Serious Games for the therapeutic and cognitive intervention of children with ADHD

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1 Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is widely regarded one of the highest communal neurodevelopmental disorders in infantile, affecting between 4% and 8% of individuals worldwide (Sújar, 2022). This complex disorder is characterized by symptoms such as impulsivity, hyperactivity, chronic social anxiety, and learning disabilities. Currently, existing treatments for ADHD focus on alleviating symptoms and enhancing overall performance (Rijo et al., 2015), including prescriptions, psychiatric and behavioral therapies, and cognitive training. As a novel intervention, Serious Video Games (SVGs) have been suggested as an adjunctive treatment option for children with ADHD (Rijo et al., 2015). Against this backdrop, the present research project seeks to explore the effectiveness of developing SVGs for assessing, therapeutic treating, and cognitive training of children between the ages of 5 and 11 who have been diagnosed with and are living with ADHD. This project will encompass a comprehensive background of the research, formulation of a realistic problem statement, identification of research aims and objectives, and delineation of different research assumptions with a detailed outline of the methodology and study context.

2 Background to study

In recent years, Serious Video Games (SVGs) have become increasingly utilized, developed, and applied in child and juvenile psychotherapy. These games have provided controlled entertainment while emphasizing cognitive training, thereby demonstrating the promising potential for psychiatric interventions. However, developing an engaging and stimulating SVG from this perspective for children with ADHD poses a significant challenge due to the lack of entertainment and motivation that traditional video games offer. With that said, this project aims to provide a detailed overview of the fundamental development of an SVG that achieves the objective of behavioral pedagogy in the form of amusement for children with ADHD. This can be achieved by analyzing the need for developing an effective SVG that stimulates excitement and motivation through physical movements, music, attention, and cognitive training using neural feedback technologies. Moreover, an approach that incorporates familiar methods that reassure, entertain, and are immersive within a game, thereby assisting the child in maintaining their attention and motivation is the basis for this project. Likewise, (Rijo et al., 2015) supports this approach and further suggests that a game that incorporates visual-spatial and visual-verbal operational memory tasks may enhance neuropsychological proficiencies, which is a critical aspect of targeted ADHD training and intervention.

3 Problem statement

Muñoz et al. (2022), define Serious Games as an intentional combination of an informative application that aims to integrate crucial elements while incorporating philosophical, educational, or communicational aspects, alongside the entertaining components of video games. While comprehensive development of gamification with a focus on Serious Games has been observed, there remains a dearth of understanding regarding the efficacy of these games in enhancing motivation and engagement in children with various therapeutic interventions, including cognitive training. In particular, the utilization of Serious Video Games for the remedy and evaluation of ADHD remains underexplored. This raises crucial questions, such as the expediency of Serious Video Games concerning the managing, treating, and evaluating of ADHD. Here, the term expediency encompasses the use of familiar methods that provide reassurance, entertainment, and immersion, thereby helping the child sustain their attention and motivation (Inmaculada et al., 2020). However, current Serious Video Games targeted towards children with ADHD often lack immersion and an adrenaline rush, features that commercial games offer, leading to a lack of motivation in children to play such games (Zayeni et al., 2020). Therefore, it is essential to develop Serious Video Games that cater to the entertainment aspect of gaming while providing educational benefits through cognitive training. Hence, this research project intends to develop a Serious Video Game that promotes hyperactivity and interaction using music, dancing, and familiarity. This will be done by incorporating pragmatic and empirical cognitive load theory to present various Serious Video Game ideas for children with ADHD, which will be developed into a whole game using the Godot 4.0 Game Engine. In closing, children with ADHD have a deficit in inner stimulus and linguistics, which poses challenges in completing tasks and leads to procrastination (Sújar, 2022). Therefore, therapeutic, and cognitive intercessions centered around Serious Gamification could prompt a promising approach to managing this difficulty.

4 Paradigmatic perspective

The Paradigmatic perspective opted and to-be implemented by this project involves interpretivism (a social constructivist) method (Kreiner, 2009):

- **Ontological Assumptions (nature of reality):** manifold dashes of realism, socially built by persons in unity (Kreiner, 2009).
- **Epistemological Assumptions (knowledge):** Knowledge should be attained through being empathetic of the partakers' life experiences by defining subjective and personal lived understandings and realities (Kreiner, 2009).

