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Design and Development of the CBT4Depression Prototype: A Digital Role-Playing Game Based on Cognitive Behavioural Therapy for Adolescents with Depression

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Abstract−Depression among adolescents is a mental health issue that requires a supportive approach that is appropriate to their needs and developmental characteristics. The development of digital game technology opens up opportunities for the delivery of therapeutic content in a more interactive manner, especially through role-playing games (RPGs) based on Cognitive Behavioural Therapy (CBT). This study aims to design and develop a prototype of CBT4Depression as well as to describe the application of cognitive and behavioural CBT techniques into the elements and mechanics of the game. The study uses a descriptive design and development approach through three main phases, namely literature review and identification of design requirements, research of models and CBT techniques, as well as design and development of prototypes. CBT4Depression was developed using RPG Maker VX Ace as a two-dimensional (2D) digital role-playing game in Malay. The results of the study were prototypes that applied CBT techniques such as cognitive restructuring, problem-solving, Socratic questioning, guided discovery, behavioural experiments, staged assignments and relaxation exercises through narratives, interactive dialogues, action choices, situation simulations and structured tasks. The Malay version of Beck's Depression Inventory (BDI-Malay) was also included as a symptom measurement component in the prototype design. The main contribution of this study was the development of a prototype and mapping of CBT techniques to game mechanics as an approach to delivering psychoeducational content and psychological skills. However, this study was limited to the development of prototypes without empirical needs analysis and sufficient evidence to confirm clinical effectiveness. Future studies should involve mental health expert assessment, usability testing, playability, user engagement as well as appropriate clinical studies to assess the safety and effectiveness of CBT4Depression before being used as a therapeutic intervention.

Keywords: CBT4Depression; Digital Role-Playing Games; Cognitive Behavioral Therapy; Prototype Design; Adolescent Depression

1. INTRODUCTION

Depression in adolescents is a mental health issue that requires attention because the adolescent phase involves complex developmental changes from emotional, cognitive and social aspects. Persistent symptoms of depression not only affect psychological well-being, but can also affect adolescents' social functioning, interpersonal relationships, and daily lives (World Health Organization [WHO], 2025). Although evidence-based psychological interventions are available, access to mental health services still faces a variety of challenges, including stigma, concerns about confidentiality, limited resources, and reluctance to seek professional help. The development of digital technology has opened up opportunities to provide mental health support through more flexible and accessible approaches. Peake et al. (2024) show that digital interventions based on Cognitive Behavioural Therapy (CBT) have the potential to help reduce symptoms of depression in adolescents. This development demonstrates the potential of digital technology as a complementary medium to conventional treatment approaches.

CBT is one of the evidence-based psychotherapy approaches used in the management of depression with an emphasis on the relationship between thoughts, emotions, and behaviors. This approach helps individuals identify negative thoughts, assess the accuracy of beliefs, and develop more adaptive responses. The systematic structure of CBT allows therapeutic techniques to be translated into digital activities such as self-training, problem-solving, reflection, and situation simulation. A meta-analysis by Wu et al. (2023), involving 18 randomized controlled trials with 1,683 participants, showed that Internet-based CBT had the potential to reduce adolescent depressive symptoms compared to the control group, although the certainty of the evidence for depression outcomes was reported to be very low. However, the effectiveness of digital CBT interventions in previous studies could not necessarily be generalized to all digital applications due to differences in content, delivery approaches, user characteristics, and levels of engagement.

In addition to the appropriateness of therapeutic content, user engagement is an important aspect of the development of digital mental health interventions. The delivery of CBT content through digital platforms alone does not guarantee that users will follow and complete the entire intervention activity. A study of the implementation of SPARX by Fleming et al. (2025), which is a serious game-form CBT intervention for adolescents, showed that the program successfully reached users on a broad scale, but only 3.1% of users who started the program managed to complete all seven modules. These findings show that ongoing user engagement and retention are still challenges even if interventions are developed based on psychological approaches that have empirical support. Therefore, interactive design, user experience and delivery of therapeutic content need to be given comprehensive attention in the development of mental health games.

Digital games have the potential to support the delivery of therapeutic content through elements such as narrative, characters, challenges, feedback, and interaction. However, there are differences to be noted between commercial role-playing games (RPGs) and CBT-based digital interventions. Commercial RPGs are typically designed for entertainment purposes with an emphasis on story development, environmental exploration, objective achievement, and player

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experience. On the other hand, digital CBT interventions are developed based on therapeutic objectives that require appropriate psychological content, learning activities, and intervention mechanisms. While game elements have the potential to enhance the appeal of digital interventions, the use of game features without a clear connection to therapeutic objectives does not necessarily result in psychological benefits. Lukka and Palva (2023) point out that the development of game-based mental health interventions requires a balance between therapeutic mechanisms and engaging gaming experiences. Accordingly, the design challenge is not just to combine CBT content with entertainment elements, but to ensure that each game mechanic has a function that is relevant to the psychological skills to be introduced.

