuous improvement of mobile device performance and the enhancement of cross-platform engine (such as Unity, Unreal) development capabilities, more and more games have begun to support the simultaneous release of PC and mobile terminals. However, despite the technical unification of platforms, there are still significant differences in the interactive experience of players on different platforms [14]. In action games, high-frequency interactive modules, especially combat systems, are often limited by the platform's own input mechanism and feedback methods, resulting in significant differences in players' experience in operation response, skill release rhythm, information recognition efficiency, etc [3].

In response to this problem, existing studies have analyzed the "experience differences of the same game on different platforms", but most of them focus on interaction methods, such as gravity sensing vs touch screen vs handle, or perceptual preferences, such as screen size, holding posture [15]. As for the **tension between the structural unity and experience perception of the combat system under cross-platform conditions**, there is still a lack of targeted prototype testing and experience research. Therefore, the original intention of this project is to use the "structurally consistent" combat system, which means maintaining consistency in operating procedures, skill functions, feedback rhythm and system architecture on different platforms to eliminate interference from non-platform factors on player experience differences, as the core variable, and systematically compare the actual experience differences of players on the combat system on PC and mobile platforms under the premise of controlling the complexity of the game and the burden of interaction, so as to provide a practical basis for the design of multi-platform combat systems.

To ensure the controllability of variables, a set of deliberately "de-strategized" combat frameworks adopted in the project. Specifically:

- All ordinary skills (Regular, Bounce, Pierce, Spin) have no cooldown and energy consumption;
- Enemies (including Boss) will not cause failure status, and in fact, the characters

are unable to die;

- The combat scene is a linear space, without additional mazes or exploration structures;
- The skill performance is consistent with the judgment logic, and only the operation method is adjusted according to different platforms.
- The purpose of these designs is to strip away the strategic complexity and failure penalty that affect the combat experience to the greatest extent, so that players are mainly affected by input methods, UI layout, and feedback mechanisms when evaluating the combat system.

In addition, based on the author's interest in cross-platform interaction design, this project uses the Unity engine as a development platform, and uses state machines and singleton patterns to build combat logic to ensure logical consistency and behavior reusability. In actual implementation, the project also introduces skill template mechanisms and UI component reuse mechanisms to achieve consistent control of the dual-end combat system, and distributes differentiated control logic (keyboard and mouse vs. joystick + button) through the platform detection mechanism.

Although the project has a certain experimental nature, all its implementations are built based on actual functional modules that can be launched online to ensure that data collection is based on real interactive behaviors rather than conceptual deductions.

In summary, this project not only focuses on the function implementation itself, but also hopes to explore how platform factors affect players' usability, responsiveness and overall satisfaction with the combat system through a design framework with consistent structure and differentiated input methods.

6.2 Game style and gameplay structure design decisions

In order to ensure the scientific nature of the experiment and the comparability of the data, this project made careful decisions on the gameplay structure and style selection. Unlike commercial games that pursue rich content and complex systems, this study uses a simplified but clearly structured 2D combat demo as the carrier for platform difference analysis. This choice not only helps to reduce the interference of non-critical variables (such as narrative structure, system depth, and player growth curve) on the test results, but also makes it easier to establish a direct causal relationship between input mechanism and interactive perception.

6.2.1 Theoretical basis for game type selection

Previous studies have shown that action games are characterized by high frequency, high feedback, and high subjective perception investment, and are therefore often used in interactive experience research [34]. Compared with strategy or role-playing

games, action combat relies more on the fit between instant input, visual response, and operation rhythm, so it is easier to show the differences in control accuracy and feedback delay between different input devices [14]. At the same time, the spatial structure and operation mode of horizontal action games are relatively linear, avoiding the additional deviation caused by differences in perspective control (such as mouse/joystick control of the camera) in 3D space [35]).

Based on the above research foundation, this project decided to adopt the horizontal action form and design short-term experience levels with combat as the core. The player's task is to use a variety of skills to deal with enemy attacks in a limited space. The core gameplay is highly focused on skill release, feedback recognition and control consistency. This structure provides an ideal environment for detailed observation of experience differences between platforms.

6.2.2 Skill system simplification and style reference

This project refers to the combat mechanism style in commercial works such as "Dead Cells", but in order to control research variables and ensure the interpretability of platform comparison, a systematically simplified combat mechanism is adopted. This design approach follows the experimental game development strategy of "minimizing functions to highlight the core of interaction" proposed by Fullerton [18], that is, without weakening player interactivity, non-core gameplay components are selectively removed to make the tested variables easier to analyze under controlled conditions.

Specifically, the skill system and enemy behavior logic in the project are designed and streamlined around the following points:

1. Four basic skills can be used at any time The player character has four basic skills: Regular, Bounce, Pierce, and Spin. Each skill has an independent attack form and performance effect, which is used to satisfy the player's complete combat experience of "release → hit → get feedback" in a short time. Although there are performance differences between these skills, the input logic, trigger method and release structure are consistent to avoid the difference in operation method covering up the actual impact of platform control on the experience. Designing such "skills with equal structural differences" not only helps to maintain the player's attention, but also makes different skills a sensitive test point for changes in input complexity between platforms. In addition, all skills can be released directly without switching character forms, predicting enemy behavior or building combo sequences, reducing strategic interference during the test process.

2. No cooldown and no energy consumption for skills In order to reduce the cognitive load caused by resource management [23]), all skills do not have a cooldown time, energy or combo threshold, that is, players can release any skill quickly and continuously, and even reuse the same skill. This design not only avoids the situation where the mobile terminal may miss the cooldown window due to misoperation, but also ensures that the high-frequency click operation on the PC terminal does not cause strategic interference to the battle rhythm.

From the perspective of experimental design, the unconstrained release mechanism makes skills a pure interaction primitive, which means its execution experience is mainly controlled by the platform input feedback and response delay. If there is a significant experience difference, it can be more clearly attributed to the input method or control accuracy, rather than the resource allocation strategy.

3. Light rhythm, remove systemic pressure Unlike the countdown, life value anxiety or enemy pressure introduced in most action games in battle, this project deliberately weakens the rhythm pressure: although the character has a life value and hit feedback, in fact, the player character cannot really die. This mechanism was not disclosed in the questionnaire or gameplay introduction. The purpose is to reduce the player's expected burden of failure punishment and focus on the subjective experience of skill operation and feedback rhythm.

   This "non-punitive experience mechanism" is in line with the "maintaining a balance between challenge and skill" emphasized in Flow theory [19]. Especially on mobile terminals, it avoids the situation where the test process is interrupted and time is wasted due to continuous failures, especially for Casual gamer groups. Players who passively experience the battle process in the experiment can still continue to participate and complete the questionnaire feedback.

4. Enemy AI is simplified and only constitutes input trigger conditions In order to further control the impact of platform differences on the interaction path, the enemy AI design in the project has been significantly simplified: the enemy only has the following three behavior states:

   - Move towards the player (path tracking);
   - Perform basic attacks after entering the attack range;
   - Trigger pursuit actions based on distance judgment.

   Enemies will not dodge, counterattack or use skills, and there are no special mechanisms (such as shields, invincible frames, stage switching, etc.). Its main function is to provide players with an attack target with clear behavior and predictable feedback, so that players can more stably perceive the hit effect and feedback rhythm of skill release.

   Through the above enemy behavior logic design, the enemy behavior logic constitutes a unified interactive trigger environment. Players' subjective perception of skill strike feeling, hit feedback and character control can be compared on different platforms without being disturbed by the differences in enemy behavior in complex combat systems.

6.2.3 Platform-neutral game structure design

In order to further reduce the uncontrollable impact of platform differences, all interaction processes in the project (such as attack, skill release, hit feedback, etc.) are implemented based on platform-neutral logic. For example, skill damage judgment,

range special effects, knockback strength and other parameters are completely consistent on PC and mobile terminals, ensuring that the differences experienced by players in actual testing mainly come from the interaction path of the input mechanism, UI accessibility and visual feedback rhythm, rather than differences in the gameplay logic itself. This design strategy of unified structure and differentiated performance is one of the experimental models currently recommended in comparative user experience research [24].

6.3 Combat system structure implementation

In order to achieve a comparative study of cross-platform combat experience, this project has built a combat system architecture for 2D horizontal action games, taking into account logical consistency, platform input adaptability and scalability. The entire system uses finite state machines as the core of behavior drive, combined with skill template abstraction, input encapsulation mechanism, special effect response system and UI display components, to achieve a highly modular and platform-independent combat control process. This not only provides a stable foundation for user experience data collection, but also provides technical feasibility for subsequent expansion or commercial iteration.

6.3.1 State machine architecture: behavior logic decoupling and flow contro

As a widely used behavior control model in game architecture, the state machine has the advantage of decomposing complex character behaviors into independent states and managing character behavior sequences through clear state flow rules [36]). This project uses the Finite State Machine (FSM) design pattern to build a player behavior control structure, which mainly includes Idle, Move, Jump, Attack, Aim, and other states. Each state corresponds to a class derived from PlayerState, which uniformly implements the Enter(), Update() and Exit() interfaces.

The player's control logic is completely bound to the current state. Each frame detects data from the input layer and determines whether the state transition conditions are met. For example, if a jump input is detected in the moving state, it will migrate to the Jump state. Each state contains instruction calls to subsystems such as animation playback, skill calls, and special effect triggers to ensure a closed logic loop.

```
using UnityEngine.Playables;

28 references
public class PlayerState
{
    protected PlayerStateMachine stateMachine;
    protected Player player;
    protected Rigidbody2D rb;

    private string animationBoolName;

    protected float stateTimer;

    protected float xInput;
    protected float yInput;

    protected bool TriggerCalled;
    12 references
    public PlayerState(Player _player, PlayerStateMachine _statemachine, string _animationBoolName)
    {
        this.player = _player;
        this.stateMachine = _statemachine;
        this.animationBoolName = _animationBoolName;
    }

    30 references
    public virtual void Enter()
    {
        player.animator.SetBool(animationBoolName, true);
        rb = player.rb;
        TriggerCalled = false;
    }

    29 references
    public virtual void Update()
    {
        xInput = MobileInputManager.Instance.GetHorizontal();
        yInput = MobileInputManager.Instance.GetVertical();

        player.animator.SetFloat("yVelocity",rb.velocity.y);

        stateTimer -= Time.deltaTime;
    }

    29 references
    public virtual void Exit()
    {
        player.animator.SetBool(animationBoolName, false);
    }
```

Figure 6.1: State machine structure

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

18 references
public class PlayerStateMachine
{
    7 references
    public PlayerState currentState {  get; private set; }

    1 reference
    public void Initialize(PlayerState _startState)
    {
        currentState = _startState;
        currentState.Enter();
    }

    29 references
    public void ChangeState(PlayerState _newstate)
    {
        currentState.Exit();
        currentState = _newstate;
        currentState.Enter();
    }
}
```

Figure 6.2: State machine structure

```
        if (MobileInputManager.Instance.ShouldStartAiming() && HasNoSword())
        {
            stateMachine.ChangeState(player.aimSwordState);
        }
#if UNITY_STANDALONE || UNITY_EDITOR

        if (Input.GetKeyDown(KeyCode.Q))
        {
            stateMachine.ChangeState(player.counterAttackState);
        }

        if(Input.GetKeyDown(KeyCode.Space) && player.IsGroundDected())
        {
            stateMachine.ChangeState(player.jumpState);
        }

        if (Input.GetKey(KeyCode.Mouse0))
        {
            stateMachine.ChangeState(player.primaryAttackState);
        }
#endif
        if(!player.IsGroundDected())
        {
            stateMachine.ChangeState(player.airState);
        }
```

Figure 6.3: Example of state transition

Compared with event-driven models or manual process control with nested conditional logic, the FSM mode improves the clarity of the code structure and the stability of behavioral responses, and facilitates logic reuse and state expansion. For example, if a new skill needs to be added, only one skill state needs to be expanded without modifying the existing process. However, the disadvantage is there will be a lot of consistency in skills, such as how to use them.

More importantly, this pattern helps achieve platform neutrality in this project: the input processing layer has been abstracted and encapsulated, and the state behavior only cares about the logic trigger, without sensing whether it is keyboard, mouse or virtual joystick input. Even if the input methods of PC and mobile terminals are quite different, it will not affect the consistency of state logic.

6.3.2 Skill template structure: unified logic, separate performance

The skill system is the core component of the combat experience. This project designs five types of skills: Regular, Bounce, Pierce, Spin and Ultimate. Among them, the first four are basic sword skills that can be switched and used at will in combat; Ultimate is an energy-driven skill that requires specific conditions to trigger. In order to avoid redundant logic and platform branches, the project uses the Skill

Template Pattern to implement the basic skill system.

All sword skills are derived from the unified SwordSkill module, and different logics are executed according to the current swordType parameters, such as the number of bounces, collision judgment, flight trajectory, etc. The execution structure of the skills remains consistent, with only slight differences in the performance of the skill body and the damage calculation. The pictures below shows the different effects of skills are distinguished by enum, and other identical parts are handled uniformly:

```
30 references
public enum SwordType
{
    Regular,
    Bounce,
    Pierce,
    Spin
}
```

Figure 6.4: Sword type

```
public void SetUpSword(Vector2 _dirction, float _gravityScale, Player _player, float _FreezeTimeDuration, float _returnSpeed, SwordType _swordType)
{
    swordType = _swordType;
    player = _player;
    rb.velocity = _dirction;
    rb.gravityScale = _gravityScale;
    freezeTimeDuration = _FreezeTimeDuration;
    returnSpeed = _returnSpeed;

    // **根据剑技类型赋值伤害**
    switch (_swordType)
    {
        case SwordType.Regular:
            currentDamage = regularDamage;
            break;
        case SwordType.Bounce:
            currentDamage = bounceDamage;
            break;
        case SwordType.Pierce:
            currentDamage = pierceDamage;
            break;
        case SwordType.Spin:
            currentDamage = spinDamage;
            break;
    }

    Debug.Log($"⚔ 当前剑技: {_swordType}, 设置伤害: {currentDamage}");

    if (pierceAmount<=0 )
    {
        ani.SetBool("Rotation",true);
    }

    spinDirection = Math.Clamp(rb.velocity.x, -1,1);