A more specified Paradigmatic perspective approach involves understanding the research aims and objectives, through the Interpretivism perspective, resulting in a subjective-oriented paradigm. Additionally, the introduction of Design Science theory will help the research project in developing an effective and working game artifact, this can be done by trailing after the seven rules of Design Science Study Methodology (Hevner *et al*., 2004).

Hevner *et al.* (2004), lists 7 rules for Design Science Study Methodology:

1. **Design by way of an object or artifact:** This involves a state where the Design Science research yields a practical artifact in the form including a method, prototype, installation, and even the exact construct (Hevner *et al*., 2004).

2. **Relevance of the problem:** Design Science study wishes to construct technology-oriented resolutions for or to imperative and applicable corporation or business issues (Hevner *et al*., 2004).

3. **Evaluation of the design:** The value, excellence, and efficiency of a developed or designed artifact should be thoroughly displayed through finely implemented assessment processes (Hevner *et al*., 2004).

4. **Contributions of the research:** Operative Design Science study should offer transparent and provable inputs in the subjects of designing artifacts, and designing foundations, including designing methodologies (Hevner *et al*., 2004).

5. **Research rigor:** Design Science study depends upon employing approaches that are rigorous in equally building and assessing the constructed artifact (Hevner *et al*., 2004).

6. **Search process through design:** The pursuit of effectual and successful artifacts demands using and applying existing and accessible means to attain anticipated results while satisfying principles in the problematic surroundings (Hevner *et al*., 2004).

7. **Research communication:** Design Science study should be communicated efficiently and successfully similarly and equally in cooperation with technology-oriented and management-oriented meetings (Hevner *et al*., 2004).

The aspiration of this research attempts to answer the strategy problem of designing a game with therapeutic and cognitive intervention benefits for children with ADHD; under that umbrella in answering the knowledge question, the empirical aspect of providing the solution in an Explanatory and Descriptive context. The visual paradigm is seen in Figure 1, below:

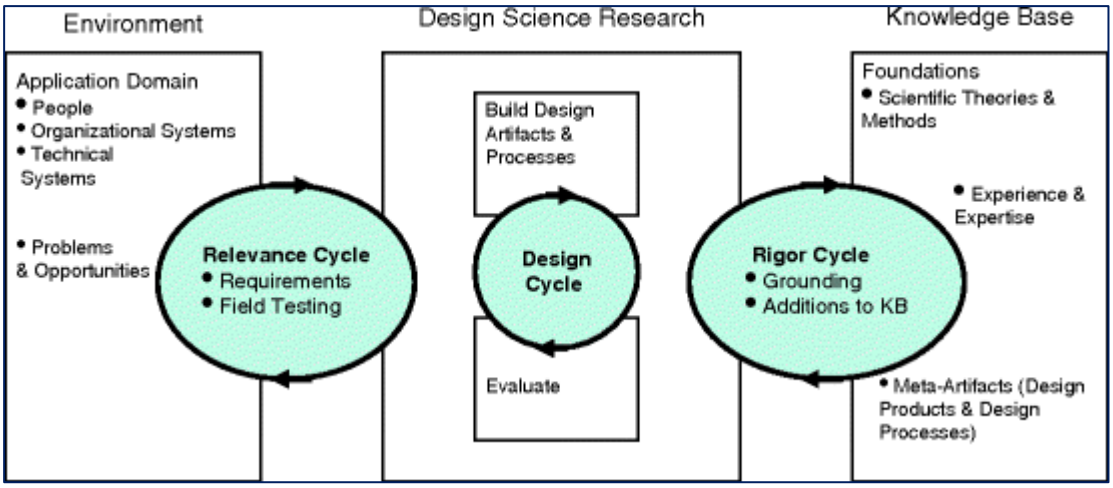


***Figure 1**. The Design Science Paradigmatic Framework*

Source: (Hevner & Chatterjee, 2010)

4.1 Meta-theoretic assumptions

The following Meta-theoretic assumptions are true and realized in this research project:

- Research Paradigm: Interpretivist or Social Constructivism (Johan, 2017:3).
- Research Methodology: Qualitative (Johan, 2017:3).
- Research Metatheory: Epistemological Assumptions and Ontology (Johan, 2017:3).
- Research Method: Case study, survey (if permitted), existing data analysis, observations, etc. (Johan, 2017:3).
- Research Technique: may include questionnaires (if permitted) (Johan, 2017:3).
- Research Instrument: involves expert reviewer (human), pen, paper, Godot 4.0, or laptop, etc. (Johan, 2017:3).