Literature highlights also show that therapeutic play has potential in supporting the mental health of young people. Systematic studies and meta-analyses by Eve et al. (2024) reported encouraging effects on reducing symptoms of depression and anxiety, but the limitations of existing study methodologies still require further research. In the context of the development of CBT-based RPGs, an aspect that needs to be clarified is how therapeutic techniques can be systematically translated into game mechanics without neglecting the original purpose of the intervention. For example, cognitive restructuring techniques can be translated through dialogues that guide players to evaluate negative thoughts, while problem-solving techniques and behavioural experiments can be presented through action choices, tasks and observation of the consequences of a decision. While such approaches provide an opportunity to develop a learning experience in a simulated manner, the existence of CBT elements in games does not automatically prove that the skill can be transferred to real life. Therefore, gap highlighted in this study is the need to detail the relationship between CBT techniques and RPG mechanics at the design and prototype development stages, in particular to produce content that is appropriate to the context of adolescents with depression.

To translate this approach into a functional prototype, CBT4Depression was developed using RPG Maker VX Ace, which is a game development software based on two-dimensional (2D) graphics. The selection of this software was made based on its suitability for the development needs of RPG prototypes, specifically the provision of game environments, character building, storytelling and execution of interactions through an event system. The features of map editing, graphic resource management and interaction functions allow CBT activities to be presented through dialogue, action choices and tasks in a simulation environment. However, RPG Maker VX Ace is a development technology that has been introduced for a long time and has limitations in terms of platform as well as fit with the expectations of today's digital users. Therefore, its use in this study is to produce and document a working prototype, rather than based on the assumption that the software can increase adolescent engagement. The usability, suitability of the game experience and user acceptance still need validation through empirical evaluation.

To address these critical service gaps and developmental needs, this study focuses on the systematic design and development of CBT4Depression, an interactive digital role-playing game (RPG) prototype engineered specifically for adolescents experiencing depressive symptoms. Built upon established Cognitive Behavioral Therapy (CBT) frameworks, the prototype strategically integrates core cognitive and behavioral interventions directly into the gameplay architecture by leveraging branching narratives, interactive dialogue systems, contextual action choices, progressive staged tasks, and real-time feedback loops. Accordingly, the primary objectives of this investigation are to design and construct a functional CBT4Depression digital RPG prototype rooted in evidence-based CBT principles, as well as to delineate the structural framework through which core cognitive and behavioral techniques are systematically translated into functional game mechanics and ludic elements. It is important to note that the scope of this study is intentionally delimited to prototype design, structural integration, and conceptual development, and therefore does not attempt to evaluate or substantiate the empirical clinical efficacy of CBT4Depression in reducing depressive pathology. Comprehensive follow-up evaluations involving clinical mental health specialists and adolescent end-users remain essential to evaluate content validity, user experience, player engagement dynamics, and its overall viability as a digital mental health supportive intervention.

2. METHODOLOGY

This study used a descriptive design and development approach to produce a prototype of CBT4Depression, which is a digital role-playing game based on Cognitive Behavioural Therapy (CBT) for adolescents with depression. The development process is divided into three main phases, namely (1) literature review and identification of design needs, (2) research of CBT models and techniques, and (3) design and development of prototypes, as shown in Figure 1. The three phases are implemented sequentially to ensure that the development of the game has a clear theoretical and rational basis for the design. This study focuses on the development of the prototype and does not involve experimental design to measure the clinical effectiveness of the game.

The first is literature review and the identification of design needs. This phase involves a literature review related to depression among adolescents, psychological treatment challenges as well as the use of digital games as a medium of mental health support. The research is used to identify initial considerations in game design, particularly in terms of therapeutic content suitability, interactivity and characteristics of the target user. The information obtained is used as a guide to determine the concept, content and approach of CBT4Depression interaction. However, the identification of this need is only based on literature sources and does not involve the collection of empirical data from adolescents or mental health experts.

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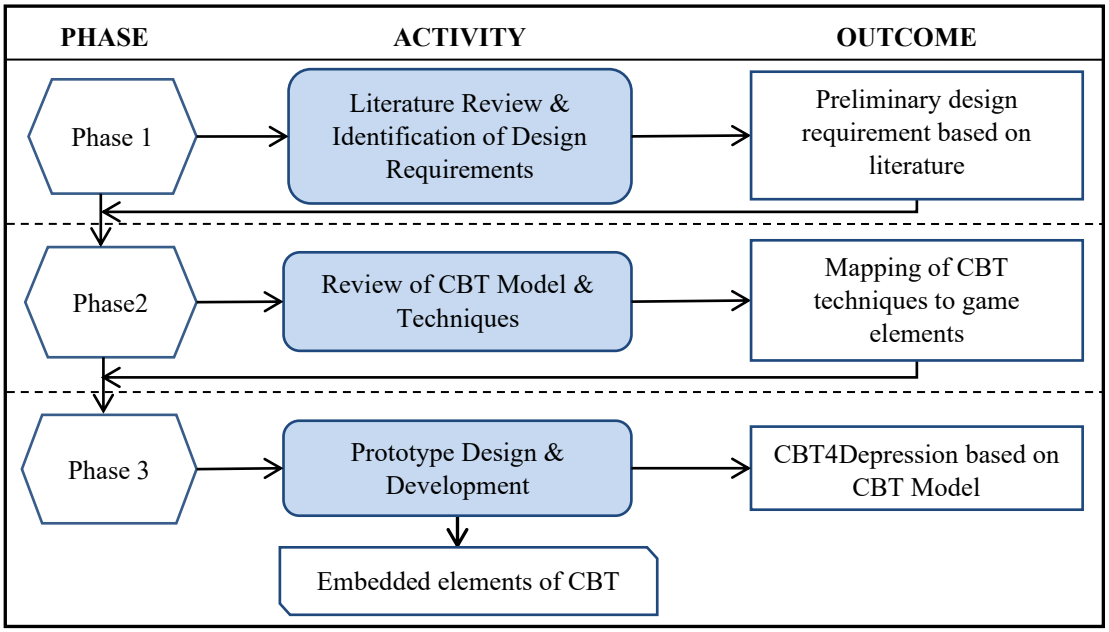