    Invoke("DestoryMe", 3f);
}
```

Figure 6.5: Sword type switch

This template design fully applies the strategy pattern idea (Strategy Pattern), extracting the "skill performance behavior" from the "trigger mechanism". Whether the player switches through the number keys on the PC or selects through the button on the mobile terminal, the SkillManager only needs to switch the swordType enumeration value, and the underlying template logic can automatically adapt.

Furthermore, all the feedback processes of skill execution - such as hit effects, enemy hit feedback, sound playback, etc. - are bound to the animation keyframes

through a unified event-driven method to achieve visual consistency and operational synchronization.

6.3.3 UI and feedback system: information mapping and platform collaboration

Skill release is essentially the player's operational input to the system status, and the UI is its feedback window. The UI module of this system is mainly responsible for three functions: skill icon display, skill selection status mark, and ultimate skill highlight prompt, which are controlled by SkillIconDisplay. The skill icon is bidirectionally bound to the SkillManager logic: whenever the skill status changes, the UI automatically refreshes the highlight effect; when the UI receives user input (such as click or keyboard), it notifies the skill system to switch.

The ultimate skill status uses dynamic visual prompts to attract the player's attention. Its display logic is independent of the charging system, but the feedback structure remains unified to ensure the same experience at both ends.

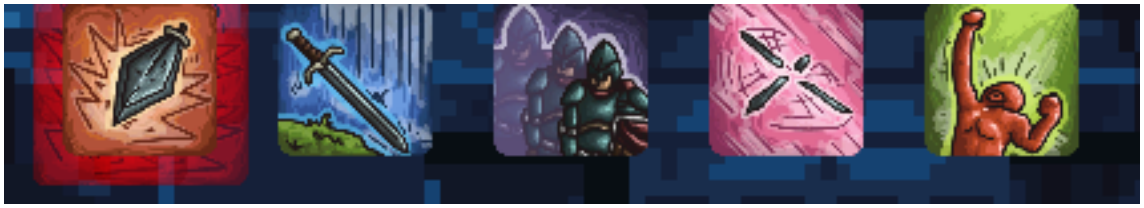


Figure 6.6: Sword type is selected by showing a red box

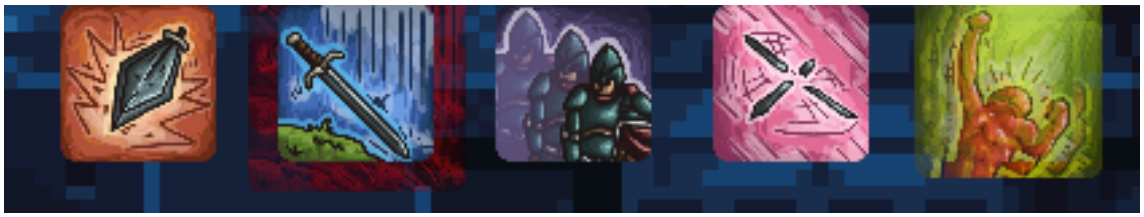


Figure 6.7: When the ultimate is fully charged, the ultimate icon will flash to remind the player

In terms of the operation feedback layer, this system inserts keyframe events in the animation of each skill to trigger hit effects, play sound effects, and start damage judgment logic. This method is more accurate than the feedback method based on judgment logic triggering, and can effectively avoid the interference of platform frame rate differences on the rhythm of operation experience.

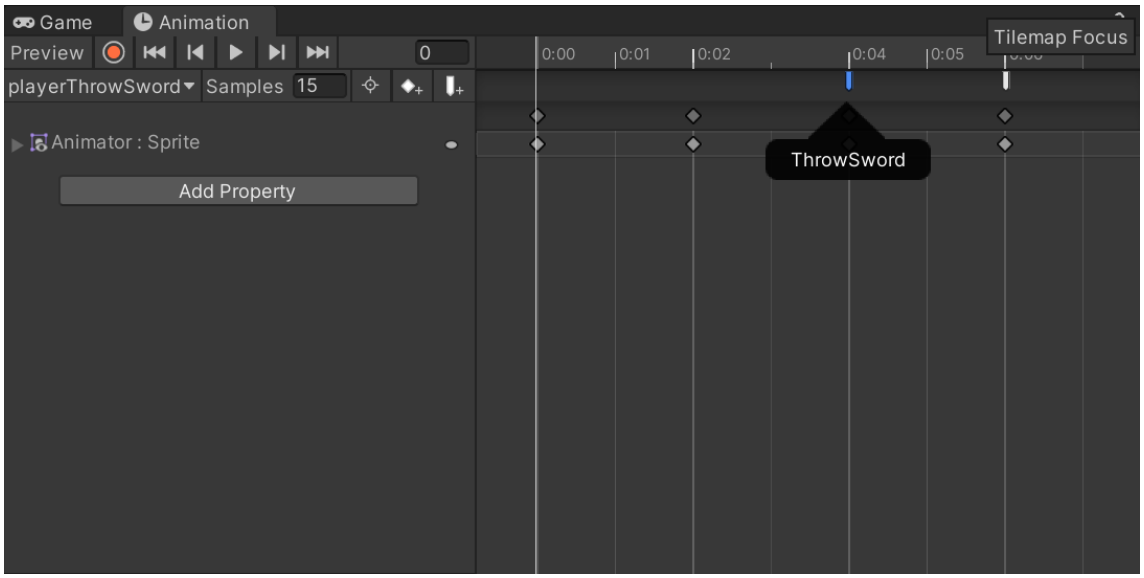


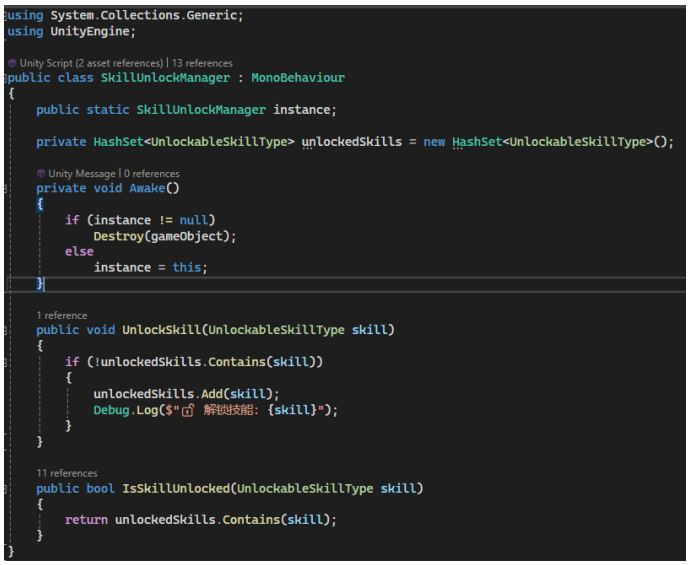
Figure 6.8: Triggering skill effects through animation events

In terms of platform adaptation, the UI module adopts a responsive layout and adapts to different resolutions and DPI settings in proportion. The PC version is mainly based on keyboard mapping, while the mobile side uses Unity prefabricated joystick components. All inputs are uniformly entered into the MobileInputManager processing class, and converted into direction values and click events through abstract interfaces to achieve consistency of UI behavior across all platforms.

6.3.4 Singleton system and global state scheduling

In order to ensure the module decoupling and state consistency of the combat system, the core control modules in the project are all implemented in singleton pattern, such as SkillManager, PlayerManager, SkillUnlockManager, etc. These modules are globally accessed through instance static interfaces, avoiding problems such as state disconnection and repeated initialization in cross-platform switching or multi-scene loading.

For example, the skill icon display module SkillIconDisplay reads the skill status in SkillUnlockManager in real time, determines the currently unlocked skills and selected skills, and dynamically activates/disables the corresponding icons in the UI.



```
using System.Collections.Generic;
using UnityEngine;

Unity Script (2 asset references) | 13 references
public class SkillUnlockManager : MonoBehaviour
{
    public static SkillUnlockManager instance;

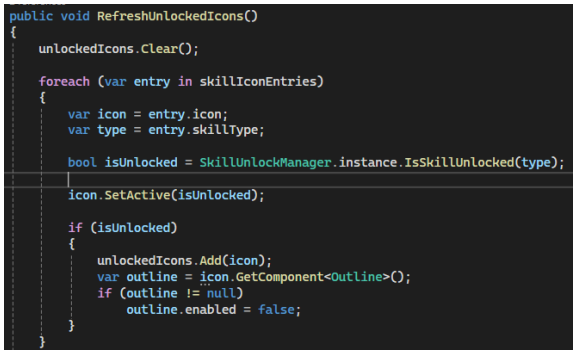
    private HashSet<UnlockableSkillType> unlockedSkills = new HashSet<UnlockableSkillType>();

    Unity Message | 0 references
    private void Awake()
    {
        if (instance != null)
            Destroy(gameObject);
        else
            instance = this;
    }

    1 reference
    public void UnlockSkill(UnlockableSkillType skill)
    {
        if (!unlockedSkills.Contains(skill))
        {
            unlockedSkills.Add(skill);
            Debug.Log($"🔓 解锁技能: {skill}");
        }
    }

    11 references
    public bool IsSkillUnlocked(UnlockableSkillType skill)
    {
        return unlockedSkills.Contains(skill);
    }
}
```

Figure 6.9: Singleton pattern in SkillUnlockManager is accessed in SkillIconDisplay



```
public void RefreshUnlockedIcons()
{
    unlockedIcons.Clear();

    foreach (var entry in skillIconEntries)
    {
        var icon = entry.icon;
        var type = entry.skillType;

        bool isUnlocked = SkillUnlockManager.instance.IsSkillUnlocked(type);

        icon.SetActive(isUnlocked);