This research assumes the following meta-theoretical designs:

- Correlational

  This will allow the understanding of the extent to how Serious Video Games can be effective in managing ADHD, which looks at the association between the two topics, without intervening in the process (Polit & Hungler,1995:649).
- Descriptive

  Descriptive research will permit researchers to accumulate an in-depth knowledge of Serious Video Games in managing ADHD by answering the when/what/where (Polit & Hungler,1995:649)

More visual emphasis is shown in Figure 2.

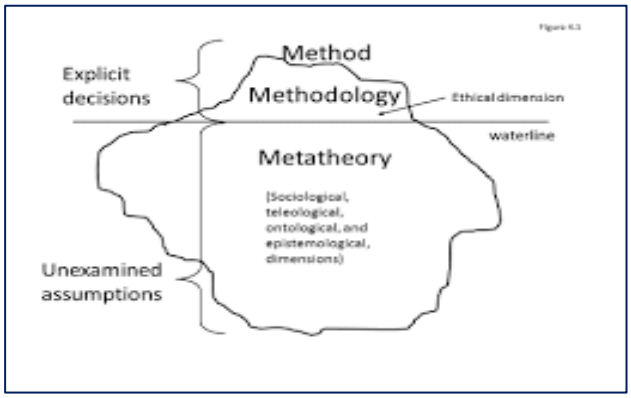


***Figure 2**. The Metatheory Framework - Iceberg Model of study decisions and assumptions*

Source: (Johan, 2017:4)

4.2 Theoretic assumptions

Design Science rehearses over twofold activities: firstly, by constructing an artifact through design that enhances an aspect for candidates and secondly, by empirical observing and examining the act of that specific, contextual artifact (Weringa, 2014: v). The research problem is only solved when there is an interaction or collaboration relating to the artifact and the problematic context that contributes to solving that research dilemma. In this context, the artifact is a Serious Video Game that needs to interact with children who are living with ADHD; and the birth of the two conjoined should meet the problem context of therapeutic intervention and cognitive theory intervention. Thus, the interaction between these two theoretic assumptions conforms to the Design Science paradigm.

4.3 Methodological assumptions

This research will follow a methodology already successfully implemented by (Rijo *et al*., 2015), this followed seven steps shown in Figure 3, below:

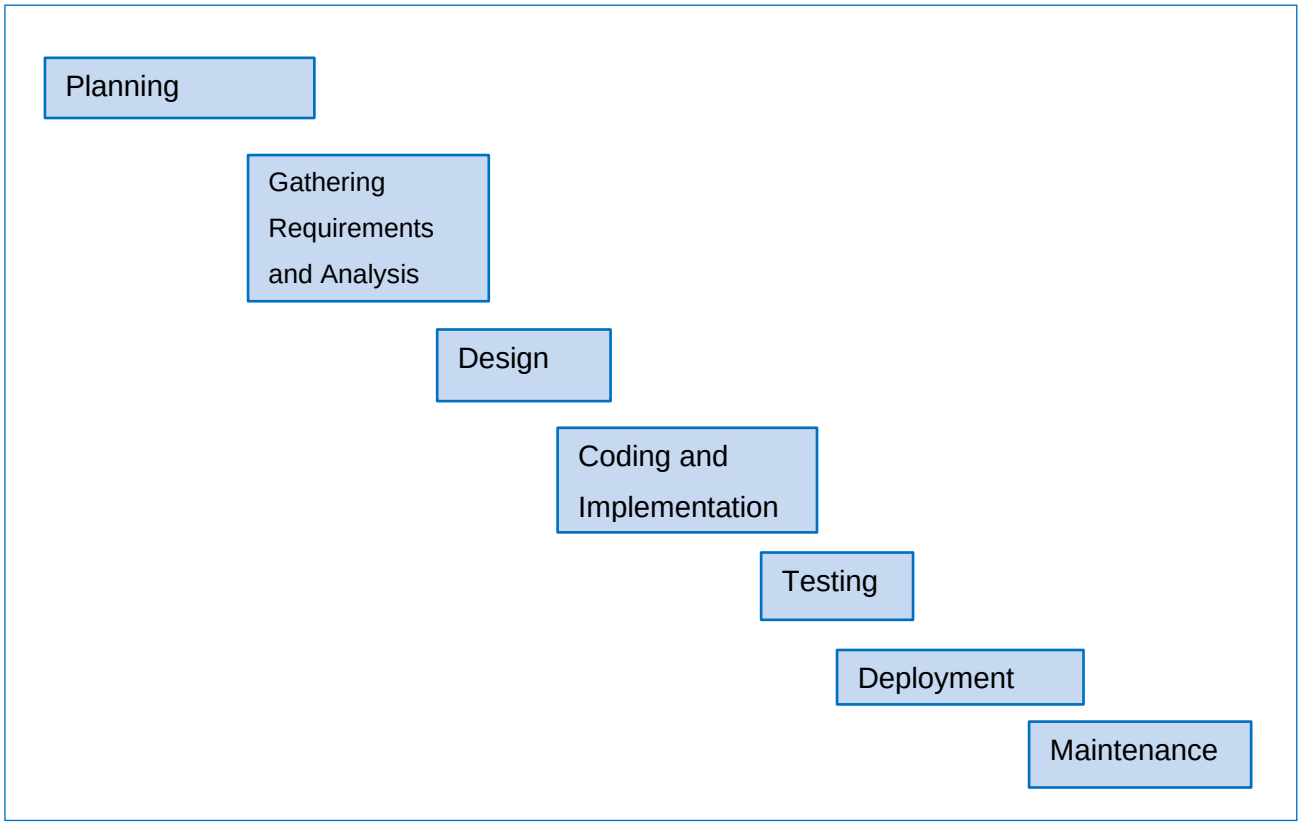


Figure 3*. The SDLC Methodology Approach*

Source: (Mahalakshmi & Sundararajan, 2013:192)

Stage 1: Planning

This stage involves the initial formation of the Serious Game.

Stage 2: Gathering Requirements and Analysis

This stage involves the gathering or collecting of various credible research articles and many other available research tools, to analyse, understand and define the requirements of this research project (Mahalakshmi & Sundararajan, 2013:193).

Stage 3: Design

This stage involves gathering all the software and hardware tools needed for the design and construction of this game, furthermore, this also includes learning all the required programming

languages. Moreover, the draft design of the game is also formulated in this stage (Mahalakshmi & Sundararajan, 2013:193).

Stage 4: Coding and Implementation

This stage involves the development of the Serious Game using the Godot 4.0 Software Application.

Stage 5: Testing

This stage involves the gathering or collecting of various credible research articles and many other available research tools, to analyse, understand and define the requirements of this research project (Mahalakshmi & Sundararajan, 2013:193).

Stage 6: Deployment

This stage involves testing the game on myself. The reason for the game not being tested on its intended audience is due to the rules and regulations of the North-West University which requires that one obtains an Ethical Clearance Permit first.

Stage 7: Maintenance

This stage will not only keep track of the software and hardware maintenance but also continually search for upgraded and innovative design and analysis conducts to improve the serious game and its impact in managing ADHD.

5 Research aims and objectives

5.1 Research aim

The research project aims to delineate the usefulness of Serious Video Games for the evaluation, intervention, and cognitive enhancement of children aged between 5 and 11 years old, who have been diagnosed with and are living with ADHD. Additionally, the research aims to scrutinize the demand for a Serious Video Game that can engender excitement and motivation via physical movements (dance), music, attention, and cognitive training, utilizing neural feedback technologies. Moreover, the investigation will assess the existing proof of the suitability and effectiveness of Serious Video Games in ameliorating ADHD symptoms. The ultimate intent of this research will be to focus on the creation and development of a game that underscores behavioral, cognitive, and playful practices or inspirations as the central activity of the Serious Game, utilizing a ludic methodology. In other words, the ludic method will seek to heighten the child's motivation and aimless playfulness for the game (Rijo et al., 2015).