Figure 1. Research Methodology for the Design and Development of CBT4Depression

Meanwhile, CBT model and technique research activities were carried out. This phase focuses on the research of CBT principles which includes cognitive therapy and behavioural therapy to identify appropriate techniques to be translated into game activities. The techniques studied include cognitive restructuring, problem solving, Socratic questioning, guided discovery, behavioural experiments, staged tasks and relaxation exercises. Based on the function of each technique, mapping is carried out between the principles of CBT and game mechanics such as interactive dialogue, action choices, situation simulation and assignments. This mapping is used as a design guide to connect the therapeutic content with the game experience.

The third phase is the design and development of the prototype. The development of CBT4Depression is carried out through three stages, namely pre-production, production and post-production. The pre-production stage involves the concept of the game, the development of the storyline, the design of the character, the arrangement of therapeutic content and the planning of the game mechanics. At the production stage, the prototype is developed using the RPG Maker VX Ace as a two-dimensional (2D) role-playing game for desktop computers. The CBT technique is translated into game activities through dialogue, response choices, structured tasks and simulation of situations. The post-production stage involves the functional review and refinement of the prototype based on the development activities carried out. The main outcome of the study is the CBT4Depression prototype and documentation of the application of CBT techniques in game mechanics. However, the suitability of therapeutic content, usability, user engagement and clinical effectiveness still require empirical evaluation before the prototype can be recommended as a mental health intervention.

3. RESULT AND DISCUSSION

3.1 Principles of Serious Gaming for Mental Health

Serious gaming for mental health needs to maintain a balance between therapeutic objectives and the gaming experience. A systematic review by Gliosci and Silva (2023) that included 26 studies showed that video games are increasingly being explored as a medium of therapeutic intervention in the treatment of depression, thus supporting the potential application of the principles of serious gaming in the field of mental health. However, the study also identified research gaps related to certain age groups, thus emphasizing the need for the development of therapeutic games that take into account the characteristics, psychological needs and suitability of the intervention with the target user group. Menawhile, Lukka and Palva (2023) point out that the effectiveness of game-based interventions depends on the appropriateness of therapeutic mechanisms, user engagement, and game design. In this context, elements such as narrative, challenges, feedback, and player choices should support the purpose of the intervention and not simply serve as an entertainment element. Gómez-Cambronero et al. (2024) also show that psychological strategies in serious games can be integrated through game mechanics, missions, stories, and forms of feedback

Evidence from past studies suggests that therapeutic play has potential in supporting the mental health of young people, however its effects need to be interpreted with caution. Eve et al. (2024) report promising effects on symptoms of depression and anxiety but point out that differences in intervention design and assessment methods influence the strength of the evidence. Thus, in CBT4Depression, the elements of play are designed to support the application of the principles of CBT, while user engagement or enjoyment is not considered direct evidence of therapeutic effectiveness.

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Journal of SAINTEKS
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3.2 Cognitive Behavioural Therapy (CBT)

CBT as depicted in Figure 2 is a structured psychotherapy approach that emphasizes the relationship between thoughts, emotions, and behaviours and the use of structured strategies to help individuals identify non-adaptive thought patterns and form more balanced responses (Beck, 2020; Beck, 1979). Indirectly, this therapeutic approach helps individuals identify unhelpful interpretations, evaluate evidence, consider alternative perspectives, and adopt more adaptive behavioural responses. Past studies on Internet-based CBT developed for adolescent depression have shown the potential of digital approaches, but effectiveness should be considered based on study design as well as intervention differences (Wu et al., 2023; Liu et. Al., 2024). In the context of the treatment of adolescent depression, CBT is a psychotherapeutic approach that has been widely used and evaluated in various empirical studies. Dardas et al. (2023) examined the effectiveness of CBT in the treatment of adolescent depression through network meta-analysis, while Bjornstad et al. (2024) compared the effectiveness of behavioural cognitive interventions based on their delivery methods.

According to Liverpool (2025), the development of digital technology has also opened opportunities to deliver CBT iterventions through online platforms. Systematic studies and meta-analyses by Wu et al. (2023) show that digital-based CBT has the potential to reduce depressive symptoms in adolescents, although the strength of the evidence and its effectiveness need to be interpreted based on the study design as well as the context of the intervention. In addition, emphasizing personalization in digital mental health interventions through the adaptation of therapeutic content, activity arrangements, coaching levels and communication according to individual needs is also important. This principle can be applied in the design of serious mental health games to provide therapeutic experiences that are more tailored to the user's needs, thus potentially increasing engagement and effectiveness of interventions, although empirical evidence on the benefits of personalization is still limited (Hornstein et al., 2023).