        if (isUnlocked)
        {
            unlockedIcons.Add(icon);
            var outline = icon.GetComponent<Outline>();
            if (outline != null)
                outline.enabled = false;
        }
    }
```

Figure 6.10: Singleton pattern in SkillUnlockManager is accessed in SkillIconDisplay

In addition, the ultimate skill release state is also uniformly controlled through global variables, so that players can continue to perceive the skill release conditions and perform response actions even in state switching (such as entering the ultimate skill release state from the moving state).

Although the singleton pattern has performance and structural limitations in massively multiplayer online games, it provides a good structural foundation for fast scheduling and state synchronization in the test-oriented prototype system of this project [37].

6.3.5 System Design Overview and Consistency Evaluation

From a structural perspective, this combat system is based on the state machine, template system and responsive UI, strictly separating the platform adaptation logic from the performance logic. The input layer only serves as a state trigger interface. No matter how the platform changes, skill performance, state switching and user feedback are always driven by a unified control process. This structural design greatly

improves the comparability of the experience test, so that the impact of platform differences on the results can be minimized when analyzing player behavior in the future.

6.3.6 Cross-platform input structure differences and design responses

Although the logical structure of the combat system of this project has achieved platform neutrality, there are still significant input structure differences between PC and mobile terminals at the interaction level, which directly affects the player's control method and feedback path.

On the PC version, players complete all input operations through keyboard and mouse. Character movement is controlled by A and D keys, and attack and skill release are bound to mouse click, and R for ultimate. Direction input can be calculated by keyboard direction or mouse position, allowing players to finely control the direction of skill release with a high degree of freedom. For example, using the mouse to click the direction can instantly determine the skill launch angle, which is suitable for quick response and micro-operation needs.

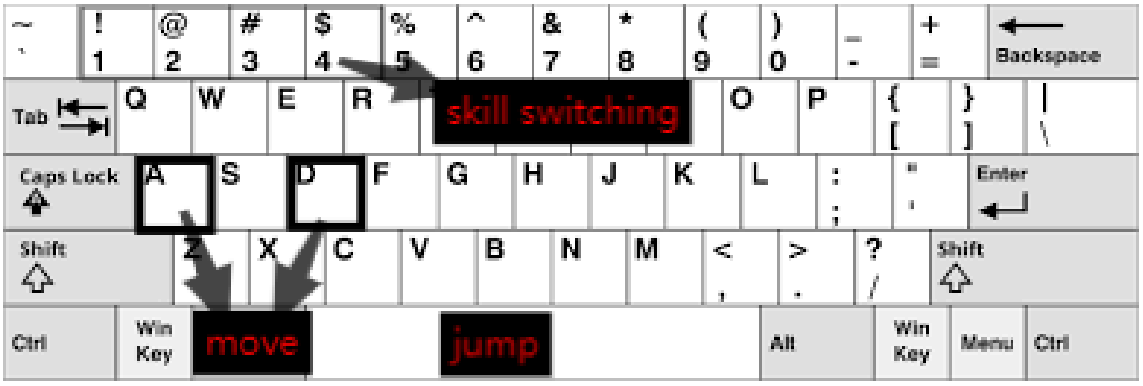


Figure 6.11: The control mode on PC, keyboard

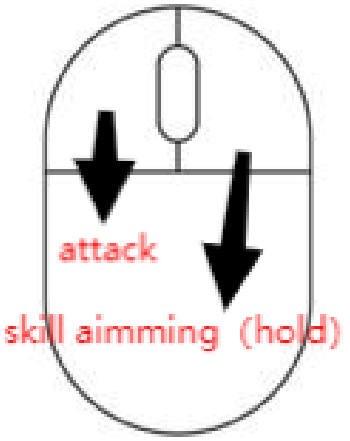


Figure 6.12: The control mode on PC, mouse



Figure 6.13: The UI mode on PC

In contrast, the mobile terminal lacks physical keyboards and high-precision mouse pointing capabilities, so the system uses virtual joysticks and key binding to simulate input operations. The player controls the direction of the character's movement through the left joystick, and the right button area is arranged with buttons such as attack, jump, dash, and skills. Each button is bound to a specific event (such as releasing the current skill, switching skill types, etc.). The direction input is dynamically mapped by the direction of the left joystick on the mobile version, and the skill release angle is determined in real time by the joystick direction, thereby bridging the problem of reduced aiming freedom caused by the lack of mouse input.



Figure 6.14: The UI layout in Mobile

The above structural differences lead to actual differences in operation load, reaction delay and control accuracy between players on both ends. In order to ensure the fairness and scientificity of platform comparison, the project adopts the following strategies in design:

- Unified input encapsulation: All inputs are uniformly encapsulated through MobileInputManager, providing platform-independent interfaces such as GetHorizontal() and GetVertical(), and the state logic and skill control module no longer perceive the underlying input source.
- Unified calculation logic of skill direction: The direction of the PC demo is calculated by the mouse position vector, and the direction of the mobile version is converted by the joystick vector. Both output a consistent two-dimensional unit vector for use in the skill template.
- UI operation area optimization: The distance between the attack and skill buttons is moderate to prevent accidental touches.

Through the above design, the system maintains the logical consistency of the combat input path to the greatest extent, and makes platform-specific compensation at the visual and interactive feedback levels, so that players can achieve similar combat behaviors through similar operations in both ports, making subsequent experience evaluations comparable and representative.

6.4 Skill system design and player strategy space

In action games, the design of skills directly determines the player's attack method, operation rhythm and feedback intensity, and is the core element of the combat experience. The skill system designed in this project includes four types of skills (Regular, Bounce, Pierce, Spin) and one ultimate skill, all of which are derived from the same skill template, ensuring structural consistency while giving skills different strategic uses and operational perceptions.

The core goal of skill design is to retain sufficient interaction differences on the basis of controlling variables, so as to observe the differences in players' cognition, control efficiency and preferences for the structurally consistent on different platforms. At the same time, the system introduces a skill switching mechanism instead of a fixed configuration, in order to test the perceived differences in "skill operation burden" between platforms and explore the impact of combat complexity on experience consistency.

6.4.1 Regular skill design and strategic significance

The four regular skills (Regular, Bounce, Pierce, Spin) are the core attack methods that constitute the main loop. There is no cooldown and no resource consumption in the design, aiming to ensure a coherent rhythm and continuous feedback. Although they differ in their forms of expression and functional positioning, they all follow the three-step process of "select-aim-release" in terms of system structure. The operation paths on the two platforms are as follows:

PC operation process:

- Players switch the current skill through the number keys (1 4);
- Press and hold the right mouse button to enter the skill aiming mode, and the system pops up the auxiliary aiming UI;
- Release the right button to complete the release, and the direction is determined by the character's face or the mouse position, with fast response and accurate aiming.

Mobile operation process:

- Players click the skill switch button in the upper right corner, and the skill wheel pops up to select the required skill;
- Press and hold the attack button to enter the charging state;
- Drag the left joystick during this period to determine the direction of the launch;
- Release the skill.

This mechanism embodies the principle of "functional equivalence and behavioral adaptation" [24], that is, retaining the core structure of the operation under different

input methods, while performing differentiated optimization according to the characteristics of the platform. The PC control focuses on input accuracy and fast response, while the mobile terminal introduces the rhythm of charging + confirmation to avoid accidental touches and improve controllability. Through these skill designs, I hope that players can get rich skill combinations and feedback experience even in the basic combat cycle, while avoiding the introduction of mechanisms with high strategic complexity such as cooling value and energy slot, so that the research focus can be focused on the impact of platform input differences on skill use behavior.

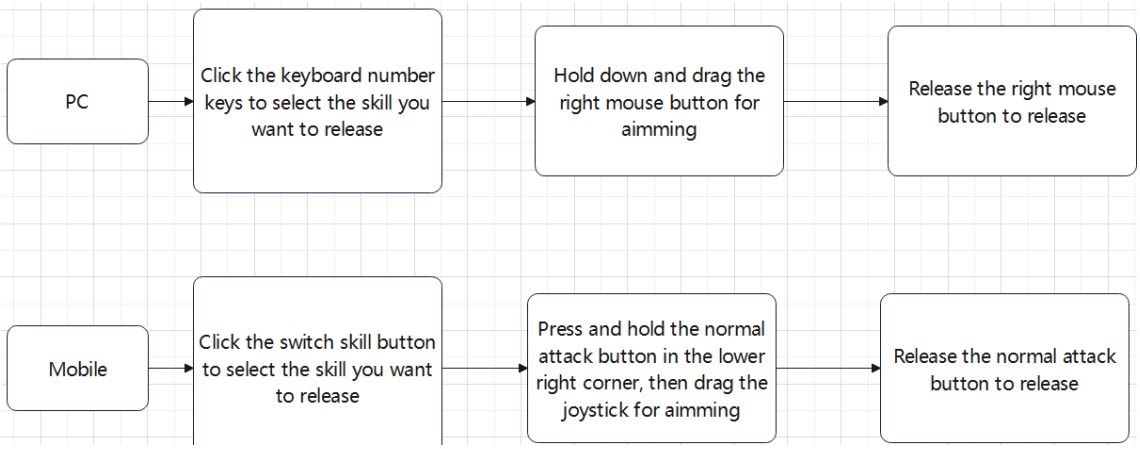


Figure 6.15: Skill release flow chart for PC and mobile demo

The details of different types of skills are as follows:

- Regular: Attacks the first enemy it touches, then disappears, which is suitable for fast hits and stable output.
- Bounce: Automatically bounce to the next target after hitting the enemy, can bounce several times and can bounce to enemies at a distance. It will search for surrounding enemies. If the distance is too far, consider attacking nearby enemies again. It's suitable for areas with multiple enemies.
- Pierce: After release, it can penetrate multiple enemies and continue to move in a fixed direction, which has advantage on horizontal line clearing and improving the sense of space for skill use.
- Spin: Control method: After release, the skill body rotates in place for a period of time. It can be used to block areas, interfere with enemies, or repel enemies that are already close.

6.4.2 Ultimate skill design and rhythm control

The ultimate skill (Ultimate) is the only skill with a release threshold. Players need to accumulate energy through skills during the battle and unlock the use permission after reaching the threshold. Skill release will send out shock waves, stun enemies within the range and cause damage with 20 percent of the total health of the enemy.

This skill design not only enriches the rhythm changes, but also enhances the manifestation of platform operation differences at the "critical moment". For example, PC players may get a more accurate release time by calmly clicking the key position; while Mobile players need to avoid accidental touches and face the adaptation problem of the release animation trigger window. This is not intentional, but is determined by the differences between the two platforms.

6.4.3 Comparison of skill switching mechanism and platform operation load

All regular skills are shared entrances (that is, the attack key triggers the currently selected skill), and players need to switch skill types through independent operations. PC binding numbers can achieve instant switching; while mobile players click the skill wheel above the UI to select the target skill in the pop-up skill panel.

The original intention of this design is to make the complete process of "skill preparation-selection-release" for skill release on both platforms the same, so as to observe the differences between platforms in continuous operation load, strategic flexibility and cognitive switching. The left picture shows the skill switching interface without expansion, and the right picture shows the expanded style:



Figure 6.16: The mobile version of the skill compass when not expanded

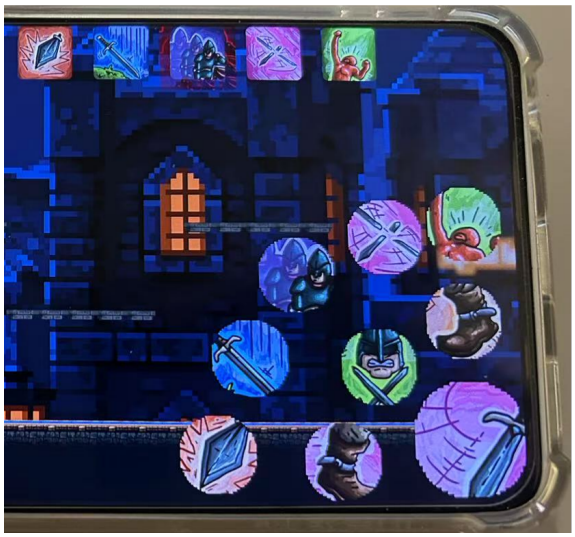


Figure 6.17: The mobile version of the skill compass when expanded

The project improved the switching interaction on the mobile terminal in the later stage, including increasing the icon spacing and highlighting the current skill type before releasing the skill to help users verify the intention.

6.4.4 Auxiliary action design: control structure and strategic use of jump and dash

In addition to the main attack skills, the combat system of this project also introduces two key auxiliary action mechanisms: jump and sprint. Although these two abilities are relatively simple in functional structure, they occupy an important position in combat experience, platform feedback and strategic design, especially when testing the impact of "mobility feedback" on different platforms. It provides a valuable observation dimension.

1. Jump: The jumping mechanism is a traditional vertical rise action that supports transfer between platforms and release of aerial skills. The system uses a single jump logic based on ground detection, with a fixed jump height. The jump action can be used together with skill release (such as Regular airdrop). On the mobile version, the jump button is fixed in the upper right area of the screen. It uses a large area button with click feedback to prevent accidental touches. On the PC side, the jump is bound to the space bar by default, which is more intuitive to operate, but because the keyboard hand shape is fixed, it is easier for players to switch between movement and jump frequently.
2. Dash: The sprint action is a fast movement ability with short-term displacement and invincible frame effects. Its key features include:
    - The sprint time is extremely short (about 0.3 seconds), but it has a judgment window of complete immunity to damage;
    - During the sprint, the player can pass through the enemy or avoid the

skill hit area;

- It can be used to cancel the attack backswing and create a rhythm switch in the battle rhythm.

This mechanism strengthens the player's requirements for "timing control", especially the prediction and use of sprint before the enemy releases skills, which can significantly improve the performance of the operation. Therefore, sprinting is not only a moving tool in this project, but also a "strategic choice with strong feedback".

3. Differences in platform experience

- PC: Dashing is bound to the Shift key, supporting quick clicks and combined movement operations; the jump and sprint keys are separated, which is conducive to forming a "jump-rush-attack" continuous action;

- Mobile: Both actions are buttons on the right side of the screen, and users need to switch and click targets with their thumbs, and the accuracy of quick combos may be slightly affected.

6.5 Cross-platform UI/UX adaptation design

6.5.1 Mobile terminal interface structure and interaction logic

The mobile terminal adopts touch interaction mode, and the overall layout is optimized for finger operation area and visual accessibility. The specific design is as follows:

The lower left corner is a directional joystick for character movement. The joystick uses Unity's prefabricated components and has dynamic center point adsorption and transparency transition feedback functions.



Figure 6.18: Mobile demo UI layout

Figure 6.18: Mobile demo UI layout

The button area structure in the lower right corner is as follows:

- Normal attack button: located in the lower right corner, releases the currently selected skill by default;
- Jump button: located directly above the attack button;
- Sprint button: located on the left side of the attack button;
- Skill switch button: located between jump and sprint, click to expand all unlocked skill icons in a fan-shaped manner, the current skill icon is highlighted, and other icons are displayed translucently.

And the health bar and energy bar are fixed in the upper right corner, red for health value, blue for ultimate skill energy. When the energy is full, the ultimate skill icon will glow and highlight.

Pause function: There is a pause button below the health bar in the upper right corner. Click it to enter the game pause UI, which displays three options:

- Resume: Continue the game;
- Options: View the complete tutorial;
- Exit: Exit the game.

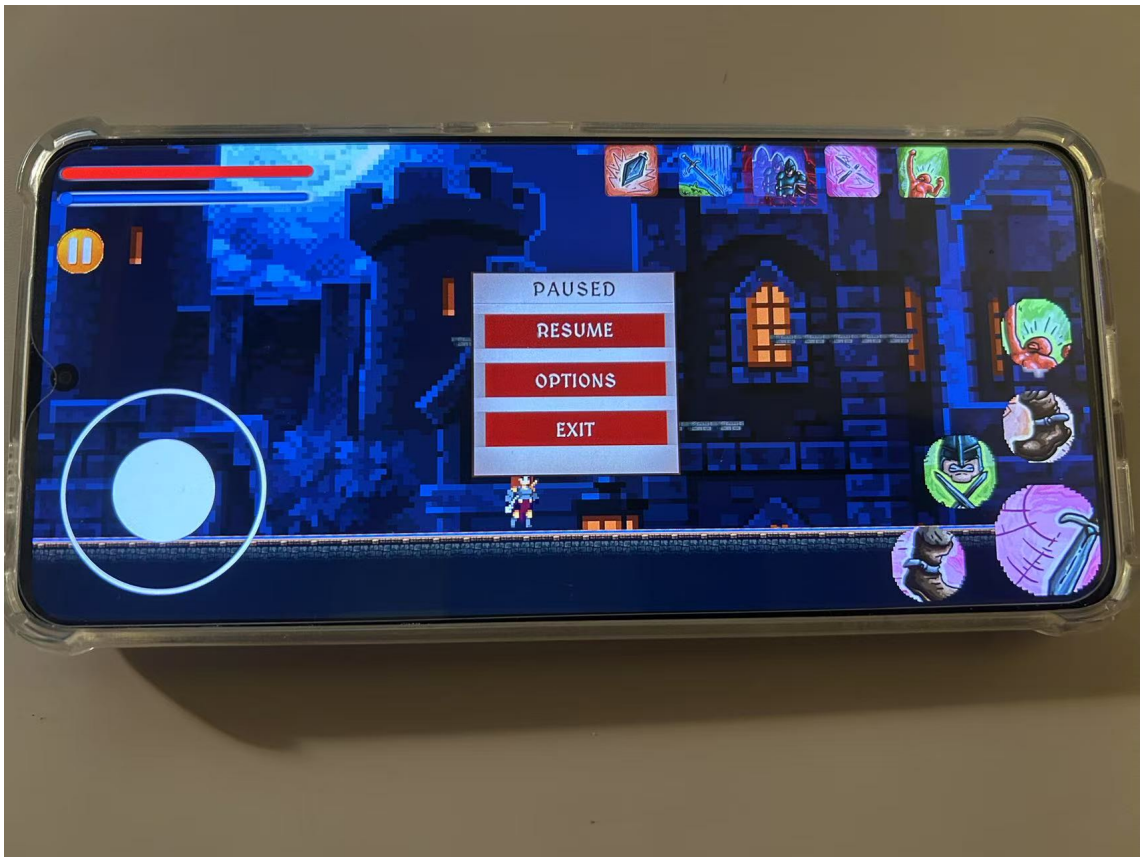


Figure 6.19: Mobile pauseing UI

6.5.2 PC Interface Structure and Operation Mapping

The PC terminal uses keyboard and mouse control, and the overall interface is more relaxed. Compared with the mobile terminal, all unnecessary display content is deleted, and the display is cleaner and neater:



Figure 6.20: PC UI layout (Not yet unlock all the skills)

The control are slidely different compare with the mobile version, which use keyboard rather then buttons on the screen:

- Skill switching: Number keys 1 4 correspond to four common skills;
- Skill release: Press and hold the right mouse button to enter the aiming state, and release to release;
- Pause the game: Press the ESC key to call up the pause menu, the function is the same as the mobile terminal.

The upper right corner UI is consistent with the mobile pause button, only the size is smaller; the pause menu is displayed in the center through a pop-up window.

6.5.3 In-game props and tutorial prompt system

In order to increase the rhythm of guidance and skill acquisition logic, a "pickup props" mechanism is designed in the game, and the specific behavior is as follows: When the player approaches the prop and touches it:

- The game will automatically pause for a few seconds;
- Display the exclusive tutorial text and icon of the unlocked skill (as shown in your picture);
- At the same time, restore all the player's health;
- Unlock a new skill;

The player can click the screen (mobile) or click the mouse (PC) to skip the pause and return to the battle immediately.

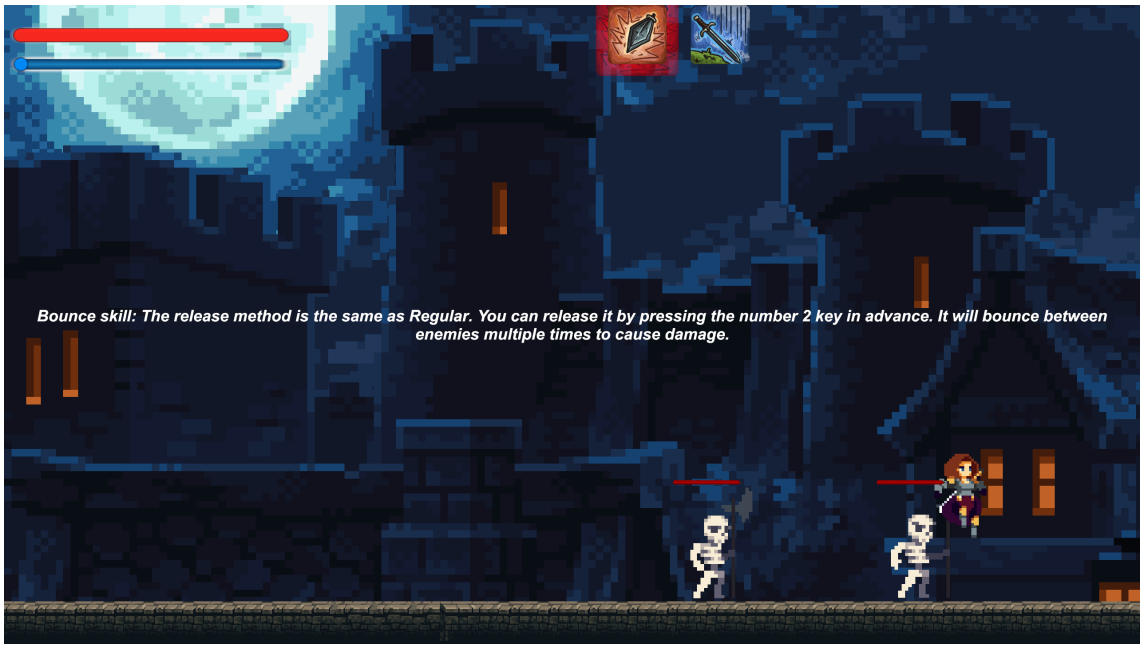


Figure 6.21: The tutorial which pops up when the player has picked the "pickup props"

6.5.4 Consistency control strategy between platforms

Although the interaction methods on both ends are completely different, the project ensures the uniformity of the user experience through the following methods:

- Unified state feedback: The binding logic of animation events such as hit, cooldown, charge, highlight, etc. is completely consistent on both platforms;
- Equivalent skill switching process: PC demo is "shortcut key + right key aiming", mobile version is "click to select + attack key charge";
- Consistent pause logic: Both platforms provide pause entrances, showing the same tutorials and options;
- Unified visual style: Icons, UI styles and color styles are consistent, and responsive layout is used to adapt to different resolutions.

7

Results

In this section, I will discuss the two questionnaires I conducted to complete this project, which include the early player game habits survey and the feedback after playing the demo. We will also discuss the set-up of each playtest, and the final result analysis.

7.1 Questionnaire results

7.1.1 Prestudy questionnaire result

This questionnaire was completed before the demo was developed. The purpose was to study the game habits of players and determine the general development direction for future demo development. The response collection period was roughly from February 15, 2025, to February 17, 2025. It is focus on the social population, but mainly the people I can reach within my ability. Please note that the table in this article only lists Likert scale questions. This questionnaire also includes some other open-ended questions, which you can find in the appendix.

7.1.1.1 English version

The survey was released in both Mandarin Chinese and English. The English-language version received 41 responses. The main findings were players generally value the feedback of the combat system, such as hitting sounds and animations, and the diversity of weapon skills. They also prefer systems that can gradually guide complexity, provide auxiliary mechanisms, and adjust difficulty. Compared with fast-paced or high-learning-curve combat, players prefer to gradually deepen their strategic experience based on intuitive operations. After the tables you would have a brief summary of the average score of the close-end questions.

Question	Avg	1	2	3	4	5
I prefer a simple and intuitive combat system, even if it sacrifices tactical depth.	3.3	4.9%	19.5%	26.8%	39.0%	9.8%
I enjoy combat systems with a steep learning curve, even if it takes time to master.	2.8	14.6%	31.7%	24.4%	19.5%	9.8%
I prefer a combat system with multiple combo options and complex mechanics for depth.	3.0	12.2%	26.8%	19.5%	31.7%	9.8%
The combat system should include assist mechanisms (e.g., auto-lock, quick combos) to lower the skill barrier.	3.4	2.4%	17.1%	36.6%	24.4%	19.5%
I enjoy managing resources (e.g., stamina bar, cooldowns) to enhance combat strategy.	3.6	7.3%	9.8%	19.5%	48.8%	14.6%
The combat system should allow players to adjust difficulty settings to accommodate different skill levels.	4.3	2.4%	2.4%	17.1%	22.0%	56.1%