5.2 Research objectives

This research project's stands twofold: firstly, involving an initial analysis followed by the design, development, testing, implementation, and evaluation of a Serious Video Game for infantile diagnosed and living with ADHD throughout the academic year. Secondly, to create and probably release a Serious Video Game that aids in the management of ADHD symptoms, while concurrently examining the aftermath of various Serious Video Games already available for children, and thereby, establishing a statistical correlation between their use and an improvement in ADHD indicators. With that said, this research project does not aim to replace or undermine traditional medication options, but rather complement them by providing parents, guardians, or healthcare professionals with a means to keep children engaged and productive (Rijo et al., 2015). As previously stated, the prime objective involves creating and investigating the efficiency of Serious Video Games in entertaining and aiding children, as well as enhancing their symptom management, in conjunction with therapy. Further research objectives with problems and questions can be viewed in Table 1, below:

Research Objectives	Research Problem	Research Objectives
Describing and Exploring	▪ There exists a pressing requirement for the efficacious development of Serious Games tailored to the needs of children living with ADHD. ▪ A paucity of erudition exists regarding the nature and essence of Serious Games. ▪ There is a lack of erudition and pragmatic measures	▪ How has the medical research in ADHD (attention deficit hyperactivity disorder) changed over time? ▪ How has the gamification research of Serious Games changed over time? ▪ What are the symptoms of ADHD and how can the use of Serious Games help patients in managing these?

	about how to manage and coexist effectively with ADHD.	▪ How has the development and integration of Serious Video Games dealt with ADHD?
Explaining and Testing	▪ The scarceness of methodical testing, coupled with an absence of comprehensive reviews and explications of the ensuing outcomes, remains a notable shortcoming. ▪ More can be tested and explained as to how and why Serious Game A was more effective than Serious Game B.	▪ What is the relationship between testing Serious Games and ADHD? ▪ What is the role of Serious Games in managing ADHD? ▪ What is the impact of Serious Games tests on ADHD? ▪ How do Serious Games influence children that live with ADHD?
Evaluating and Acting	▪ There exists an insufficiency of applicable and thoroughly evaluated research about the concept of Serious Games and their indispensability in fostering child development. ▪ The tendency among most children to favour commercial games over Serious	▪ What are the advantages and disadvantages of using Serious Games? ▪ How effective are Serious Games on ADHD? ▪ How can Serious Games be improved?

	Games stems from the fact that the latter tend to resemble classroom sessions more than a recreational tool intended for entertainment purposes. ▪ The rapid evolution of the artificial intelligence landscape necessitates the continual innovation and development of Serious Games to keep pace with this dynamic field.	

Table 1. *Research Objectives, Problems, and Questions*

Source: (Rijo et al., 2015)

5.3 Study design

This research project intends to employ both Qualitative Research Methodology and Design Science Theory, and therefore, it is fitting to adopt an Interpretivism Research or Study Strategy. Therefore, in choosing this study strategy, is based on the type of the problem statement, objectives, including the available resources. Additionally, this will be done through the incorporation of subjectively observed reality, meaning that the reality of an observer is unique to them (Ranganathan & Aggarwal, 2018:184). In this case, the observers are the expert reviewers and the children aged between 5 to 11 years old, who are living with ADHD. Each observers' experience and reality of living with ADHD differ, including how they manage their symptoms. Hence, their response to the Serious Game developed in this context may likely vary and be contingent on their entertainment preference and cognitive capability. Furthermore, the Observational Study Design intended to be utilized in this research is a Descriptive or Non-Analytical study approach. This descriptive study approach will assist in fully describing the characteristics of the collected data (Ranganathan & Aggarwal, 2018:184). Generally, the selection of these research designs is founded on the directionality of the study inquiry, indicating

the direction of the research design. Thus, the research's directionality is backward, which implies that the need for a Serious Game for ADHD children has been identified, and the analysis of the game's potential effectiveness on participants is required (Ranganathan & Aggarwal, 2018:185).