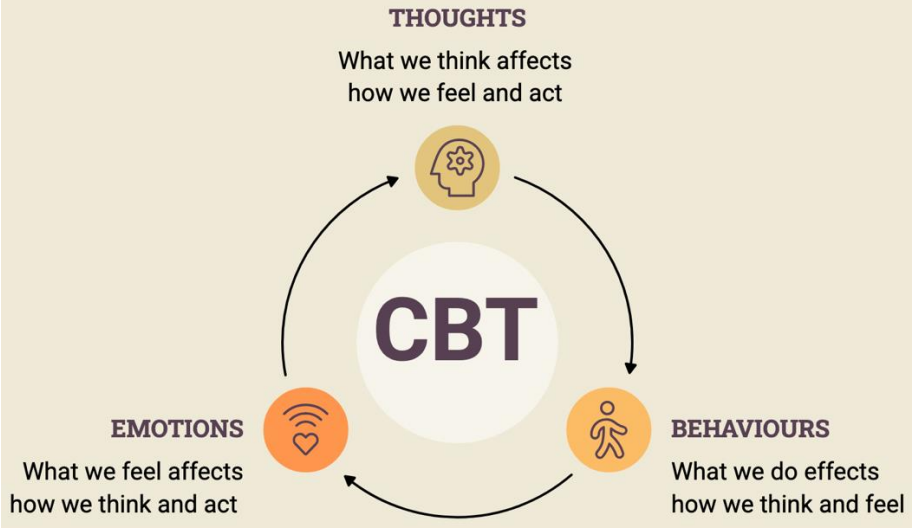


Figure 2. Cognitive Behavioural Therapy (Beck, 1979)

Figure 2 illustrates the three main components of this therapy model. The relationship between thoughts, emotions and behaviour in this CBT model relates what is thought can influence what is felt and done, while emotions and behaviours can influence thoughts. In the use of CBT for adolescents, certain situations can be observed through three elements, namely automatic thinking, feelings and actions. Adolescents are guided to be aware of how negative impressions affect their responses, then reassess those impressions in a more balanced way. Self-skills such as monitoring thoughts, problem-solving and managing emotions are important components that can be translated into play activities.

This structure of CBT is ideally applied in a digital environment because components such as psychoeducation, identification of negative thoughts, cognitive restructuring, and problem-solving can be translated into interactive activities, scenarios, and exercises. However, the use of Cognitive Behaviour Therapy in digital products should not be limited to the delivery of purely therapeutic information. Interactive elements should provide users with the opportunity to apply Cognitive Behaviour Therapy skills through choice, reflection, and response to specific situations. Jackson et al. (2023) assert that the acquisition and application of skills is an essential component of digital CBT. Therefore, CBT4Depression uses CBT as the basis of the content by integrating the therapeutic principles into the activities and situations of the game, without assuming that its use automatically proves the clinical effectiveness of the game.

3.3 Cognitive Technique

Cognitive techniques are one of the key components of CBT that aims to help individuals identify, evaluate, and change negative thought patterns and non-adaptive beliefs that can contribute to depressive symptoms. Through this approach, individuals are guided to understand the relationship between thoughts, emotions, and behaviours, thereby developing a more balanced perspective in dealing with challenging situations. Ezawa and Hollon (2023) explain that cognitive restructuring is one of the important techniques in psychotherapy that involves the process of identifying and reevaluating

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unhelpful thoughts. In addition, Socratic questioning and guided discovery are also used to encourage individuals to explore assumptions, evaluate evidence that supports a belief, and form an alternative perspective through the process of self-reflection (Overholser & Beale, 2023).

Accordingly, in the development of CBT4Depression, cognitive techniques identified through literature review are used as a basis in designing game activities that encourage players to identify negative thoughts, consider alternative perspectives and make more rational decisions. The techniques applied include cognitive restructuring, problem solving, role-playing, Socratic questioning, guided discovery, assessment of strengths and weaknesses, imagination or cognitive training as well as a record of thought changes. Some of these techniques are interconnected and can be combined to form an interactive gaming experience that is oriented towards learning cognitive skills. Table 1 details the identified cognitive techniques along with their functions and applications in Cognitive Behavioural Therapy.