I prefer fast-paced, perform a large number of combos in a short period of time.	2.8	19.5%	17.1%	29.3%	29.3%	4.9%
I prefer tactical and strategy combat systems.	3.4	9.8%	12.2%	29.3%	26.8%	22.0%
"Hit feedback" is crucial to my combat experience.	4.3	2.4%	4.9%	9.8%	26.8%	56.1%
I want the combat system to include different weapons or skill styles for variety.	4.4	0.0%	4.9%	7.3%	39.0%	48.8%
The game should provide a detailed tutorial or training mode.	3.7	2.4%	12.2%	24.4%	31.7%	29.3%
I prefer to learn combat mechanics through trial and error.	3.2	9.8%	26.8%	17.1%	26.8%	19.5%
The combat system should allow adjustable AI difficulty.	3.9	2.4%	9.8%	19.5%	31.7%	36.6%
The combat system is a critical factor in my decision to play a game.	3.2	9.8%	19.5%	29.3%	26.8%	14.6%
Even if a game has an engaging story, I would stop if combat is bad.	2.7	17.1%	34.1%	17.1%	24.4%	7.3%
Combat system should gradually introduce complexity.	4.1	0.0%	4.9%	17.1%	43.9%	34.1%

Table 7.1: English prestudy questionnaire result with full score distribution(1 = Strongly disagree, 5 = Strongly agree)

The numbers in the vertical column represent the percentage of the total score. In summary, Compared with fast-paced or high-learning-curve combat, players prefer to gradually deepen their strategic experience based on intuitive operations.

7.1.1.2 Chinese version

The Chinese-language questionnaire received 374 responses, the results to which can be found in table 7.2. The main findings were they think a good combat system should have a variety of skill options, clear hit feedback, adjustable difficulty and progressive complexity, while also supporting the provision of certain auxiliary mechanisms to lower the entry threshold; compared to extremely complex or minimalist systems, most people prefer to gradually deepen the strategic space based on intuitive operations.

Question	Avg	1	2	3	4	5
I prefer a simple and intuitive combat system, even if it sacrifices tactical depth.	3.3	5.9%	13.6%	44.9%	20.1%	15.5%
I enjoy combat systems with a steep learning curve, even if it takes time to master.	3.0	8.8%	21.1%	42.8%	19.0%	8.8%
I prefer a combat system with multiple combo options and complex mechanics for depth.	3.3	6.1%	11.0%	40.4%	28.3%	14.2%
The combat system should include assist mechanisms (e.g., auto-lock, quick combos) to lower the skill barrier.	3.6	2.9%	8.3%	36.1%	32.9%	19.8%
I enjoy managing resources (e.g., stamina bar, cooldowns) to enhance combat strategy.	3.7	3.2%	6.1%	33.4%	34.5%	22.7%
The combat system should allow players to adjust difficulty settings to accommodate different skill levels.	3.9	2.9%	5.1%	27.5%	31.3%	33.2%
I prefer fast-paced, perform a large number of combos in a short period of time.	3.1	7.2%	10.2%	48.1%	18.4%	16.0%
I prefer tactical and strategy combat systems.	3.2	5.3%	15.8%	46.3%	20.9%	11.8%
"Hit feedback" is crucial to my combat experience.	3.8	2.7%	5.1%	31.3%	31.3%	29.7%
I want the combat system to include different weapons or skill styles for variety.	4.0	1.9%	4.3%	24.9%	30.2%	38.8%
The game should provide a detailed tutorial or training mode.	3.9	2.9%	4.3%	25.7%	31.3%	35.8%
I prefer to learn combat mechanics through trial and error.	3.4	4.8%	13.1%	36.6%	28.1%	17.4%
The combat system should allow adjustable AI difficulty.	3.8	2.9%	5.9%	28.1%	38.0%	25.1%
The combat system is a critical factor in my decision to play a game.	3.4	4.8%	7.8%	43.6%	28.9%	15.0%
Even if a game has an engaging story, I would stop if combat is bad.	3.4	5.1%	12.6%	36.4%	28.1%	17.9%
Combat system should gradually introduce complexity.	3.9	1.6%	5.1%	28.6%	31.3%	33.4%

Table 7.2: Chinese prestudy questionnaire result with full score distribution(1 = Strongly disagree, 5 = Strongly agree)

In general, by comparing the two questionnaires, the two groups of respondents with different language backgrounds showed consistent tendencies in most dimensions. For example, they generally agreed that the combat system should include auxiliary mechanisms (English 3.4, Chinese 3.6), provide a variety of weapon skills (English 4.4, Chinese 4.0), and have adjustable difficulty (English 4.3, Chinese 3.9) and progressive complexity design (English 3.9, Chinese 3.8). However, there are also some representative differences: Chinese respondents scored lower on "hit feedback" (English 4.3, Chinese 3.8), and were slightly more accepting of system complexity, such as "combination operation and mechanism depth", (Chinese 3.3, English 3.0), and gave higher scores to the impact of the game's combat system on the overall experience (English 3.4, Chinese 2.7). These differences reflect that cultural and platform habits may have a certain impact on combat system preferences.

7.1.2 Formal playtesting questionnaire result

After the completion of this project, in order to optimize the project and collect the data required for the project goals, I designed this questionnaire. You can find the content of the questionnaire and the approximate statistical results of all closed questions.

Question (Accessibility)	**Avg**	**1**	**2**	**3**	**4**	**5**
The basic controls in the PC version were intuitive and easy to learn.	4.2	0%	0%	10%	60%	30%
The basic controls in the Mobile version were intuitive and easy to learn.	3.5	0%	30%	20%	20%	30%
The on-screen UI in PC version was clear and easy to understand.	3.5	0%	10%	30%	60%	0%
The on-screen UI in Mobile version was clear and easy to understand.	3.7	0%	10%	30%	40%	20%
Buttons and controls were appropriately placed on screen in Mobile version.	3.8	0%	30%	0%	30%	40%
Buttons and controls were appropriately placed on screen in PC version.	3.9	0%	10%	10%	60%	20%
Important information (e.g., health, energy) was easy to find in Mobile version.	4.8	0%	0%	0%	20%	80%
Important information (e.g., health, energy) was easy to find in PC version.	4.8	0%	0%	0%	20%	80%

Table 7.3: Formal playtesting questions (Accessibility) with score distribution (1 = Strongly disagree, 5 = Strongly agree)

Question (Playability)	Avg	1	2	3	4	5
I felt in control of the character throughout the game.	3.8	0%	10%	40%	10%	40%
Switching between skills was easy to perform and understand in Mobile version.	3.5	0%	20%	30%	30%	20%
Switching between skills was easy to perform and understand in PC version.	4.2	0%	10%	10%	30%	50%
Combat mechanics felt responsive and engaging.	2.6	20%	20%	40%	20%	0%
The game provided a good balance between challenge and fun.	3.3	0%	10%	60%	20%	10%

Table 7.4: Formal playtesting questions (Playability) with score distribution(1 = Strongly disagree, 5 = Strongly agree)

Question (Satisfaction)	Avg	1	2	3	4	5
Overall, how satisfied are you with the PC demo?	3.5	0%	0%	62.5%	25%	12.5%
Overall, how satisfied are you with the Mobile demo?	3.375	0%	25%	25%	37.5%	12.5%

Table 7.5: Formal playtesting questions (Satisfaction) with score distribution(1 = Strongly disagree, 5 = Strongly agree)

Question (Engagement)	Avg	1	2	3	4	5
Visual feedback (e.g., button highlights, skill indicators) helped me understand game state.	3.6	0%	10%	30%	50%	10%
Sound feedback (e.g., hitting sound, being hit sound, skill sound effects, etc.) helped me understand game state.	4.25	0%	12.5%	12.5%	12.5%	62.5%
The overall visual layout contributed positively to my experience.	4.0	0%	0%	20%	60%	20%

Table 7.6: Formal playtesting questions (Engagement) with score distribution(1 = Strongly disagree, 5 = Strongly agree)

Question (Inclusivity)	Avg	1	2	3	4	5
How difficult do you think the PC demo is?	1.625	0%	37.5%	62.5%	0%	0%
How difficult do you think the Mobile demo is?	2.25	12.5%	62.5%	12.5%	12.5%	0%

Table 7.7: Formal playtesting questions (Inclusivity) with score distribution(1 = Strongly disagree, 5 = Strongly agree)

Question (Technical Issues and Performance)	Avg	1	2	3	4	5
I encountered technical issues or bugs during gameplay.	3.5	0%	10%	30%	60%	0%
The game ran smoothly without performance problems.	4.1	0%	10%	10%	40%	40%
Any issues I faced negatively impacted my gameplay experience.	3.6	0%	20%	20%	40%	20%

Table 7.8: Formal playtesting questions (Technical Issues and Performance) with score distribution(1 = Strongly disagree, 5 = Strongly agree)

A total of 10 players filled out the questionnaire. Due to the adjustment of the questionnaire title, two of the questionnaires did not answer all the necessary questions, but I don't think this affects the analysis of the questionnaire results because the newly added questions do not involve the key research purpose.

7.2 Playtesting result

7.2.1 First playtest

7.2.1.1 Data statement

The main purpose of this first playtesting is to discover potential systemic bugs through a small-scale player trial after the initial completion of the development of the core combat framework of the PC and Mobile versions, and to collect preliminary feedback from players on the smoothness of operation, clarity of interface information, and basic interactive experience, so as to guide subsequent function optimization and experience improvement. This round of testing collected complete questionnaire data and open feedback from two players, covering closed-ended scoring and detailed subjective descriptions. Because some of the students I recruited earlier did not show up that night for some reason, and the recruitment I launched at the trial site that day received very few responses, I only received two completed questionnaires in the end. The lower the response rate in a survey, the higher the risk of sampling bias, which means certain groups within the target population are more likely to be overrepresented in the sample while others are underrepresented or excluded altogether.[38]

From the scoring data of closed-ended questions, the overall evaluation of the two players showed an upper-middle level, and the basic operation experience of the PC and Mobile terminals both received an average score of more than 4 points, especially the intuitiveness of basic operations (PC Basic Control: 4 points; Mobile Basic Control: 4.5 points) and the readability of important information (Both are 5), indicating that the game has good usability in basic interaction and information prompt design. However, in terms of Combat Mechanics Responsiveness, both players gave medium-low scores (3 and 4 points), reflecting that the initial version of the

system still has room for further improvement in skill feedback and coherence. In addition, from the qualitative feedback, it can be seen that some players pointed out that the selected status prompt during skill switching is not obvious enough, the problem of residual pre-aiming auxiliary lines after skill release on the PC demo, and the unsmooth status switching of the character when climbing the wall on the Mobile version are all important issues that directly affect the operation experience.

In the open-ended answers, players also made constructive suggestions for specific issues. One player suggested shortening the prompt text in the mobile interface and increasing the font size to facilitate players to quickly identify the operation instructions in battle, and suggested that the practical part of the tutorial operation should be increased instead of just displaying it in static text. Another player made a test structure suggestion, that is, he hoped to split the game function modules (such as movement, attack, skill release) into independent test areas for one-by-one experience and feedback. Some players also mentioned that the PC version has a more traditional level rhythm, which is similar to old games in the 80s and 90s, while the Mobile version has a more modern mobile game fast experience.

7.2.1.2 Result analyis

According to player feedback, the following targeted changes and corrections were made after this test:

- Fixed the bug that sword skills were incorrectly retracted under certain circumstances;
- Enlarged the visual effects prompts when skills were selected, and improved the intuitiveness when switching skills;
- Added an "Option" option in the pause menu, allowing players to actively view the full tutorial content, and display corresponding control prompts according to the player's platform (PC or Mobile), improving the accessibility and usability of the tutorial;
- For some interface prompt texts, the copy has been simplified and the font size has been appropriately enlarged to improve the efficiency of information reading in Mobile battles.



Figure 7.1: During the first playtesting, I found that sometimes the skills would suddenly stop in mid-air.

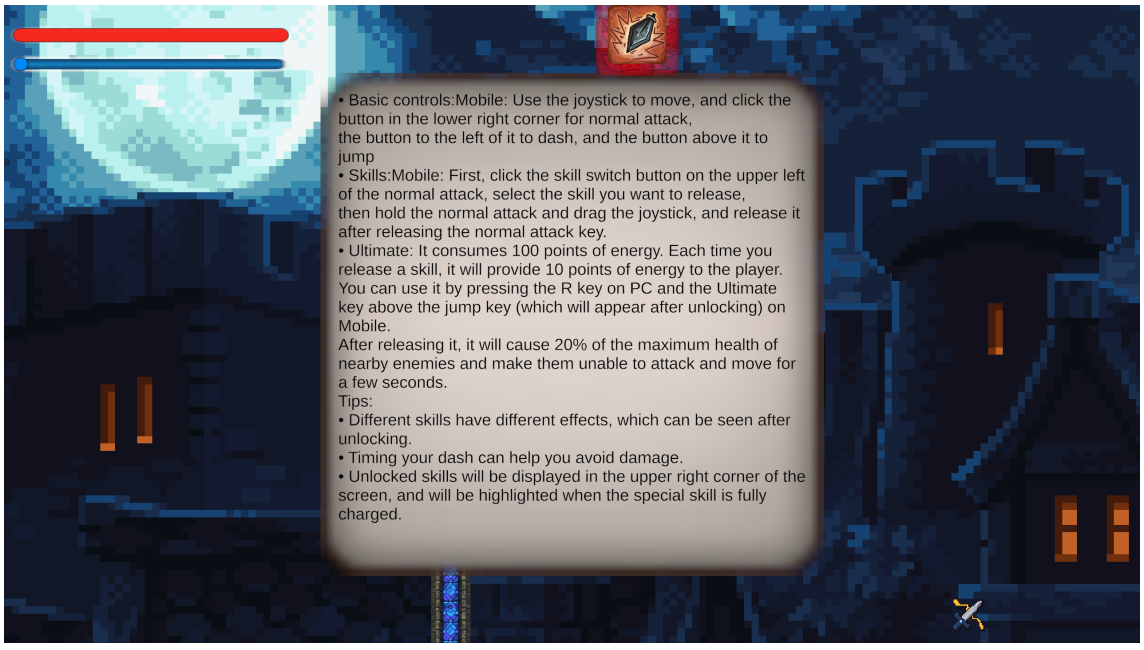


Figure 7.2: After this playtesting, the option button has been added. It will now display the operation table of this platform.

However, some of the issues raised by players were not fixed or adopted in this iteration due to technical limitations or design concepts. Among them, the problem of residual pre-aiming auxiliary lines after releasing skills on the PC demo was not fixed in time because the logic involved deep processing of the skill release module, which was high-risk and needed to be optimized in subsequent versions; the problem

of frequent switching of actions of mobile characters in the wall climbing state was not completely solved in this update. It was initially judged that the coupling with the input state switching logic was too high, and it was planned to be adjusted intensively before the second test. At the same time, regarding the suggestion to regionalize functional testing, considering that the current game has a built-in progressive skill unlocking mechanism, and the level design has naturally guided players to experience new skills through different areas (for example, after unlocking a new skill, the terrain or combat scene that requires the skill to be passed is designed immediately), the modification suggestion of the split test structure was not adopted in the end.

Overall, this first trial test achieved the expected goals of discovering key bugs and collecting early player experience feedback, providing a clear direction for subsequent optimization. Although some systemic problems are yet to be improved in subsequent versions, the core interaction logic and basic combat experience have been preliminarily verified. The next step will focus on improving combat fluency, strengthening visual feedback and control responsiveness, and making targeted adjustments and optimizations.

7.2.2 Second playtest

7.2.2.1 Data statement

Based on the first trial test, the second test further optimized the test questionnaire content, adding questions about sound effect feedback, overall interface layout, perception of experience differences on different platforms, and overall satisfaction, in order to more systematically collect players' feedback on the differences between the PC and Mobile experiences. At the same time, the test still takes into account the discovery of systemic bugs and the collection of basic operation experience opinions to ensure the continuous improvement of the game mechanism. A total of 5 valid questionnaire data were collected in this round of testing, covering detailed closed-ended scoring and rich open-ended subjective feedback.

In terms of closed-ended question scores, the overall trend is basically the same as the first test. Players generally give higher operation intuitiveness scores to the PC version (such as the basic control intuitiveness score of the PC side is 4 or 5 points), while the Mobile side still has certain shortcomings in terms of ease of operation and smoothness of skill switching. In particular, in the item "Combat mechanics felt responsive and engaging", some players still gave medium and low scores (such as 2 points), showing that combat coherence and control feedback are still the shortcomings in the current experience. New questions such as "Sound feedback helped me understand game state" and "The overall visual layout contributed positively to my experience" generally scored high (the average score of sound feedback reached 4.25), indicating that the auditory feedback and overall interface design have been recognized by certain players. In addition, players' overall satisfaction with the game is above average (3 to 5 points), which is consistent with the trend of the first test results.

Open feedback further enriches the understanding of experience differences. Most

players pointed out that although the core gameplay mechanism of the PC and Mobile versions is the same, there are significant differences in the actual operation experience due to different input methods and UI layouts. For example, some players said that when switching skills on the Mobile demo, the buttons are dense and require multiple clicks, which increases the complexity of the operation and affects the continuity of the battle rhythm. Negative feedback on the operation experience on the Mobile demo focuses on skill switching, unclear UI button layout, and too long prompt text length; on the PC demo, the problems are mainly concentrated on details such as unclear feedback on skill selection status and lack of intuitive markings in operation prompts. Some players suggested shortening the prompt text and increasing the font size, and proposed that the skill release and attack button areas on the Mobile demo should be more reasonably divided to reduce misoperation. In addition, some players pointed out that they hope to further strengthen the visual distinction of skills, such as using different colors and icon changes to help players quickly identify the selected skills.

Based on the feedback collected in this test, the project team made the following major optimizations and corrections:

- Reduce the horizontal proportion of the prompt prop text on the screen to make the prompt content more centered and easier to read;
- Enhance the visual effects of the Ultimate Skill to improve the recognition and impact of skill release in battle;
- Fixed the bug that the current displayed skill on the PC version is inconsistent with the actual selected skill effect;
- Fixed the bug that the mobile player constantly switches the moving/climbing animation when climbing the wall;
- Successfully fixed the problem that the preview auxiliary line remains after releasing the skill on the PC version.

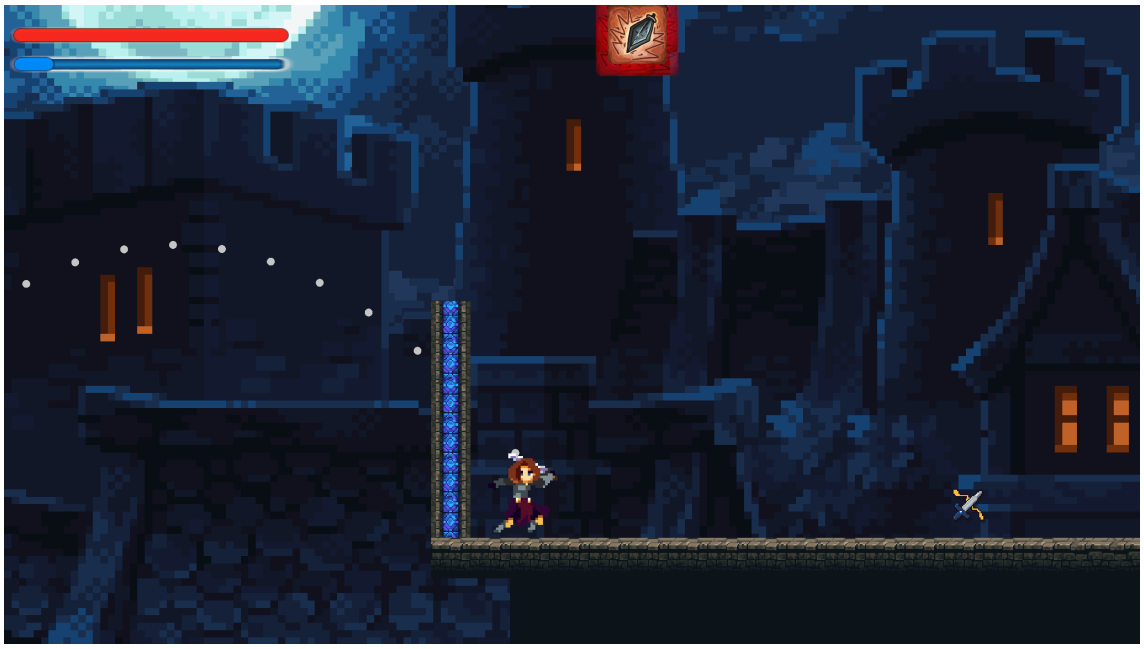


Figure 7.3: Sometimes the line of aiming would not disappear after the skill was released

However, in this round of testing, some players also proposed to further simplify the skill switching method on the Mobile demo, and suggested that all skills be displayed directly on the interface, which means there is no need a button to unfold the skill table, the skills should be always on the screen. After on-site inquiries and comprehensive evaluation, it was decided not to adopt the suggestion for the time being and keep the existing skill switching logic, considering the visual burden of small-screen devices (displaying all skills at the same time will seriously occupy screen space, affecting the visual and operational experience). In addition, some new systemic problems were found in this round of testing, including occasional blankness of the PC pause interface, the PC character automatically moving left without operation, and the character's aiming direction and skill release direction occasionally inconsistent. These problems have been included in the subsequent version repair plan.

7.2.2.2 Result analysis

Based on the Likert scale data and open text feedback collected in this round, I preliminarily summarized the main differences in player experience between PC and Mobile:

Because the PC relies on physical keyboard and mouse input devices, it performs better in terms of skill release accuracy, character operation consistency, and immediate combat feedback. Player feedback pointed out that the PC can complete skill switching and movement operations more smoothly, and the action feedback after skill release is faster, which enhances the overall combat rhythm and sense of control. However, the PC version has certain deficiencies in terms of interface information

prompts, such as the skill switching status is not intuitive enough and the operation prompts are not clear enough, which leads to the need to frequently look down at the keyboard in high-speed battles, affecting the continuity and immersion of operations.

In contrast, the Mobile version, with its simple UI layout and low basic operation threshold, performs well in the presentation of important information (such as health and energy display) and sound feedback, helping players quickly understand the combat status on mobile devices. However, due to the limitations of touch input, players generally face the problems of cumbersome skill switching steps, too dense buttons, and high false touch rate in the combat experience on the Mobile version. Especially when it is necessary to quickly switch skills or perform multiple operations in succession (such as dodge plus attack combination), Mobile players are more likely to make operational errors, resulting in interruptions in the combat rhythm. In addition, some players pointed out that the skill aiming and release logic design on the Mobile version deviates from the player's intuitive operation expectations, such as the long press release mechanism is not smooth enough, which further affects the consistency of the operation experience.

Overall, the second test effectively collected preliminary quantitative and qualitative evidence for the difference in experience between the two terminals. The results further verified the problems found previously, that is, the PC terminal has a better experience in control freedom, consistency and skill feedback, while the Mobile terminal has an advantage in the clarity of basic information prompts but lacks consistency in operational details. Through active response and correction to player feedback, this test has further improved the overall completion and experience consistency of the game, laying the foundation for the subsequent formal testing phase.

7.2.3 Third playtest

7.2.3.1 Data statement

After completing basic function verification and major bug fixes in the first two rounds of testing, this third round of playtest focused on collecting players' system feedback on the differences in experience between the PC and Mobile terminals, as the core data source for this graduation project research. Prior to this round of testing, we optimized a number of functions based on the feedback from the previous playtesting session, including fixing the problem of character automatic movement, optimizing the smoothness of character movement, fixing the abnormal display of the pause interface on the PC terminal, adjusting the layout and size of the buttons in the lower right corner of the mobile terminal, and solving problems such as skill release interruption and specific enemy AI abnormalities, to ensure that the experience foundation of this test is more stable and reliable.

The closed scoring results show that players' perception of the difference between the PC and Mobile terminal experiences has been further clarified. Overall, the PC terminal received higher evaluations in terms of operation responsiveness, skill release continuity, and overall combat rhythm control, especially in terms of skill

switching accuracy (PC 4.0, Mobile 3.0). The Mobile terminal continues to maintain its advantages in terms of intuitive UI layout and basic information display(PC 3.0, Mobile 3.3). Players can more easily quickly understand the skill release button and basic control logic in the Mobile version, but there are still certain shortcomings in operation accuracy and response speed.

The open-ended answers further concretize the perception of differences in the dual-terminal experience. One players pointed out that: The controls in the mobile seemed less responsive, thus making the game harder to play. Another player also mentioned that: The mobile version has clearer UI, but in the pc version it's harder to understand it, however, switching skills was confusing in the pc version. Although the skill switching operation process on the mobile version is evaluated by some players as easier to understand, some players also reported that frequent skill switching in battles still feels complicated.

For the PC version, players generally believe that skill release, character movement, and attack feedback are better than the Mobile version in terms of responsiveness and strike feel, but there are also feedbacks pointing out that the skill switching status in the PC version is not intuitive enough, and there is a lack of clear skill distinction prompts, especially when using multiple skill combinations and combos, which is easy to cause cognitive confusion. Some players suggested further strengthening the visual differences between skills so that the current skill status can be quickly identified in fast-paced battles.

7.2.3.2 Result analyis

In terms of experience commonality, most players recognized the overall improvements in this round of test versions in terms of system stability, sound feedback, and interface information presentation, especially the release effect of special moves and character fluency, which received positive feedback. Players also showed a certain degree of appreciation for the overall gameplay, weapon throwing mechanism, skill combination attack and other contents, and believed that these designs brought a high sense of pleasure and creative space to the combat experience.

Based on the feedback results of the first three rounds of testing, we can preliminarily draw the following conclusions about the difference in experience between the two terminals: the PC terminal has significant advantages in precise control, smooth rhythm, and instant feedback, and is more suitable for complex and coherent operation processes; while the Mobile terminal has certain advantages in basic information readability, intuitive interface and lightweight operation, and is more suitable for short-term and lightweight experience needs. The difference in input methods (physical keyboard and mouse vs. touch screen) directly leads to differences in experience in terms of skill switching complexity, action coherence, and false touch rate, which is particularly obvious during high-frequency combat interactions.

7.2.4 Formal playtesting questionnaire result analysis

Considering the small number of valid samples (10 people in total) participating in the official trial questionnaire, it is difficult to make a statistically significant judgment on the overall distribution characteristics in data analysis. For the sake of prudence, this study mainly uses the average score as the core analysis indicator, and a small number of relatively extreme scoring results are regarded as possible individual differences or statistical errors, and are not interpreted as the main trend.

Overall, compared with the questionnaires in the prestudy, the feedback collected in this playtest questionnaire rarely focused on the median values (such as "3"), but rather more on choosing extreme values (1 or 5). This distribution change indicates that after the actual trial play, players have formed a clearer attitude towards the experience of various dimensions of the game. This indicates that this trial play test does indeed help participants distinguish between good and bad in real interactions and establish clear preferences. The polarization of the scores reflects the intensification of players' attitudes and also enhances the explanatory power of the results when analyzing design flaws and advantages.

Based on the analysis results of 23 closed-ended scale questions in the questionnaire, this study further summarized five core experience dimensions and systematically organized them from the perspective of the differences in experience between the two terminals. Although the PC version and the Mobile version share the same core combat system, the player experience shows obvious differences in the five dimensions of Accessibility, Playability, Satisfaction, Engagement, and Inclusivity, and these differences can be verified by quantitative data and open feedback.

In terms of Accessibility, the overall performance of the PC terminal is better than that of the Mobile terminal. Players generally believe that the operation of the PC terminal is more intuitive, and the skill release and basic movement control are smoother(PC gets 4.2 and mobile gets 3.5 on average, and 90 perfect of the player give 4 or higher score in the PC version). Although the Mobile version scored high in important information (such as health and energy display) and the overall clarity of the UI interface is good, it scored low in basic operation comprehension(Mobile 3.8 points PC 3.9 points and 30 perecnt of mobile players chose the low score of 2 points), reflecting that some players have adaptation barriers when they first come into contact. This difference shows that the input device characteristics (physical keyboard and mouse vs. touch screen) have a significant impact on the experience.

In the dimension of Playability, the difference between the two terminals is particularly prominent. The PC terminal scored more than 4.0 in terms of skill responsiveness, attack and defense coherence, skill hit judgment accuracy, and character action synchronization, showing that the overall combat operation is smooth and responsive. In the combat mechanics felt responsive and engaging, which only received a very low score of 2.6, becoming the most obvious shortcoming in the experience. Although the scores were mainly concentrated on the milder 3 points, accounting for 40 percent, no player chose the full score of 5 points, and 20 percent of the players chose the lowest 1 point. Compared with the high scores of other items, this item can be said to have performed quite poorly. Furthermore, in the open-end questions some players

generally reported that the mobile terminal's skill switching is prone to accidental touches, delayed action response, and interrupted combat rhythm, which seriously affected the playability experience.

In the dimension of Satisfaction, the experience of both terminals is above average. The overall satisfaction of the PC version is 3.5, slightly higher than the 3.375 of the Mobile version, but neither of them reached the ideal standard of high satisfaction, which is higher than 4.0. The data distribution of the PC side is mostly in the middle value of 3 points, reaching 62.5 percent, while the mobile side data is more scattered, ranging from 2 points to 5 points, and the proportion is also relatively uniform. This shows that the satisfaction of both platforms is above average, but not highly satisfied. The PC experience is relatively stable but lacks highlights, while there are large differences on the mobile side, reflecting that the user experience is greatly affected by differences in equipment or operations, and further optimization of consistency and adaptability is needed. In their open-ended responses, players pointed out that although the Mobile version is more intuitive in some operations, such as dashing, the overall satisfaction is limited due to insufficient consistency and feedback.

In terms of immersion, visual feedback in this demo is relatively insufficient (the average score is 3.6, and 80 percent of the players scored 2 or 4 points, showing that this item is severely polarized, but not too polarized). This shows that visual feedback is not enough to improve immersion. It is worth noting that the sound feedback on both ends received high evaluations (the average score is 4.25 and more than half of the players scored 5 points), which is considered to be able to effectively improve the perception of skill release and combat status, but visual feedback (such as button highlighting and skill cooldown prompts) is slightly insufficient and has limited auxiliary effect on operations.

According to the table data, in the Inclusivity dimension, the mobile terminal performs slightly better than the PC terminal, with a lower overall difficulty perception, and is more suitable for players of different levels, especially novice players. The average score of the PC terminal is 1.625, of which 62.5 percent of the players chose 3 points (indicating medium difficulty), 37.5 percent chose 2 points (lower difficulty), and no one chose 1 point (very easy) or 4 or 5 points (difficult). This shows that the experience of the PC version is relatively concentrated at the "medium to easy" level, but has not yet reached the true "simple and easy to use". The average score of the mobile terminal is 2.25. Although the score is slightly higher, the score distribution is more dispersed. 62.5 percent of the players chose 2 points, and another 12.5 percent chose 1 point, 12.5 percent chose 3 points, and 12.5 percent chose 4 points, indicating that the simplified operation has been recognized by some players. The proportion of 1 point and 2 points in the mobile terminal is relatively high, indicating that most players think that the operation threshold is lower and easy to use; but at the same time, some players think it is still challenging, reflecting the influence of device differences or operating habits. Overall, the mobile version has shown strong inclusiveness thanks to its simplified touch logic and more direct interface interaction. Although the PC version has a stable experience, there is still room for improvement in its friendliness for novice players.

In summary, although the core gameplay design of the PC version and the Mobile version remains the same, the differences in input devices, operation interaction logic and interface layout strategy directly shape the differences in players' experience in multiple dimensions such as ease of use, operation fluency, satisfaction and immersion. The data from this questionnaire clearly reveals the structural sources of these differences, providing important empirical evidence for the subsequent optimization of cross-platform combat experience.

7.3 Result Summary

7.3.1 Prestudy questionnaire result analysis

Before this project entered the formal testing and development stage, in order to fully understand the players' preferences, acceptance and key experience factors for the combat system, I designed and distributed two sets of preliminary questionnaires: the English version of the questionnaire was mainly for international PC users, and the Chinese version covered Chinese native players.

7.3.1.1 Overall score trend and core preferences

From the aggregated scale data, it can be seen that the scores of Chinese and English users on multiple core issues are highly consistent, showing the following more significant trends:

The importance of auxiliary mechanisms and adaptive design: The question "The combat system should include auxiliary mechanisms, such as automatic locking and simplified combos, to lower the threshold" has an average score of 3.4 and 3.6 in the English and Chinese questionnaires, respectively, indicating that most players support moderate operation assistance to reduce the difficulty of getting started. Interestingly, even though many players gave 5 points to both questions, believing that game guidance is very important, a very small number of players (about 10 players in total) gave the lowest score of 1 in both questionnaires, which may be due to lack of gaming experience or not realizing the importance of game guidance. Most of the players who gave 1 point to this question have less than three years of gaming experience.

Preference for gradual system guidance: The question "The combat system should gradually introduce complexity during the game, rather than overwhelming it at the beginning" scored an average of 4.1 in the English questionnaire and 3.9 in the Chinese questionnaire, both of which are high-scoring items, indicating that players generally prefer to master the combat system through gradual learning rather than being overwhelmed by the amount of information at the beginning. Another piece of information that can prove the high recognition rate of this question in the Chinese and English questionnaires is that in the Chinese questionnaire, where 3 points is the mainstream for most questions, the number of players who chose 5 points on this question exceeded the number of players who chose other scores, reaching one-third. In the English questionnaire, nearly 80 percent chose 4 points or higher,

which strongly shows that Chinese and English game players have a high consensus on this issue.

7.3.1.2 Divergent attitudes towards system complexity

In terms of system complexity and skill operation strategies, the feedback from participants showed a certain polarization:

Some players supported "preferring a simple and intuitive combat system even at the expense of strategic depth" (English: 3.3; Chinese: 3.3);

But at the same time, the option of "I prefer to include multiple combos and complex mechanisms to increase depth" also received relatively close support (English: 3.0; Chinese: 3.3).

Two questions with opposite meanings came to similar conclusions. This reflects that there is a differentiated perception of the "complex vs. simple" combat experience among the current player group. This set of seemingly contradictory questionnaire results shows that players do not simply prefer "simple" or "complex", but prefer a combat system that is "simple in operation but gradually introduces depth". They hope that it is easy to get started while also having room for exploration. Therefore, the design should focus on basic understanding and advanced strategies to take into account the needs of players at different levels. Among them, the Chinese version of the questionnaire still has most players writing 3 points on these two questions, and the data distribution is closer to Gaussian distribution. In the English version of the questionnaire, more players chose 2 points or 4 points on these two questions than 3 points. This shows that English version players have a clearer stance on the combat system (either pursuing depth or preferring simplicity) because they have more game experience and prefer hardcore platforms; while Chinese version players have less experience and prefer mobile platforms, and tend to choose conservative neutral options, reflecting that they do not have a clear understanding of complexity or prefer a more balanced system. Therefore, a compatible strategy needs to be adopted in the actual design, that is, while keeping the core operation simple and intuitive, the deep content is gradually unlocked through the expansion mechanism to meet the needs of players at different levels.

7.3.1.3 Combat feedback and "strike feeling" design

"Strike feedback" (such as sound effects, vibrations, and attack animations) is considered to be an important factor affecting the combat experience. This item scored high in both the Chinese and English questionnaires (English: 4.3, Chinese: 3.8), and was repeatedly mentioned in the free answers of multiple players. For example, some players pointed out that they prefer "a combo system with clear feedback and a sense of rhythm" and listed "the cool feeling of audio and video feedback" as a decisive indicator of the quality of the combat system. The possible reason is that most of the players in the English questionnaire have played games for a longer time, mainly on consoles and PCs, so they have a deeper understanding of the sense of attack. They have experienced games with high-quality feedback design, such