This research will adhere, with the other methodologies, to the IDEAL – Game framework developed by (Sújar, 2022), as shown in Figure 4:

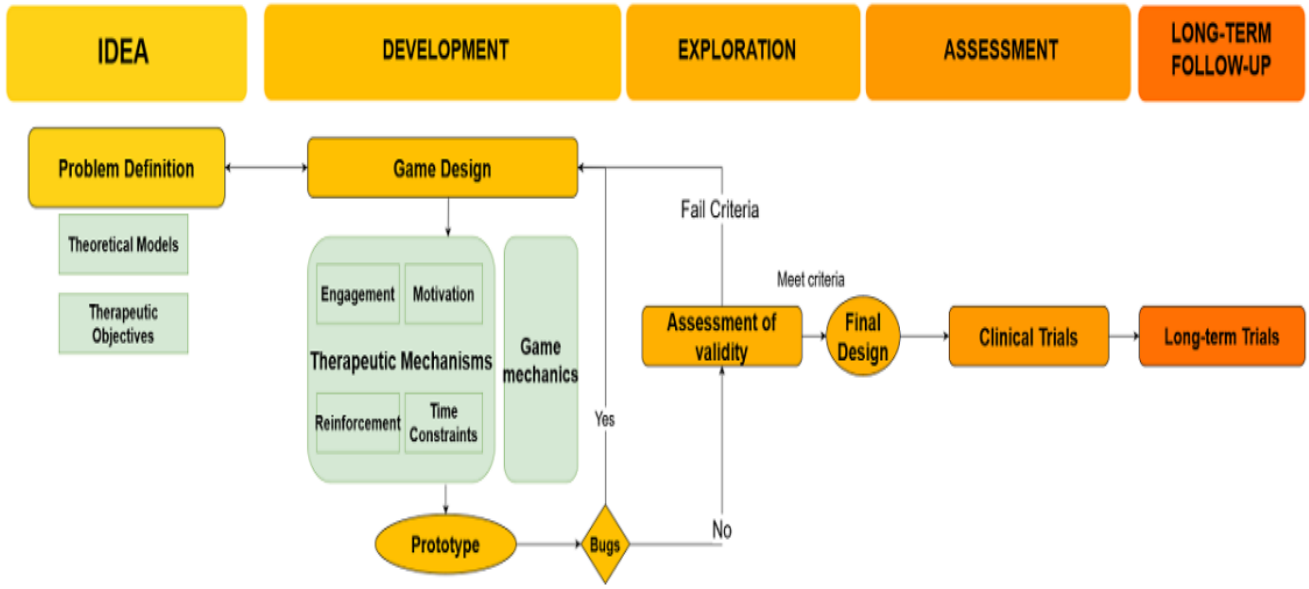


***Figure 4**. IDEAL-Games framework designed to develop an overall conductor for Serious Game-grounded ADHD intervention.*

Source: (Sújar, 2022)

5.4 Study context

The proposed research will adhere to a Qualitative research methodology, which prioritizes the gathering and evaluation of data through the analysis of written/spoken words and documented data (Dervin, B. 2003). This methodology has been chosen due to the subjective characteristics of the studies' aims, problem statement, and objectives, which do not require calculations, measurements, or numerical projections. Additionally, the Explanatory technique will be employed to better understand the context and archetype of the situation at hand, as the studies' objectives and aims are more explanatory in nature than confirmatory (Dervin, B. 2003).

This approach is justifiable, as the research project aims to understand the theoretical background and research already done on the development and integration of Serious Video Games, as well