Tabel 1. Common Cognitive Techniques

Technique	Explanation	Sources
Cognitive Restructuring	A technique for identifying and evaluating automated negative thoughts by examining evidence that supports or refutes a thought. Individuals are guided to challenge irrational assumptions and form more balanced alternative thoughts, thus helping to manage emotional responses.	Ezawa & Hollon (2023); Furukawa et al. (2023); Beck (2011); and Depreeuw, Eldar, Conroy, & Hofmann (2017);
Problem Solving	A structured technique that helps individuals deal with conflict, stress, and problematic situations through six steps: (i) identifying the problem, (ii) generating alternative solutions, (iii) evaluating the advantages and disadvantages of each option, (iv) choosing the best solution, (v) implementing the solution and (vi) evaluating the outcome of the action.	Metz et al. (2023); Krause et al. (2022); Beck (2011); and Depreeuw et al. (2017);
Role-Play	Simulation techniques that allow individuals to role-play situations or take the perspective of others to understand thoughts, emotions, and reactions in interpersonal relationships. These techniques also allow individuals to try alternative responses and practice conflict resolution skills in a controlled environment.	Arenas et al. (2022); Otani et al. (2024); and Abdoola, Flack, & Karrim (2017)
Socratic Questioning	Structured questioning techniques that encourage individuals to critically evaluate automated thinking. Through open-ended questions, individuals are guided to identify evidence, question assumptions and consider alternative explanations of a situation.	Overholser & Beale (2023); and Beck (2011)
Guided Discovery	A technique that guides individuals to explore and reevaluate non-adaptive beliefs through a process of question-and-answer and reflection. This technique is closely related to Socratic questioning and emphasizes the discovery of new perspectives by the individual himself, rather than the reception of direct interpretation from the therapist.	Overholser & Beale (2023); and Beck (2011)
Examining of advantages and disadvantages	A technique that helps individuals compare the benefits and risks of a thought, belief or action. This process encourages more rational consideration before making decisions and helps individuals identify more adaptive options.	Metz et al. (2023); and Beck (2011);
Imagery / cognitive rehearsal	A technique that uses mental visualization to help individuals explore experiences, emotions, and thoughts related to a situation. Individuals can also imagine alternative responses or solutions in preparation for challenging situations.	Kroener et al. (2023); and Beck (2011),
Thought change record	Techniques of recording situations, automatic thoughts, emotions, and reactions experienced. These records help individuals identify the relationship between thoughts and emotions, assess the accuracy of negative thoughts, and form more balanced alternative interpretations.	Furukawa et al. (2023); Ezawa & Hollon (2023); Beck (2011), and Beck (2011)

3.4 Behavioural Techniques

Behavioural techniques as listed in Table 2 aim to encourage more adaptive actions through training and observation of individual responses. From a clinical practice point of view, exposure and response prevention (ERP) is usually more specifically applied to conditions such as obsessive-compulsive disorder; any use of it in the context of depression should have appropriate clinical rationale and supervision.

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Journal of SAINTEKS
Vol 4, No 1, November 2026, page 30-41
ISSN 3030-8011 (Media Online)
Website https://prosiding.seminars.id/sainteks

Table 2. Common Behavioural Techniques

Technique	Explanation	Sources
Exposure and response prevention (ERP)	A technique that involves gradual exposure to situations or stimuli that trigger anxiety, while helping individuals reduce compulsive responses or non-adaptive avoidance. This technique is primarily used in the treatment of obsessive-compulsive disorder (OCD). In the context of CBT4Depression, the principle of exposure can be adapted through simulation of game situations that challenge the player's thinking and responses.	Song et al. (2022); Steele et al. (2025); and Blakey, Abramowitz, Leonard, & Riemann (2019)
Graded task assignments	A technique that helps individuals manage challenging activities or situations by dividing complex tasks into small, more manageable steps. Each task is arranged in stages according to the individual's ability level to promote active engagement, goal achievement and self-confidence. This technique is closely related to behavioural activation which emphasizes involvement in meaningful and rewarding activities.	Andersson et al. (2022); Tindall et al. (2024); and Beck (2011)
Relaxation exercises	Techniques aimed at helping individuals manage stress, anxiety and physiological responses through methods such as controlled breathing, progressive muscle relaxation and visualization. These exercises help to increase awareness of physical tension as well as develop calming skills when faced with challenging situations.	Muhammad Khir et al. (2024);
Behavioural experiments	A technique that allows individuals to test negative predictions or non-adaptive beliefs through planned activities and experiences. Individuals are encouraged to make predictions about the outcome of an action, perform the activity, observe the actual outcome and compare it to initial expectations. This process aims to help individuals reassess beliefs and form more adaptive thoughts and responses.	Warnock-Parkes et al. (2025); Yilmaz et al. (2025) and Beck (2020)

3.5 Design And Development Of Cbt4depression

The development process to produce CBT4Depression, a digital therapeutic game based on CBT for adolescents is described in Figure 3. The development process is divided into three main phases, namely pre-production, production and post-production. This framework is used as a multimedia development workflow to translate therapeutic content and game concepts into a 2D playable Role-Playing Game (RPG) prototype.

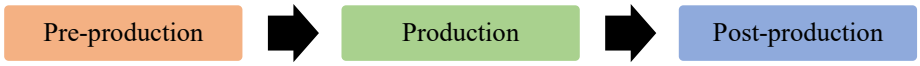


Figure 3. Development of CBT4Depression

The pre-production phase focuses on needs analysis and initial planning for the development of CBT4Depression. Needs analysis is carried out through interviews with mental health professionals to identify the characteristics, needs and challenges faced by adolescents with depression. The findings from this analysis, together with the results of the research of the CBT model, are used as a guide in determining the concept of games and therapeutic content that is appropriate for the target user. In addition, this phase also involves discussion and brainstorming sessions among the development team to identify technical needs, game features, interactive elements as well as therapeutic content delivery approaches. Planning also includes the formation of storytelling concepts, character development and the determination of game activities that can integrate the principles of Cognitive Behavioural Therapy. Overall, the pre-production phase produces a planning foundation that guides the design and development process of the prototype in the next phase.