as "God of War" and "Sekiro", and know what is a "textured" and "cool" attack experience. Therefore, they can clearly judge whether the experience is good or bad, give high scores, and form a stepped distribution (5 points are the highest, and then gradually decrease from 5 to 1). Most of the players in the Chinese questionnaire prefer mobile games. Such platforms are generally limited by touch input, hardware feedback and development costs, and perform poorly in attack feedback. Players are accustomed to this relatively "light attack" battle, so their perception sensitivity and evaluation criteria for this item are relatively vague, and they give 3 to 4 points of "medium recognition", forming a more concentrated but not extreme distribution. In addition, Chinese users generally have a tendency to prefer the middle option in the questionnaire; that is, they do not easily give extremely high or extremely low scores, and are more inclined to choose the middle item to express the attitude of okay and not good or bad. This expression style also makes the proportion of 3 and 4 points higher. Even if you may feel that "the sense of attack is pretty good" in your heart, you may not give 5 points.

7.3.1.4 Guidance and learning method preference

On the question of "Do you prefer to learn the combat system through trial and error rather than tutorials", the average score for the English version was 3.2, and the average score for Chinese users was 3.4, indicating that most players still tend to accept some form of guidance in the initial stage, especially when facing complex skill combinations or fast-paced battles. The score of the supporting question "Should the game provide a detailed tutorial/training mode" is higher (English: 3.7, Chinese: 3.9), which once again confirms the general demand of players for "reasonable teaching". In the English questionnaire, more players chose 2 or 4 points, showing a trend of "slight opposition", indicating that they have a clearer attitude towards complex mechanisms or learning through trial and error, either they like challenges and accept complexity, or they prefer simple and clear mechanisms and tutorials. This is related to their overall richer game experience and familiarity with high-complexity systems, and their evaluations are more directional and biased. The Chinese questionnaire showed a more typical Gaussian distribution with 3 points as the main score, indicating that players have more neutral, conservative, or vague attitudes towards these two questions. On the one hand, it may be because of limited game experience that they are not clear about the specific meaning of complex mechanisms or trial and error learning; on the other hand, it also reflects the lack of actual experience with such mechanisms, which leads them to tend to choose a middle score to show approval but not radicalism. The average scores of these two questions fall in the middle range, further indicating that most players do not oppose complex mechanisms, but only if there is a reasonable guidance path or learning mechanism. In other words, they hope that the system has depth and that the learning process is not frustrating, but gradual.

7.3.1.5 Open-end question analysis and observation of cultural differences

In the free text feedback of English users, common keywords include "fluidity", "responsiveness" and "learning curve". For example, some players mentioned that the

"blocking mechanism" of "Sekiro" is addictive and "like talking to the enemy".

In contrast, Chinese users are more inclined to use words such as "strike feeling", "operation refreshing feeling" and "skill release intuitiveness" in their free responses. Some users said that "the most annoying thing is the game that requires you to recite a bunch of combo instructions first" and "the operation can be done in one second", which shows that Chinese users have a more significant preference for "operation response speed" and "light burden".

7.3.1.6 Additional explanation of sample validity

It should be pointed out that although the questions in the Chinese and English questionnaires are consistent, the reference value of the Chinese questionnaire has certain limitations. After the questionnaire was distributed, the researchers communicated with some of the respondents and found that many of them had almost no gaming experience and answered only based on subjective impressions. In the first question about gaming experience, a considerable proportion of respondents chose "less than a year", and nearly half of the respondents had played games for no more than 3 years, while more than 92 percent of the respondents in the English version of the questionnaire had more than 10 years of gaming experience. This further confirms this problem.

In addition, when respondents lack understanding of the questions or have unclear positions, they tend to choose the middle item, which means 3 points out of 1-5, in the Likert scale as an avoidance strategy rather than truly expressing a neutral attitude. This phenomenon was also observed in the Chinese questionnaire, resulting in "unnatural concentrated distribution" of some questions, which interfered with the explanatory power of the results.[39]

7.3.1.7 Suggestions on the design tendency of the battle demo

Combining the quantitative data collected in the English questionnaire with the open text feedback, the battle demo of this project should follow the overall design concept of "easy to get started and gradually deepen". In the quantitative feedback, players highly recognized "battle style diversity" (average score 4.4) and "hit feedback mechanism" (4.3), and the acceptance of "resource management mechanism" (such as stamina bar, cooling time) was also at a medium-high level (3.6), indicating that players generally welcome system designs with strategic dimensions but not burdensome.

Relatively speaking, players' support for "fast-paced combo combat system" was low (2.8), and the feedback on "highly strategic tactical combat" was relatively neutral (3.4), showing that users generally prefer combat systems with a sense of control, clear feedback, and moderate rhythm, rather than gameplay that emphasizes extreme operation intensity or complex command input.

In open-ended answers, many players mentioned games such as "Sekiro", "Monster Hunter", and "Slay the Spire", emphasizing that "hit feeling", "skill style differences" and "step-by-step system guidance" are the most attractive factors in their combat

experience. For example, one player pointed out: "The battle must be exciting. Even if the system is not complicated, as long as the hit feedback and rhythm are well mastered, you can still get a highly immersive experience." Another player said: "I care more about the vibration, sound effects, and character reactions after the hit. These can leave a better impression on me than the combo itself."

Based on this, the design of the demo of this project can be carried out around the following key directions:

- Strengthen the hit feedback mechanism: Build a distinct attack feeling through sound effects, vibrations, knockback animations, etc., to provide players with an immediate positive feedback experience;
- Clearly distinguish between skill styles: Design significantly different A variety of combat styles to increase the space for strategic expression;
- Adopt progressive complexity design: retain simple operations and basic mechanisms (such as auxiliary locking and combo prompts) in the early guidance stage, and then gradually introduce higher-level combinations and resource control logic;
- Strengthen mobile terminal adaptability: Consider the touch screen characteristics, improve the smoothness of mobile terminal operations by simplifying input methods, expanding interactive areas, and introducing locking and fault tolerance mechanisms;
- Reduce the burden of mandatory tutorials: Combine player preferences and gradually guide combat mechanisms in a "learn while playing" manner to avoid lengthy instruction-based teaching that interferes with the rhythm of the game.

8

Discussion

8.1 Introduction

This chapter will discuss the main findings of this study in four aspects: summarizing the research results, discussing limitations, analyzing practical significance, and proposing future research suggestions. Through empirical analysis of the differences in player experience on different platforms, this chapter aims to fully understand the impact of platform input mechanism, UI design, and operation burden on the combat system experience, and provide a reference for future cross-platform game design.

8.2 Hypothesis and analysis

8.2.1 Hypotheses focus on UI

The two demos are exactly the same, so feedback should focus on the differences in UI and operation feel.

According to the questionnaire survey and open-ended feedback, the PC version scored significantly higher than the mobile version (3.5 points) in terms of basic operation intuitiveness (4.2 points) and skill switching convenience (4.2 points). In terms of UI clarity and key information visibility, the mobile version (4.8 points) is slightly better than the PC version (4.8 points are the same, but the UI understanding of the mobile version is higher).

Judgment: Partially Accepted. Although players generally pay attention to the differences in operation feel and interface layout, there is an unexpected feedback phenomenon that perception regards the two versions of the demo as "different games", which exceeds the original assumption.

Analysis: Although the PC version and the mobile version are completely consistent in gameplay logic, art style, and level structure, many players still expressed the subjective feeling of "as if they have experienced two different games" after trying them. A player pointed out that when players experience the PC version of the demo, they often naturally compare it with other PC games; while on the mobile version, they compare it with other mobile games. This phenomenon can be attributed to the

reference comparison effect, which states that when individuals perceive a stimulus, they are often influenced by similar stimuli in their long-term experience [40].

In the field of games, this means that players' experience evaluation is not only affected by the current game itself, but also by the moderating effect of platform expectations [14]. Since PC games usually provide interactive experiences with higher degrees of freedom and higher responsiveness, while mobile terminals are mainly characterized by ease of operation, even if the two versions of the demo design are consistent, players will form different experience frameworks based on platform characteristics.

Summary of the significance of the findings: This finding shows that when conducting cross-platform game experience consistency research, it is not enough to only ensure the consistency of gameplay and art. Players' platform expectations must be taken into consideration in design and testing, especially in core gameplay modules such as combat systems that are highly sensitive to operational details. This result poses a new challenge to future cross-platform game development, namely how to simultaneously meet different player reference systems and operating experience standards on different platforms.

8.2.2 Hypothesis for mobile experience

Since the respondents generally lack experience in mobile gaming, it is expected that the adaptation period of mobile demo is longer.

Data result description: Questionnaire feedback shows that the mobile terminal scores low in basic operation intuitiveness (3.5 points), and the ease of skill switching is significantly lower than that of PC (3.5 vs 4.2). In the open feedback, many players mentioned that when they first came into contact with the mobile demo, there was a short period of unfamiliarity with the operation, especially in skill release and direction control. Some players said that they needed multiple attempts to successfully complete the combat action chain.

Hypothesis judgment: Accepted. Both the data and the subjective feedback of the players show that there is a certain initial adaptation threshold for the mobile demo, and the adaptation time is generally higher than that of the PC.

Analysis: This phenomenon can be explained by the Cognitive Load Theory [23]. Since touch input is inherently inferior to physical keyboards and mice in terms of accuracy and timely feedback, mobile players need to invest more extraneous load in the process of skill aiming and combo release, which prolongs the learning curve [14].

In addition, the open-ended question feedback also highlighted that since mobile terminals need to use multiple virtual buttons to complete skill switching and attack combos, compared with the shortcut keys + mouse operation on the PC demo, fingers will frequently switch targets on the small screen, which increases the physical operation burden [15], further affecting the early adaptation speed.

It is worth noting that although there are difficulties in adaptation in the early stage, some players said that "after getting familiar with it, the mobile terminal operation

can also be smooth and coherent", indicating that the obstacles to mobile terminal operation are mainly concentrated in the entry stage, and the experience tends to be stable in the later stage. This is consistent with the dynamic change mechanism of skill and challenge matching in the Flow Theory [19], that is, as the skill mastery improves, the sense of experience fluency gradually increases.

Summary of the significance of the findings: This result emphasizes that when designing a cross-platform combat system, the rationality of the initial operation guidance and adaptation mechanism is crucial to the mobile experience. Especially for players who lack mobile experience, simplifying the learning curve and providing clearer and more intuitive operation feedback may become a key strategy to improve overall satisfaction and reduce churn.

8.2.3 Hypothesis about screen real estate

The mobile terminal may affect the gaming experience because the buttons occupy a large display area.

Data result description: In the questionnaire survey, the overall feedback on the mobile terminal UI layout and experience fluency is medium to low (UI understandability 3.7 points, button layout rationality 3.8 points). In the open feedback, many players pointed out that the function buttons such as attack, skill switching, jump, and sprint in the lower right corner of the mobile terminal are densely arranged, occupying a large visible area, resulting in limited observation of enemy or environmental information during combat. In addition, some players mentioned that accidental touches occur from time to time, especially during high-intensity continuous operations, such as jump plus attack combo.

Hypothesis judgment: Accepted. The data display and player feedback both verify that the occupation of screen space by mobile terminal UI elements does affect the operation experience and information perception efficiency to a certain extent.

Analysis: Mobile devices are limited by screen size and interaction methods (direct touch rather than peripheral input), and inevitably face space-function conflict problems when laying out combat operation UI [24]. According to the theory of human-computer interaction [11]), densely arranging high-frequency interactive elements in a limited screen space will lead to visual clutter and complexity of interaction paths, thereby increasing cognitive load and physical burden.

In addition, Fitts' Law [41] points out that in an interface that requires fast and accurate clicks, the target size and distance directly determine the speed and accuracy of the operation. Multiple small buttons are arranged at the same time on the mobile terminal, and players need to switch finger positions at high speed during combat, which significantly increases the false touch rate and operation delay. This problem is greatly alleviated on the PC demo because it uses physical buttons and mouse aiming, and there are fewer operation conflicts.

This is further supported by the subjective feedback from players: some players hope to add custom UI functions, or to reduce occlusion and false touches by optimizing

the layout to improve the fluency of mobile combat.

Summary of the significance of the findings: This study found that in the design of mobile combat systems, UI layout and operation area design have become one of the key factors affecting player experience. Reasonable arrangement of the position, size and feedback mechanism of interactive buttons, and the introduction of dynamic hiding and display mechanisms when possible, such as hiding part of the UI when out of combat, will help improve the mobile combat experience, especially in high-frequency input action-intensive games.

8.2.4 Hypothesis about skill release

For skill release, PC is more convenient because it can use the keyboard to control the release of skills with multiple fingers, while mobile has an extra step (you need to click the skill switch button to expand the unlocked skill library). It is expected that the feedback can reflect this difference.

Data result description: Questionnaire data shows that PC is higher than mobile (3.5 points) in skill switching fluency (4.2 points) and character operation control (3.8 points).

In open feedback, many players pointed out that using shortcut keys to switch skills and mouse positioning release operations on PC is very natural and efficient, while on mobile, due to the need to use virtual joysticks and touch buttons, the skill release delay is obvious and the operation load is increased, especially in high-intensity combat situations.

Hypothesis judgment: Accepted. The feedback results clearly show that PC has advantages in the convenience and fluency of skill release, while the operation complexity of mobile is high and the experience is limited.

In-depth analysis: This finding is highly consistent with Multi-finger Input Theory. PC players can usually use their left hand (keyboard) to control movement and skill switching, and their right hand (mouse) to aim and release, forming an operation mode with clear division of labor and parallel input processing [11] [35]. This input mode greatly reduces the cognitive switching cost and improves the fluency of complex operations.

On the contrary, mobile terminals are limited to single-point touch (or limited touch area of both hands), and players need to frequently complete multiple tasks such as character movement, aiming direction, skill selection and release in a limited screen area, forming a high degree of input congestion [15]. When switching skills quickly and continuously or performing combos, this congestion leads to obvious operation lag and difficulty in finger coordination, affecting the rhythm of the battle. In addition, there are extra steps to release skills, which makes this situation worse.

According to Flow Theory [19], once players feel a delay in skill response or excessive physical operation load during operation, they will easily break the immersion state and cause a break of flow.

Therefore, this verifies that in the design of cross-platform combat systems, differences in input methods have a decisive impact on the skill release experience. For mobile terminals, if you want to improve combat continuity and operational fluency, you may need to introduce a more intelligent skill release mechanism, such as: skill auto-aim, predictive input, simplified combo execution, etc., to alleviate the experience loss caused by the limitations of input devices.