The production phase involves the implementation of the design and development of the CBT4Depression prototype based on the requirements and specifications that have been identified in the pre-production phase. The VX Ace RPG Maker software is used as the main platform to develop RPGs based on two-dimensional (2D) graphics. In this phase, various elements of the game such as character design, objects, game environment, user interface and navigation system are developed to produce an interactive gaming experience. Development also involves programming the functions and interactions of the game to enable players to explore the environment, interact with the characters and perform the activities provided. The elements and techniques of CBT identified in the previous phase are translated into therapeutic content, dialogues, situations and game activities to support the application of cognitive and behavioural skills in CBT4Depression.

The post-production phase focuses on the testing and formative evaluation process of the CBT4Depression prototype to identify weaknesses and aspects that need improvement. The playability evaluation focuses on three main components, namely gameplay experience and flow, usability and game mechanics. The evaluation process involves

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researchers, design and development teams, target users as well as selected experts in the field of digital games and mental health. The feedback obtained is used to assess the suitability of the design, functionality, navigation, interaction and application of therapeutic content in the game. Suggestions for improvement are used as a guide to refine the design and improve the overall quality of the prototype. Once the development and evaluation process is complete, CBT4Depression is available in the form of a game application for desktop computers. The results of the prototype development, including the game interface and the application of CBT techniques, are discussed further in the findings and discussion section.

3.6 Findings

The main outcome of this study was the development of a prototype of CBT4Depression, which is a digital role-playing game (RPG) that applies psychoeducational content, basic life skills and Cognitive Behavioural Therapy (CBT) techniques. This prototype was developed in a Malay-language two-dimensional (2D) environment using RPG mechanics such as exploration, character interaction, dialogue, action choices and task completion. The goal of the game is to defeat the character Nega, collect points and get out of the forest. Through game activities, players are introduced to the relationship between negative automatic thinking, emotions and behaviour. A key contribution to this development is the translation of CBT techniques into game mechanics that have specific therapeutic functions, as formulated in Table 3.

Table 3. Mapping of CBT Techniques to CBT4Depression Game Mechanics

CBT Techniques	Application in CBT4Depression	Game mechanics	Intended Therapeutic Goals
Cognitive Restructuring	Players identify negative automatic thoughts and consider alternative interpretations based on game situations.	Interactive dialogs, questions and response options.	Identify and reevaluate negative thoughts.
Problem Solving	Players face problematic situations and consider the advantages and disadvantages of some actions before making a decision.	Simulation of situations, choice of actions and completion of tasks.	Introduce systematic problem-solving skills.
Role-Play	The player is asked to imagine himself as another individual, such as a loved one, and consider the appropriate actions in the situation.	Character interactions, role simulations and dialogue choices.	Encourage the exploration of alternative perspectives.
Socratic Questioning	Players answer questions that guide them through their thoughts, assumptions, and possible responses to a situation.	Interactive questions and answers.	Promotes critical evaluation of negative automated thinking.
Guided Discovery	Players are guided through a series of questions to consider the evidence and form their own conclusions.	Staged dialogue and reflective questions.	Introducing the process of forming a more balanced alternative mindset.
Examining Advantages and Disadvantages	Players assess the benefits and risks of several course of action options before making a decision.	Choice of answers, comparison of choices and simulation of results.	Introduce the decision-making process based on rational considerations.
Imagery / Cognitive Rehearsal	The activity of imagining situations and trying alternative responses can be translated into storytelling and character simulation, but its implementation as a specific technique is not yet clear in the prototype documentation.	Simulation of situations and narrative descriptions (mapping recommendations).	Train mental preparedness to face challenging situations.
Thought Change Record	Players record thoughts, feelings, and responses to specific situations through note-taking activities.	Reflection notes and in-game thought records.	Introduce self-monitoring skills and identification of negative thoughts.
		Behavioural Techniques	
Exposure and Response Prevention (ERP)	Players are presented with situations that can trigger anxiety through simulations and interactive questions.	Simulation of situations, questions and response options.	Introducing identification of situations triggering anxiety; not certified clinical ERP training.
Graded Task Assignments	Players are asked to record daily activities or tasks as well as how they feel after completing them.	Game assignments, activity notes and reflections.	Introduce task management and activity monitoring.

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Journal of SAINTEKS
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CBT Techniques	Application in CBT4Depression	Game mechanics	Intended Therapeutic Goals
Relaxation Exercises	Players are introduced to relaxation exercises through the game's content when faced with stressful situations.	Guided relaxation activities and game interactions.	Introduce strategies for managing emotional tension and stress.
Behavioural Experiments	The player makes predictions about the possible outcome of an action and reevaluates assumptions based on the situation presented.	Simulate the situation, make predictions, questions and reflection notes.	Encourage negative assumption testing and consideration of alternative outcomes.

CBT therapeutic strategies are used to reinforce the therapeutic elements in the CBT4Depression role-playing exercise. The game focuses heavily on how to handle negative automatic thoughts and reactions. CBT4Depression helps players identify negative thoughts and adverse reactions because of those thoughts. The mapping of CBT techniques to game mechanics as shown in Table 3 shows a CBT4Depression design approach that links therapeutic principles with interactive activities. Cognitive techniques are translated mainly through dialogue, reflective questions, action choices and thought notes, while behavioural techniques are introduced through situation simulations, assignments, relaxation exercises and predictive making activities. Several techniques are also incorporated in the same activities, such as Socratic questioning with guided discovery as well as problem solving with assessment of advantages and disadvantages. This approach allows CBT content to be presented through game experience rather than mere theoretical descriptions. However, the mapping only shows the relationship between CBT techniques and the prototype features developed and does not prove the mastery of CBT skills or therapeutic effectiveness on the players.

3.7 Cognitive Techniques

Figure 4 shows several examples of the application of cognitive techniques in the CBT4Depression prototype, including Socratic questioning, guided discovery, problem-solving, assessment of strengths and weaknesses, role-playing, and records of thought changes.

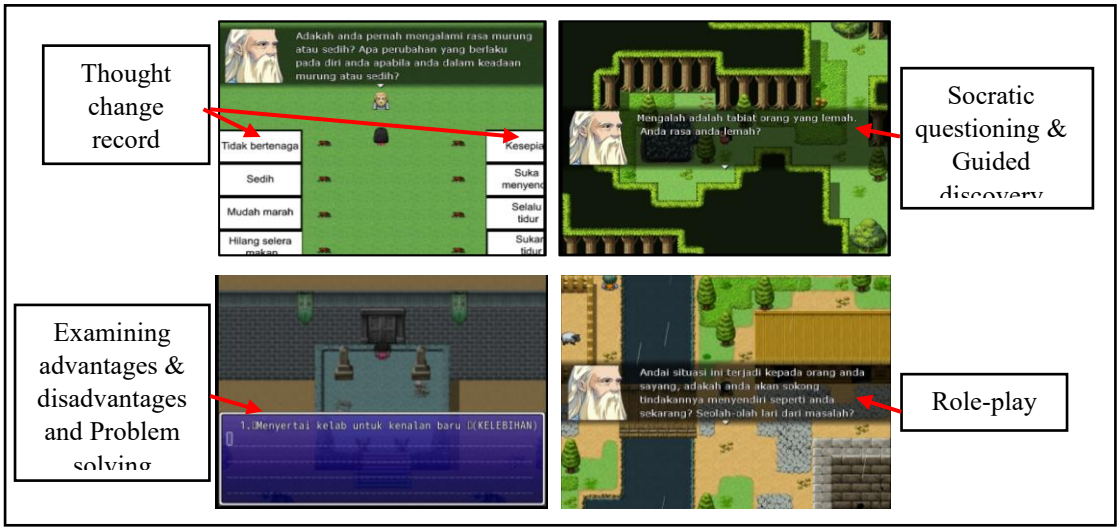


Figure 4. Examples of Cognitive Techniques Applied in CBT4Depression

The Cognitive techniques translated into interactive activities that guide players to identify, evaluate, and reconsider negative automated thinking based on the situations presented in the game. For example, problem-solving techniques are combined with an assessment of strengths and weaknesses to allow players to consider several course of action options before making a decision. Meanwhile, Socratic questioning and guided discovery are applied through a series of interactive questions and dialogues that encourage players to evaluate evidence, question negative assumptions and explore alternative perspectives. Role-playing techniques allow players to imagine themselves as other individuals, such as family members or loved ones, to understand situations from different perspectives. Additionally, a record of mindset changes is used to help players identify the relationship between situations, thoughts, emotions, and reactions experienced. Overall, the application of this cognitive technique shows how the principles of CBT translate into structured game mechanics to introduce more adaptive thinking strategies. However, the effectiveness of these activities in improving players' cognitive skills still needs validation through empirical evaluation.

3.8 Behavioural Techniques

All the behavioural techniques identified in Table 2 have been integrated into CBT4Depression to support the application of the principles of CBT through interactive play activities. For example, Exposure and Response Prevention (ERP)

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techniques are applied through game situations that allow players to identify and cope with situations that trigger anxiety, while behavioural experiments are used to help players assess negative beliefs, assumptions and expectations. Both techniques translate into interactive activities such as Q&A sessions, reflection notes, situation simulations and practice of making predictions about the likely outcome of an action. These activities are designed to encourage players to assess their thought patterns and reactions and develop more adaptive coping strategies. The integration of CBT-based psychotherapy approaches in digital play is in line with the development of mental health interventions that leverage serious play as a medium of psychological support. Systematic reviews by Abd-Alrazaq et al. (2022), Eve et al. (2024) and Wols et al. (2024) show that therapeutic play has the potential to reduce symptoms of depression and anxiety, although its effectiveness depends on the intervention design and the quality of the empirical evidence. Figure 5 illustrates how Behavioural Techniques are applied into CBT4Depression.

Through the staged task technique, players are required to record their daily activities/tasks and their feelings after completing a given task. This technique is used in CBT4Depression by questioning their automatic thinking. Relaxation exercises are also embedded in CBT4Depression. This technique is very helpful for calming down teens who are suffering from depression when they are in unexpected situations. Through relaxation training, any decisions that could lead to adverse outcomes can be prevented. However, the findings of previous studies cannot be used as evidence of the effectiveness of CBT4Depression as this prototype has not undergone adequate clinical evaluation. Figure 5 describes some of the Behavioural Techniques embedded in CBT4Depression.