8.3 Limitations

Although this study strives to be rigorous in the design and execution process, there are still some limitations that cannot be ignored, which may have a certain impact on the universality and explanatory power of the research results. The following will conduct a systematic analysis from the aspects of sample size and representativeness, research methods, data sources and other potential biases.

8.3.1 Sample size and representativeness

The data of this study mainly comes from multiple rounds of internal trial tests. The overall number of respondents is small and mainly concentrated on subjects with a certain gaming background. Due to the lack of a broader and more diverse audience base, especially the heavy mobile gamers and non-core game user groups, the representativeness of the sample has certain limitations. Therefore, the research results should be extended to a wider group of players with caution. In the future, the robustness of the conclusions should be further verified by expanding the sample size and enriching the types of players.

8.3.2 Methodological limitations

First, although this study adopted a unified structure and control variable method to develop PC and mobile demos, some experiences were still affected by systematic bugs during the actual testing process. For example, in some versions, there are problems such as residual auxiliary lines for skill release, abnormal status when the character switches actions on the wall, and inconsistent touch feedback on some mobile devices. These incompletely fixed defects may have interfered with the player's natural operation experience to a certain extent and affected the objectivity of the feedback.

Secondly, in terms of enemy types and mechanism design, in order to control the research variables, the project chose a very simplified enemy behavior logic (basic movement and attack), but this simplification also reduced the richness of the battle process, which may cause some players to have a biased experience of the depth and challenge of the system. In the future, if we can moderately increase the diversity of enemies and the complexity of behavior while maintaining controllability, we may further enrich the experience dimension.

8.3.3 Limitations of data sources

This study mainly relies on questionnaires and open-ended feedback to collect player experience data. Although the questionnaire content has been revised and optimized many times, there are still some problems with the broad expression of individual questions, which leads to the failure of some feedback to deeply explore the specific cognitive process of players. For example, in the specific quantification of skill switching burden and mistouch frequency, there is a lack of subdivision indicators, which limits further quantitative analysis.

In addition, due to the use of self-filled questionnaires and semi-structured interviews, the subjective preferences and expression differences of the respondents may also introduce certain subjective biases [31].

8.3.4 Other potential biases

It is worth noting that this project was completed independently by a single developer. In the process of test design, questionnaire writing, data collection and analysis, it is difficult to completely avoid the researcher bias of individual experience and expectations on the research process. Although efforts have been made to introduce standardized processes and multiple rounds of corrections during implementation, if future research can introduce multi-researcher cross-validation and third-party testing mechanisms, it will be more helpful to improve the objectivity of the data and the credibility of the research.

8.3.5 Potential impact of limitations on the results

The above limitations may lead to certain biases in players' feedback on some indicators such as operation fluency, skill experience, and satisfaction, affecting the universality and breadth of interpretation of the results. In particular, in the data on the burden of mobile experience and false touches, the interference of systemic problems may have aggravated negative feedback. Therefore, future research still needs to be further optimized and strengthened in terms of system stability, test scale and method design to improve the reliability and external validity of cross-platform experience research.

8.4 Implications

This study not only enriches the analytical framework of cross-platform combat experience differences at the theoretical level, but also provides operational guidance for the design of multi-platform game systems at the practical application level. The following analysis will be carried out from three aspects: academic contribution, practical application significance, and inspiration for future research.

8.4.1 Academic Value

First, this study proposed and verified a cross-platform combat experience evaluation framework covering five dimensions: Accessibility, Playability, Satisfaction, Engagement, and Inclusivity. I believe that this study can expand the existing theoretical system of multi-platform playability research [3].

Unlike previous studies that focus on a single dimension (such as control accuracy or visual feedback differences), this study systematically reveals the complex interactive relationship between platform input mechanism, interface layout, and player expectations through unified gameplay design, systematic data collection, and multiple rounds of qualitative analysis.

Secondly, this study empirically verified the existence of Reference Comparison Effect in cross-platform experience perception, that is, when players experience the same content on different platforms, they form differentiated evaluations based on existing platform experience and cognitive frameworks. This finding provides a new research perspective for in-depth exploration of the role of platform culture and player psychological construction in game experience in the future [40][14].

8.4.2 Practical application significance

At the practical level, this study provides an important design reference for multi-platform game development, which is mainly reflected in the following points:

The importance of input mechanism adaptation: Even if the core gameplay is completely the same, different input methods (keyboard and mouse and touch screen) may still lead to significant differentiation in operation experience. Therefore, in cross-platform development, exclusive optimization strategies should be designed for different platforms, such as introducing automatic locking on mobile terminals and simplifying the skill switching process, so as to reduce cognitive load and improve coherence and responsiveness.

The criticality of interface layout and information presentation: On small-screen devices, reasonable control of UI element density and optimization of operation area division play an important role in improving the sense of battle rhythm and reducing accidental touches. The findings of this study support the importance of the "spatial optimization principle" in human-computer interaction design[11].

Design considerations for platform expectation effects: Developers should fully realize that players do not evaluate cross-platform experiences based on absolutely neutral standards, but compare them based on the established experience standards of their respective platforms. Therefore, cross-platform versions should consider echoing the implicit expectations of players on each platform in design details to improve overall satisfaction and immersion.

8.4.3 Implications for future research

This study also provides some inspiration for future related research:

- Expand sample types and scales: Future research can introduce samples of players from different cultural backgrounds and different core levels (casual players and hardcore players) to test the cultural adaptability and group differences of platform experience differences.
- Introduce longitudinal tracking studies: Through multiple rounds of long-term tracking tests, dynamically observe the changes in players' adaptation, learning and loss processes on different platforms, and provide richer empirical evidence for understanding skill transfer and experience durability.
- Combine with physiological data analysis: In the future, we can combine eye-tracking, heart rate variability, or HRV and other physiological indicators to further refine the impact of platform differences on player concentration and emotional changes, so as to achieve deeper experience modeling [34].

8.5 Recommendations

Based on the findings and limitation analysis of this study, in addition to fixing the existing problems of the project, this paper proposes the following specific suggestions for practical applications and future research directions, in order to further optimize the cross-platform combat experience design and promote the development of theoretical systems in related fields.

8.5.1 Design recommendations

The following recommendations are based on triangulated evidence from user questionnaire data, open-ended feedback, and iterative testing observations and interviews gathered during three rounds of playtesting.

1. Strengthen the optimization of mobile terminal operation experience Considering that the operation burden of mobile terminals is significantly higher than that of PC terminals, it is recommended to introduce the following mechanisms in the mobile terminal version to improve fluency and reduce the rate of false touches:
    - Introduce intelligent auxiliary mechanisms: such as auto-aimming system, simplified skill switching (such as gesture operation instead of multi-step click) or skill pre-reading (predictive input) mechanism to reduce cognitive load and enhance the sense of combat rhythm [24]).
    - Optimize UI layout and customization settings: Provide players with the option of customizing the size and position of operation buttons to reduce the sense of space crowding, adapt to different hand shapes and operation habits, and comply with the ergonomics principle [11].
    - Dynamically hide non-essential UI elements: When there is no need for skill switching, jumping, etc., dynamically hide related buttons, expand the main combat view area, and improve environmental perception and combat response efficiency.

- Merge some button functions: The UI design on the mobile version is also limited by the UI occupying the display area and the cumbersome operation. For this reason, in the future, some existing buttons can be merged, such as detecting the terrain to determine whether jumping or sprinting is required, and the skills are switched by dragging out the button instead of clicking twice, etc.

2. Differentiated fine-tuning design for platform characteristics In view of the significant Reference Comparison Effect of players, it is recommended that in the future, cross-platform games should unify the core gameplay while carrying out detailed adaptation design for different platforms:

   - The PC version can further strengthen the precise operation feedback (such as instant action response, fine-grained skill combination support) and enhance the sense of competition;

   - The mobile version should emphasize the continuity and simplicity of operation, give priority to ensuring the smoothness of basic skill combos, and moderately reduce the dependence on high-precision input.

   Such differentiated adjustments help maximize the immersion and satisfaction of players' experience on different platforms.

3. For the combat system itself, it is best to consider simplifying some operations on mobile devices or platforms where the UI display accounts for a large proportion. On PC or other host platforms, that is, platforms where the UI display accounts for a small proportion, the developers can consider retaining the complete operation or using a relatively complex operation chain.

   Based on the results of the user questionnaire, the mobile terminal is significantly lower than the PC terminal (4.2 points and 4.2 points respectively) in terms of basic operation intuitiveness (3.5 points) and skill switching convenience (3.5 points). At the same time, players also have subjective feedback on the mobile terminal UI layout, such as "dense buttons", "blocked information", and "high false touch rate". These problems are particularly prominent under the condition of limited screen space on mobile devices, and in actual tests, they also lead to interruptions in combat rhythm and decreased operational coherence (the score of "combat mechanism responsiveness and participation" is only 2.6 points). Combined with Cognitive Load Theory[19], it can be seen that mobile touch operations often bring higher extraneous load, which is not conducive to the execution and learning of complex operation chains.

   Therefore, this study recommends that: on mobile terminals or platforms where the UI display accounts for a large proportion, the operation process should be appropriately simplified, such as merging multi-step operations, introducing an automatic skill assisted release mechanism, etc., to reduce the operation load; while on platforms such as PCs or consoles where the UI display accounts for a small proportion, more complex or higher-degree-of-freedom operation chains can be retained to meet users' needs for operation accuracy and strategy depth.

8.5.2 Suggestions for future research

- Introduce a more diverse group of players Future research should expand the sample range to cover players of different ages, different game platform backgrounds (such as pure mobile players, pure PC players and dual-platform users) and different game proficiency levels, and further explore the performance characteristics of platform experience differences in population stratification.
- Adopt longitudinal and multi-stage tracking design It is recommended to adopt a longitudinal research design in the future, through multi-stage and long-term experience tracking of the same group of subjects, dynamically observe the changing rules of experience differences between platforms with factors such as proficiency improvement and fatigue accumulation, so as to reveal the evolution mechanism of platform adaptability.
- Deepen the exploration of the impact of platform cultural differences on experience Considering that players' evaluation of PC and mobile experience is not only derived from the physical differences in operation, but also from the long-term platform-specific cognitive framing, future research can further introduce a cross-cultural comparative perspective to explore the moderating effect of platform expectation effect on combat experience evaluation under different cultural backgrounds.

8.6 Answering the Research Question

The problem consciousness of this study focuses on:**What are some of the ways in which platfrom difference impacts on players combat experience** By comparing the player feedback of the two platforms in five dimensions (accessibility, operability, satisfaction, playability and inclusivity), and combining the comprehensive analysis of questionnaire data and open opinions, the research results show that the platform does have a systematic impact on the combat experience. Since the core of the test of this project is the input method and UI layout, according to the test feedback, **the convenience of the input method** and **the degree of screen occupation of the UI layout**are the two most influential key factors.

On the PC side, players generally believe that input control is more intuitive, can achieve multi-finger simultaneous operation through the keyboard, the operation process is simpler, and the skill switching is smoother; on the mobile side, due to the limitations of touch input itself, and the button layout occupies more screen space, players are prone to problems such as mis-touch, visual occlusion or rhythm interruption, which in turn affects the operability and immersion scores.

In addition, mobile gamers also showed a longer adaptation period and a higher learning burden, especially in scenes with a fast battle rhythm or frequent skill switching, where their subjective satisfaction and sense of rhythm control were significantly lower than those on PC. These differences confirm the research hypotheses proposed in the previous article and clearly respond to the core issues raised in this study from the two dimensions of operational logic and perceived burden.

9

Conclusion

This study aimed to explore the differences in user experience of the same combat system on PC and mobile platforms, focusing on how input methods, UI layout and feedback mechanisms affect players' operational cognition and immersion. By building a 2D action game demo with the same platform but different interactive styles, and combining user questionnaire surveys and open feedback, the paper conducts a systematic comparative analysis from multiple dimensions such as accessibility, operability, feedback cognition and player satisfaction.

The results show that even if the core gameplay remains unchanged, the differences in input mechanisms and information presentation methods between platforms still significantly affect players' perception of combat fluency and system clarity. This phenomenon is in line with the "perceptual affinity" theory, that is, the degree of match between the design system and the user's existing cognitive model directly determines the operational fluency[42]. In this experiment, although the PC platform has advantages in terms of operational freedom and input accuracy, it is limited by the traditional keyboard layout and the lack of explicit skill prompts. Some players have delayed judgments on skill switching and cooling status in their first experience, which affects the rhythm of the game. The mobile platform performs better in operation guidance due to its more intuitive touch interaction and centralized interface layout, but it also has certain bottlenecks in high-frequency interaction due to limited interface space, button overlap and insufficient response accuracy.

Players' open feedback further emphasizes the core role of feedback in cross-platform experience consistency. Because the immediate feedback between player behavior and system response not only determines the perceptibility of operation, but also affects the possibility of strategic expression [43]. The current game demo still has room for improvement in terms of skill differentiation, performance and combat status perception. The main output of your research is the guidelines for game developers developing mobile games that feature combat.

9.1 Suggestions for Improvement

Based on measured data and player feedback, this study proposes the following optimization suggestions:

- Skill switching mechanism enhancement: PC can add digital marks, color

highlights and cooldown progress animations to skill icons to improve visual guidance; mobile can introduce "long press-slide selection" or "slide fast switch" mechanism to optimize skill operation fluency.

- Enhance feedback diversity: Introduce richer visual and sound feedback mechanisms, such as skill hit sound effects, differentiated special effects for skill types, and graying out of skill available status, to improve the operation feel and strategy judgment efficiency.

9.2 Future Work