Figure 5. Examples of the Integration of Behavioural Techniques into CBT4Depression

3.9 Depression Inventory

CBT4Depression also provided the Malay version of the Beck Depression Inventory (BDI-Malay) as a component of measuring depression symptoms in the prototype design, as shown in Figure 6. The instrument was provided to be completed before and after the game to allow for score comparisons to be planned. The study by Mukhtar and Oei (2008) reported on the psychometric properties of BDI-Malay in the population studied. However, the evidence did not automatically confirm the suitability of the instrument for all adolescent groups. In addition, the study did not report pretest and posttest score data or statistical analysis to determine changes in depressive symptoms after using CBT4Depression. Therefore, the preparation of BDI-Malay in the prototype is a design feature and should not be considered evidence of therapeutic effectiveness. Its use in future clinical studies requires consideration of the validity of the instrument for the target population, authorization of use, interpretation of scores and participant safety procedures.

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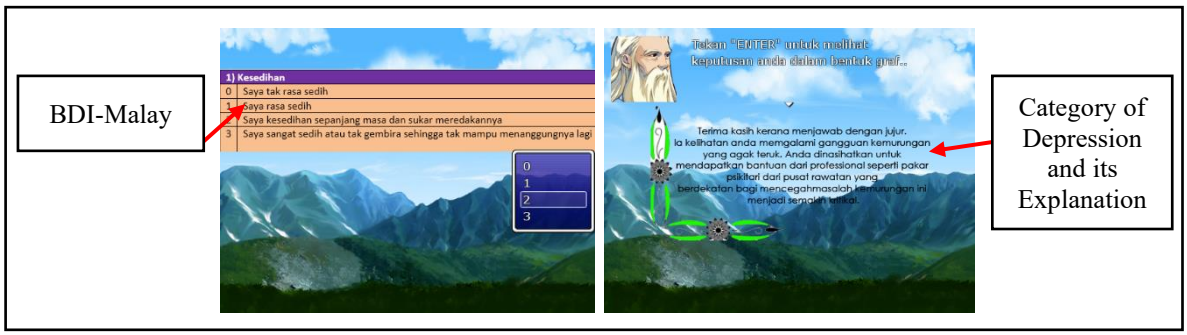


Figure 6. Beck's Depression Inventory (English Version) in CBT4Depression

3.10 Discussion

The findings of the development of CBT4Depression demonstrate the potential of the RPG approach as a medium for delivering CBT content through interaction, storytelling, and structured tasks. Different from commercial games that prioritize entertainment, this prototype uses game mechanics to deliver learning functions associated with cognitive and behavioral techniques. The mapping presented in Table 3 clarifies the relationship between therapeutic content and game activities, thus being a key design contribution of this study. However, the presence of CBT techniques in game mechanics does not necessarily guarantee mastery of psychological skills or behavioral changes in real life.

Although the design review was mentioned in the original development process, the available study documentation does not detail the number of evaluators, instruments, usability scores, or expert feedback findings in a systematic manner. Therefore, the appropriateness of therapeutic content and user experience has not been validated based on sufficient formative assessment data. McGovern et al. (2025) emphasized the importance of engaging young people in the co-design process, while Wanniarachchi et al. (2025) discussed the need for personalization of digital mental health interventions. Based on these considerations, the further development of CBT4Depression should involve mental health expert assessments, usability tests as well as user engagement assessments to identify aspects that need improvement.

Overall, the contribution of this study lies in the development of prototypes and documentation of the application of CBT techniques in RPG mechanics, rather than confirmation of the effectiveness of depression treatment. Further studies are needed to assess clinical suitability, safety, usability and user engagement before therapeutic efficacy can be tested through appropriate research design.

4. CONCLUSION

This study has described the design and development process of the CBT4Depression prototype, which is a digital role-playing game (RPG) based on Cognitive Behavioural Therapy (CBT) for adolescents suffering from depression. The development of this prototype shows how cognitive and behavioural techniques, including cognitive restructuring, problem solving, Socratic questioning, guided discovery, behavioural experiments, staged tasks and relaxation exercises, are translated into game mechanics through narratives, interactive dialogues, action choices and structured tasks. The main contribution of this study is from the aspect of design and development of a Malay language game prototype that links the principles of CBT with RPG elements as an approach to the delivery of psychoeducational content and psychological skills. However, this study was limited to the development of prototypes without sufficient empirical evidence to confirm its clinical suitability, user involvement or effectiveness in reducing depressive symptoms. The inclusion of the Malay version of the Beck Depression Inventory (BDI-Malay) as an in-game measurement component also did not prove therapeutic efficacy without valid assessment data. For future studies, formative assessments involving mental health specialists should be carried out to verify the accuracy of therapeutic content, appropriateness of CBT techniques and the safety of play activities. Next, usability and playability tests as well as player engagement assessments should be conducted among adolescents to identify levels of acceptance, interaction experiences and aspects that need improvement. Further development may also consider user involvement in the co-design process as well as the modernisation of game platforms to better suit the needs of today's adolescents. Once the suitability and safety of the prototype have been assessed, clinical efficacy studies through appropriate experimental design can be conducted under the supervision of a mental health professional to assess changes in depression symptoms using valid psychological instruments. Overall, CBT4Depression is a CBT-based game prototype that has the potential to be developed as a mental health support medium, but requires empirical validation before it can be recommended as a therapeutic intervention.

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