Future research can further expand the depth and breadth of this work in multiple directions. On the one hand, the data of the current study mainly comes from one-time questionnaires and small-scale samples. In the future, a larger group of subjects can be introduced, and multiple rounds of tests can be conducted using a longitudinal design to capture the adaptive evolution of players on different platforms and observe how their operation strategies, cognitive models, and emotional feedback change over time. This process change has important implications for understanding platform adaptation in interactive design.

On the other hand, subsequent research can further integrate behavioral tracking data with psychophysiological measurement methods to conduct a more detailed and multi-dimensional analysis of players' experience status on different platforms. For example, by collecting objective data such as operation logs, input frequency, skill usage paths, etc., combined with eye movement trajectories, heart rate changes and subjective immersion evaluation, a more systematic user model can be established to reveal the causal mechanism between platform characteristics and experience feedback. In addition, at the design practice level, we can explore adaptive interaction systems based on player input behavior, so that the game can dynamically adjust its UI layout, prompt logic and control method after identifying the player's platform characteristics, proficiency and operation style, thereby achieving a more flexible and personalized cross-platform interaction adaptation strategy.

With the continuous expansion of the game platform form, future research can also further focus on host platforms, stylus devices, wearable devices and even mixed reality interaction environments to build a more universal interaction design theory system. This not only helps to enrich the research paradigm of cross-platform user experience, but also provides theoretical support and experimental basis for the adaptation mechanism of the next generation of multi-terminal game systems.

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A

Appendix A Game Design Document

A.1 Game Name

Underdeath

A.2 Core Concept (High Concept)

This game aims to explore the differences in the experience of the same combat mechanism on PC and mobile terminals by building a cross-platform combat experience system with consistent structure and gameplay, and different operation methods for different platforms. The game focuses on "lightweight combat strategy + fast-paced operation feedback".

A.3 Game Overview

A.3.1 Gameplay Concept

Players will control the character to move, attack, release skills in a 2D horizontal platform scene, and gradually unlock new skills. The core goal is to test the smoothness of operations on different platforms, whether the UI can clearly convey enough information, and the combat feedback and skill release experience.

A.3.2 Game Type

2D horizontal action game / experience demo / experimental prototype

A.3.3 Target Group

Players who like action games, pay attention to the operation feel, and are interested in cross-platform design, suitable for light and medium game players.

A.3.4 Target Platforms

PC and mobile devices (mainly Android)

A.3.5 Unique Selling Points

The game maintains the core combat logic of the platforms completely consistent, and only tests the impact of the platform on the player's combat experience through differences in operation methods and UI layout. However, this demo is only experimental and has no release plan.

A.3.6 Brief description of the game process

After starting the game, players can move freely and release skills; Unlock more skills by picking up props in battle; Each skill is slightly different in visual performance and striking feeling, encouraging players to try to release in combination; The game has no failure mechanism and focuses on comparison and feedback of operation experience.

A.3.7 Game art style and aesthetic experience

Expression: Players can show personalized combat methods through different skill combinations;

Rhythm: Fast-paced release and CD-free skills bring continuous output pleasure;

Control: Emphasize operation feedback and rhythm control to enhance immersion.

A.4 Gameplay and Mechanics

A.4.1 Game Process

At the beginning of the game, the basic movement, jumping, and attacking are introduced, and then the game guides the player to pick up the first skill prop, unlock new skills for the player and show how to release them. Enemies will appear in the subsequent areas for the player to test the release of skills, and the player can pick up the remaining three skills and the final big move skill.

A.5 Game options

Pause menu (ESC / screen button)

Resume game

View operation guide

Exit game

A.6 Archive and replay mechanism

Auto-archive: automatically save every time you pick up an item or pass a level

Behavior record: record each skill release, hit feedback and interactive behavior of the player

A.7 Story background and character settings

None

A.8 Sound effects and music

A.8.1 Sound effects (SFX)

Skill hit sound effects

Feedback sound of player being hit

Feedback sound of enemy being hit

A.8.2 Music

None

A.9 UI design

PC: streamlined UI, important information such as health bar and energy are located in the upper right corner of the screen

Mobile: buttons are distributed in the left and right lower corners, and the central area is kept as clean as possible

All platforms support:

Pop-up instructions for picking up props

Highlight prompts for skill switching

Flashing prompts for skill charging status

A.10 Visual design

The overall style refers to "Dead Cells", using pixel style and high-contrast colors to distinguish skill status. Icons, special effects and animations are centered on simplicity and clear feedback to ensure visual consistency between mobile and PC.

B

Appendix B Questionnaire and feedback

B.1 Prestudy questionnaire

B.1.1 English version

Combat Systems in Video Games

A combat system in video games is a mechanic that defines how players or artificial intelligence interact in combat situations within the game world. This survey aims to understand players' preferences for different levels of combat system complexity to improve game design. Please choose the option that best matches your experience.

* 表示必填

1。 电子邮件地址 *

2。 How long have you been playing video games? *

请仅选择一个答案。

- ◯ Less than 1 year
- ◯ 1-3 years
- ◯ 4-6 years
- ◯ 7-10 years
- ◯ More than 10 years

3。 In the following types of games, what types of games do you usually play? *

请选择所有适用项。

- ☐ Action Games (e.g., Devil May Cry, Bayonetta)
- ☐ Fighting Games (e.g., Tekken, Street Fighter)
- ☐ Shooting Games (e.g., Call of Duty, Apex Legends)
- ☐ MOBA (e.g., League of Legends, DOTA2)
- ☐ Turn-based combat games(e.g., Baldur's Gate 3, Persona 5: The Phantom X)
- ☐ Soulslike Game(e.g., Elden Ring, Dark Souls)
- ☐ 其他:

4。 Which platform do you primarily use for gaming? *

请仅选择一个答案。

- ◯ PC
- ◯ Console (PS, Xbox, Switch)
- ◯ Mobile/Tablet
- ◯ 其他: _____

Preferences for Combat System Complexity

(Please rate on a scale of 1-5, where **1 = Strongly Disagree** and **5 = Strongly Agree**)

5。 I prefer a simple and intuitive combat system, even if it sacrifices tactical depth. *

请仅选择一个答案。

	1	2	3	4	5	
Stro	◯	◯	◯	◯	◯	Strongly Agree

6。 I enjoy combat systems with a steep learning curve, even if it takes time to master. *

请仅选择一个答案。

	1	2	3	4	5	
Stro	◯	◯	◯	◯	◯	Strongly Agree

7。 I prefer a combat system with multiple combo options and complex mechanics for depth. *

请仅选择一个答案。

	1	2	3	4	5	
Stro	◯	◯	◯	◯	◯	Strongly Agree

8。 The combat system should include assist mechanisms (e.g., auto-lock, quick combos) to lower the skill barrier. *

请仅选择一个答案。

	1	2	3	4	5	
Stro	◯	◯	◯	◯	◯	Strongly Agree

9。 I enjoy managing resources (e.g., stamina bar, cooldowns) to enhance combat strategy. *

请仅选择一个答案。

	1	2	3	4	5	
Stro	◯	◯	◯	◯	◯	Strongly Agree

10。 The combat system should allow players to adjust difficulty settings to accommodate different skill levels. *

请仅选择一个答案。

	1	2	3	4	5	
Stro	◯	◯	◯	◯	◯	Strongly Agree

Combat Pace and Impact Feedback

(Please rate on a scale of 1-5, where **1 = Strongly Disagree** and **5 = Strongly Agree**)

11。 I prefer fast-paced, perform a large number of combos in a short period of time (e.g., *Devil May Cry, Bayonetta*). *

请仅选择一个答案。

	1	2	3	4	5	
Stro	◯	◯	◯	◯	◯	Strongly Agree

12。 I prefer tactical and strategy combat systems (e.g., StarCraft II , Total War: Warhammer III). *

请仅选择一个答案。

	1	2	3	4	5	
Stro	◯	◯	◯	◯	◯	Strongly Agree

13。 "Hit feedback" (e.g., sound effects, vibration, attack animation) is crucial to my combat experience. *

请仅选择一个答案。

	1	2	3	4	5	
Stro	◯	◯	◯	◯	◯	Strongly Agree

14。 I want the combat system to include different weapons or skill styles for variety. *

请仅选择一个答案。

	1	2	3	4	5	
Stro	◯	◯	◯	◯	◯	Strongly Agree

Learning and Adaptation to Combat Systems

(Please rate on a scale of 1-5, where **1 = Strongly Disagree** and **5 = Strongly Agree**)

15。 The game should provide a detailed tutorial or training mode to help players learn the combat system. *

请仅选择一个答案。

1	2	3	4	5
◯	◯	◯	◯	◯

16。 I prefer to learn combat mechanics through trial and error rather than relying on tutorials. *

请仅选择一个答案。

1	2	3	4	5
◯	◯	◯	◯	◯

17。 The combat system should allow adjustable AI difficulty or difficulty settings to cater to different players. *

请仅选择一个答案。

1	2	3	4	5
◯	◯	◯	◯	◯

Combat System and Overall Game Experience

(Please rate on a scale of 1-5, where **1 = Strongly Disagree** and **5 = Strongly Agree**)

18。 The combat system is a critical factor in my decision to play a game. *

请仅选择一个答案。

1	2	3	4	5
◯	◯	◯	◯	◯

19。 Even if a game has an engaging story or world, I would stop playing if the combat system is bad. *

请仅选择一个答案。

1	2	3	4	5
◯	◯	◯	◯	◯

20。 The combat system should gradually introduce complexity as the game progresses, rather than overwhelming players at the start. *

请仅选择一个答案。

1	2	3	4	5
◯	◯	◯	◯	◯

Open-Ended Questions (Optional Responses)

21。 Which game has your favorite combat system, and why?

22。 Which game has your least favorite combat system, and why?

23。 **What do you think is the most important factor in combat system design?**

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Google 表单

B.1.1.1 Feedback

Prestudy questionnaire feedback

B.1.2 Chinese version

游戏中的战斗系统

电子游戏中的战斗系统是一种机制，它定义了玩家或人工智能在游戏世界中的战斗情况下如何互动。本次调查旨在了解玩家对不同复杂程度的战斗系统偏好，以改进游戏设计。请选择最符合您体验的选项。

1. 您的游戏经验有多久？【单选题】*
   - ○ 1 年以内
   - ○ 1–3 年
   - ○ 4–6 年
   - ○ 7–10 年
   - ○ 10 年以上

2. 在以下游戏类别中，您通常玩哪种类型的游戏？（可多选）【多选题】*
   - □ 动作游戏（如《鬼泣》《只狼》）
   - □ 格斗游戏（如《铁拳》《街霸》）
   - □ 射击游戏（如《使命召唤》《Apex 英雄》）
   - □ MOBA（如《英雄联盟》《DOTA2》）
   - □ 回合制战斗游戏（例如《博德之门 3》、《女神异闻录 5》）
   - □ 魂类（如艾尔登法环，黑暗之魂 3）
   - □ 其他____

3. 您通常在哪个平台上游玩游戏？【单选题】*
   - ○ PC
   - ○ 游戏主机（PS、Xbox、Switch）
   - ○ 手机/平板
   - ○ 其他____

4. 我喜欢简单直观的战斗系统，即便牺牲了一些战术深度。【量表/NPS】（请填数字 1–5 打分）*

   （1 = 强烈反对，5 = 强烈同意）

   您的评分是_____

5. 我更倾向于学习曲线较陡的战斗系统，即便需要投入较长时间来熟练掌握。【量表/NPS】（请填数字 1–5 打分）*

   （1 = 强烈反对，5 = 强烈同意）

   您的评分是_____

6. 我希望战斗系统能够提供更多连招组合和复杂操作，以提升战斗深度。【量表/NPS】（请填数字 1–5 打分）*

   （1 = 强烈反对，5 = 强烈同意）

   您的评分是_____

7. 战斗系统应该具备一定的辅助机制（如自动锁定、快速连招）来降低操作门槛。【量表/NPS】（请填数字 1-5 打分）*

（1 = 强烈反对，5 = 强烈同意）

您的评分是_____

8. 我喜欢战斗系统中加入资源管理（如能量条、技能冷却），以增加策略性。【量表/NPS】（请填数字 1-5 打分）*

（1 = 强烈反对，5 = 强烈同意）

您的评分是_____

9. 战斗系统应该允许玩家自由调整操作难度，以适应不同水平的玩家。【量表/NPS】（请填数字 1-5 打分）*

（1 = 强烈反对，5 = 强烈同意）

您的评分是_____

10. 我更喜欢快节奏、反应为主的战斗系统（如《鬼泣》《猎天使魔女》）。【量表/NPS】（请填数字 1-5 打分）*

（1 = 强烈反对，5 = 强烈同意）

您的评分是_____

11. 我更喜欢注重战术和耐心的战斗系统（如《星际争霸 2》《全面战争：战锤 3》）。【量表/NPS】（请填数字 1-5 打分）*

（1 = 强烈反对，5 = 强烈同意）

您的评分是_____

12. 战斗系统的“打击感”（如音效、震动反馈、攻击动画）对我的战斗体验至关重要。【量表/NPS】（请填数字 1-5 打分）*

（1 = 强烈反对，5 = 强烈同意）

您的评分是_____

13. 我希望战斗系统具有不同武器或技能风格，以增加可玩性。【量表/NPS】（请填数字 1-5 打分）*

（1 = 强烈反对，5 = 强烈同意）

您的评分是_____

14. 游戏应该提供详细的战斗教程或练习模式，以帮助玩家掌握战斗系统。【量表/NPS】（请填数字 1-5 打分）*

（1 = 强烈反对，5 = 强烈同意）

您的评分是_____

15. 我喜欢通过不断试错、自己摸索来掌握战斗系统，而不是依赖教程。【量表/NPS】（请填数字 1-5 打

分）*

（1 = 强烈反对，5 = 强烈同意）

您的评分是_____

16. 战斗系统应该具备可调整的 AI 或难度设定，以满足不同玩家的需求。【量表/NPS】（请填数字 1–5 打分）*

（1 = 强烈反对，5 = 强烈同意）

您的评分是_____

17. 战斗系统是我选择游戏时的核心考量因素。【量表/NPS】（请填数字 1–5 打分）*

（1 = 强烈反对，5 = 强烈同意）

您的评分是_____

18. 即使游戏剧情或世界观吸引我，但如果战斗系统不好玩，我仍然不会继续玩下去。【量表/NPS】（请填数字 1–5 打分）*

（1 = 强烈反对，5 = 强烈同意）

您的评分是_____

19. 战斗系统应该根据游戏进度逐步增加复杂度，而不是一开始就让玩家面对复杂操作。【量表/NPS】（请填数字 1–5 打分）*

（1 = 强烈反对，5 = 强烈同意）

您的评分是_____

20. 您最喜欢的战斗系统是哪个游戏的？为什么？【多行文本】

_____

21. 您最不喜欢的战斗系统是哪个游戏的？为什么？【多行文本】

_____

22. 在战斗系统设计上，您认为最重要的因素是什么？【多行文本】

_____

B.1.2.1 Feedback

Chinese Prestudy questionnaire feedback

B.2 Formal playtesting questionnaire

First playtest

Regarding the linear scale questions in this questionnaire, if no explanation is given, 1 means very negative and 5 means very positive. Please try both the PC and Mobile versions before filling in the form. Thank you very much!

* 表示必填

1。 I encountered technical issues or bugs during gameplay. *

请仅选择一个答案。

	1	2	3	4	5	
Seri	◯	◯	◯	◯	◯	Not much effects of the experience

2。 The game ran smoothly without performance problems. *

请仅选择一个答案。

	1	2	3	4	5	
Not	◯	◯	◯	◯	◯	Very smooth

3。 Any issues I faced negatively impacted my gameplay experience. *

请仅选择一个答案。

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Not Much issues

4。 The game provided a good balance between challenge and fun. *

请仅选择一个答案。

	1	2	3	4	5	
Not	◯	◯	◯	◯	◯	Very balance

5。 Combat mechanics felt responsive and engaging. *

请仅选择一个答案。

	1	2	3	4	5	
Easy	◯	◯	◯	◯	◯	complex combat

6。 The basic controls in PC version were intuitive and easy to learn. *

请仅选择一个答案。

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very easy

7。 The basic controls in Mobile version were intuitive and easy to learn. *

请仅选择一个答案。

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very easy

8。 Switching between skills was easy to perform and understand in PC version *

请仅选择一个答案。

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very easy

9。 Switching between skills was easy to perform and understand in Mobile version *

请仅选择一个答案。

	1	2	3	4	5	
Not	◯	◯	◯	◯	◯	Very clearly

10。 I felt in control of the character throughout the game. *

请仅选择一个答案。

	1	2	3	4	5	
Not	◯	◯	◯	◯	◯	Very under control

11。 The on-screen UI in PC version was clear and easy to understand. *

请仅选择一个答案。

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very easy

12。 The on-screen UI in Mobile version was clear and easy to understand. *

请仅选择一个答案。

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very easy

13。 Buttons and controls were appropriately placed on screen in Mobile version. *

请仅选择一个答案。

	1	2	3	4	5	
Hard	◯	◯	◯	◯	◯	Easy to read

14。 Buttons and controls were appropriately placed on screen in PC version. *

请仅选择一个答案。

	1	2	3	4	5	
Hard	◯	◯	◯	◯	◯	Easy to read

15。 Important information (e.g., health, energy) was easy to find in Mobile version *

请仅选择一个答案。

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very Easy

16。 Important information (e.g., health, energy) was easy to find in PC version *

请仅选择一个答案。

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very easy

17。 Visual feedback (e.g., button highlights, skill indicators) helped me understand game state. *

请仅选择一个答案。

	1	2	3	4	5	
Unh	◯	◯	◯	◯	◯	Helpful

18。 Sound feedback (e.g.,Hitting sound, being hitted sound, skill sound effects, etc.) helped me understand game state. *

请仅选择一个答案。

	1	2	3	4	5	
Unh	◯	◯	◯	◯	◯	Helpful

19。 The overall visual layout contributed positively to my experience. *

请仅选择一个答案。

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very good

20。 How difficult do you think the PC demo is? *

请仅选择一个答案。

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very hard

21。 How difficult do you think the Mobile demo is? *

请仅选择一个答案。

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Vey hard

22。 If your answers to the previous two questions are different, please explain your reasons.

23。 Overall, how satisfied are you with the PC demo? *

请仅选择一个答案。

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very satified

24。 Overall, how satisfied are you with the Mobile demo? *

请仅选择一个答案。

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very satified

25。 If your answers to the previous two questions are different, please explain your reasons.

Open end questions

26。 What do you think are the similarities and differences between PC and mobile experiences? *

27。 What did you enjoy most about the game?

28。 What part(s) of the game did you find confusing or frustrating?

29。 Do you have any suggestions for improvement?

30。 Any other feedback you'd like to share?

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Google 表单

B.2.0.1 Feedback

Formal playtesting questionnaire feedback
You might find that some participants did not answer some questions, that is because these questions were added later in the playtesting.

C

Appendix C Participation Consent form

C.1 Purpose of Data Collection

This table is intended to explain how this project collects, analyzes, and uses player feedback information in game testing and research. The data will be used to optimize game design, improve user experience, and support the author's graduation thesis analysis and conclusions on "Differences in Cross-Platform Combat Experience".

C.2 Types of Information Collected

We collect the following two types of information through questionnaires and observation records:

- Quantitative data: such as scale items such as operation intuitiveness score, difficulty perception, and satisfaction.
- Qualitative feedback: such as free text suggestions and opinions on gameplay, control methods, UI layout, combat feel, etc., as well as basic background information such as game experience, commonly used platforms, etc.

C.3 Information Usage Description

The collected data will be used to:

- Analyze the differences in user operations on PC and mobile platforms.
- Discover confusion points and improvement opportunities in the interface or operation.
- Guide the optimization direction of subsequent versions of the game prototype.
- Provide basis and reference materials for the user experience research part of the master thesis.

C.4 Anonymity and Privacy Protection

All questionnaires are anonymous and no personally identifiable information is collected. The user feedback will only appear in graduation papers or public presentations in the form of aggregated results or anonymous excerpts. And the original data will not be made public or provided to third parties.

C.5 Voluntary Participation Instructions

All game trials and questionnaires are completely voluntary, and participants can choose not to answer or withdraw at any time without any adverse effects. All the feedback or opinions will be respected and taken seriously.

C.6 Contact Information

If you have any questions about the use of data or wish to withdraw your opinion, please contact:

Name: Zeng Shouhui

Organization: University of Gothenburg, Master's Program in Game Design and Technology

Email: zshznb@outlook.com

D

Appendix D: Game file and game control

D.1 Game File

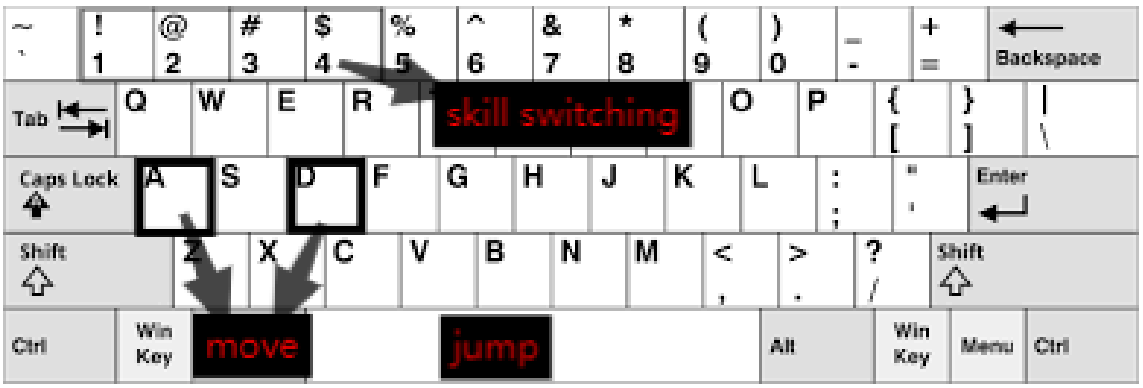
Click on this link to access and download the game files: Game File

D.2 Game control

Table D.1: Game Control

Action	PC Controls	Mobile Controls
Move	A (Move left) / D (Move right)	Virtual left joystick
Jump	Spacebar	Jump button
Dash	Shift	Dash button
Basic Attack	Left Mouse Button	Basic attack button
Skill Releasing	Hold Right Mouse + Aim Direction	Hold attack + joystick direction
Skill Switch	Number Keys 1~4	Skill wheel selection
Ultimate Skill	R Key	Ultimate button

Figure D.1 and D.2: The PC game control



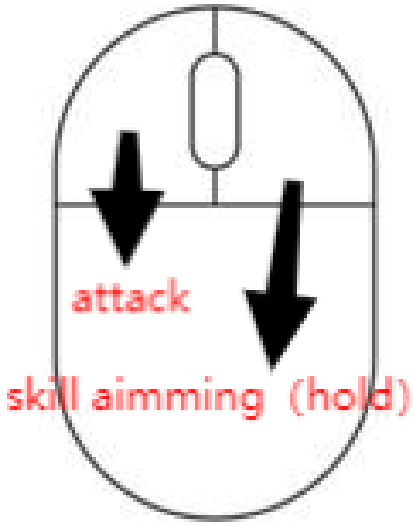
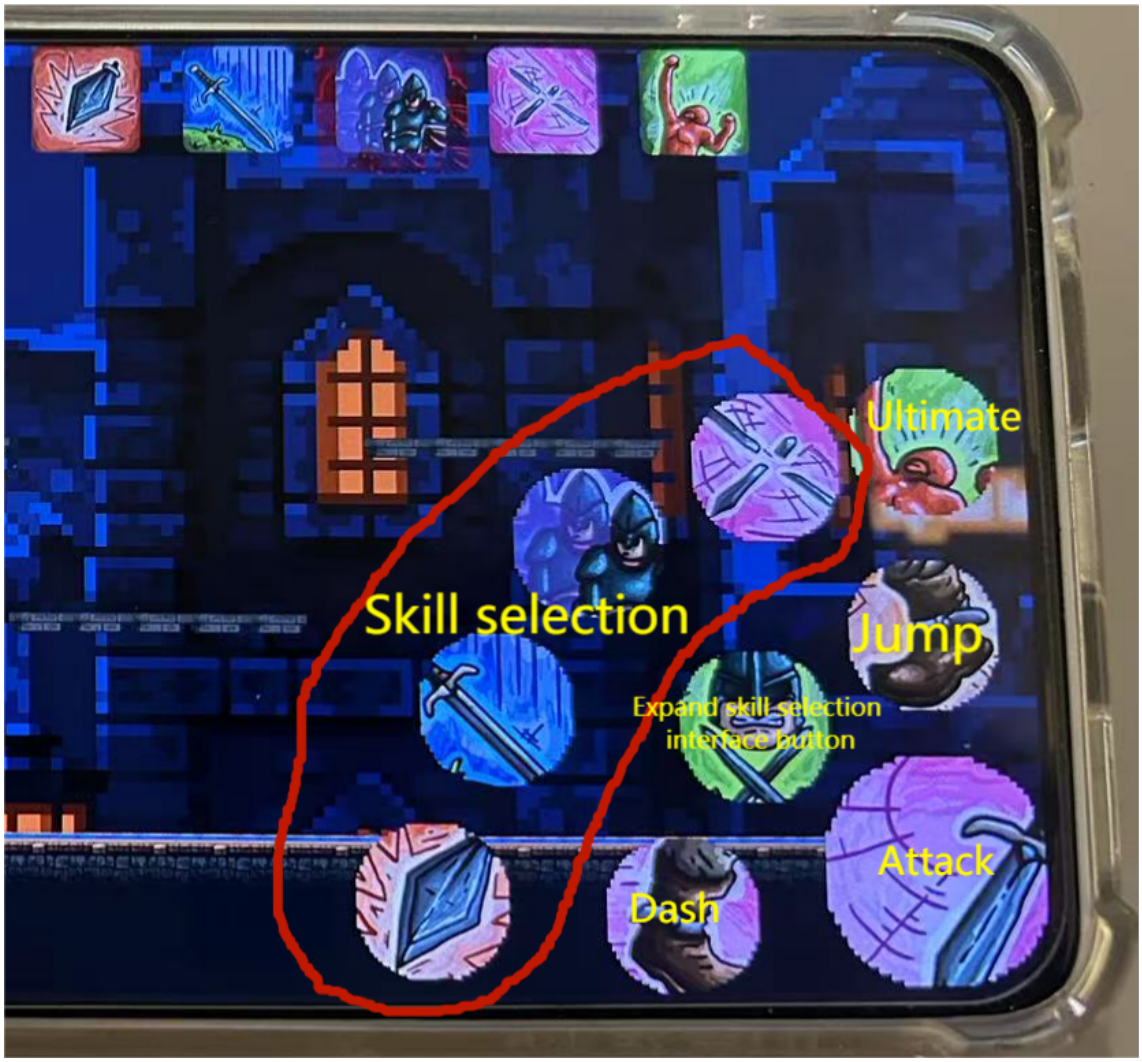


Figure D.3 and D.4: The Mobile game control




Ultimate
Skill selection
Jump
Expand skill selection interface button
Attack
Dash