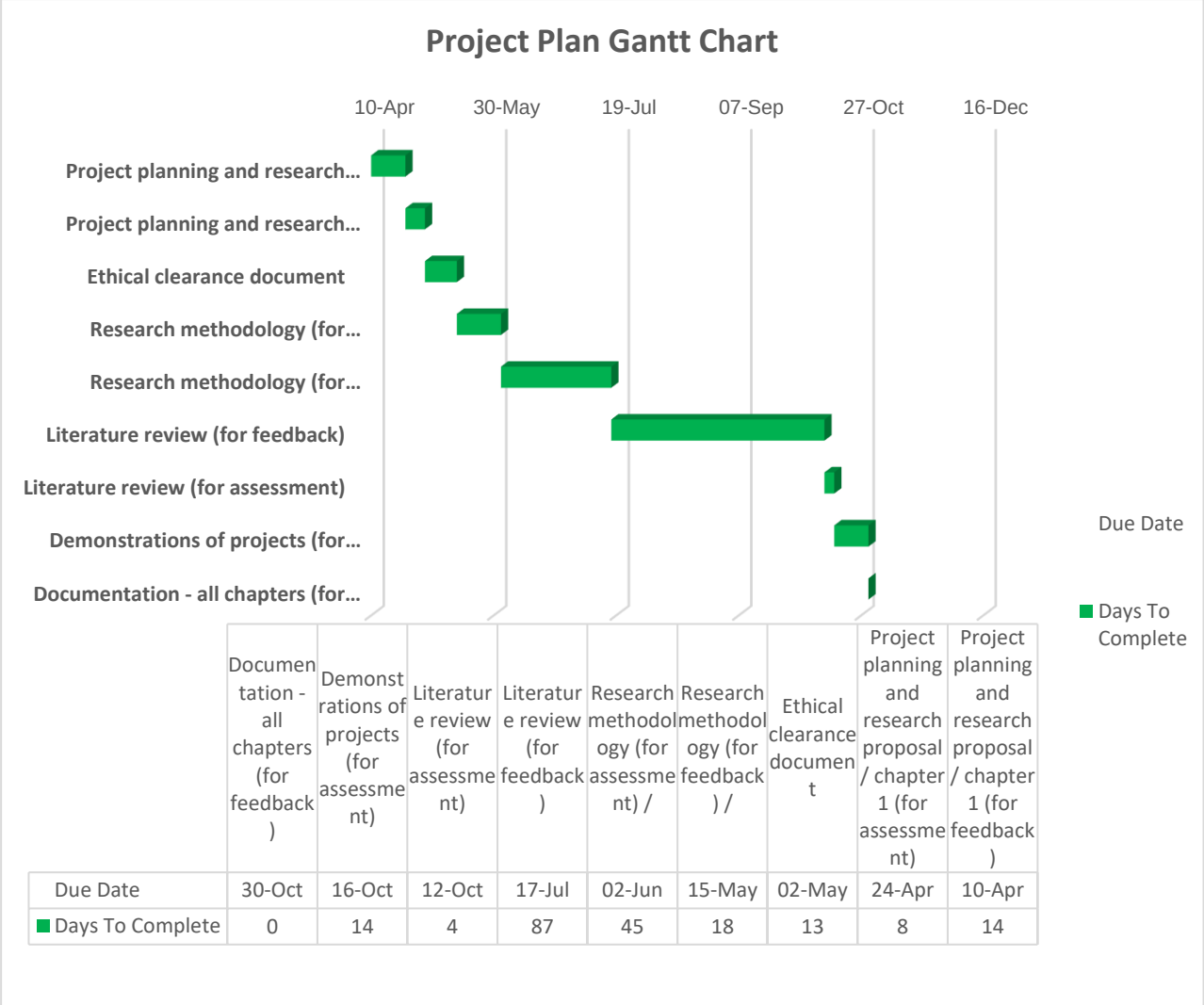
as the characteristics of neurodevelopmental disease ADHD in children and how it can be effectively managed using Serious Video Games. Moreover, Dervin, B. (2003), suggest that hypothetical perceptions and ideas will be critically analyzed alongside proven review facts and ideas. Furthermore, this research project will use a deductive, bottom-up approach to research, utilizing words, concepts, perceptions, and ideas as the focal point, rather than statistics and numbers. This approach, in conjunction with the Qualitative methodology and Design Science Theory, will enable a comprehensive understanding of the research problem and a detailed exploration of the data collected.

6 Research Project Plan

6.1 Project Gantt Chart

Due Date	Days To Complete	Document Submission
10-Apr	14	Project planning and research proposal / chapter 1 (for feedback)
24-Apr	8	Project planning and research proposal / chapter 1 (for assessment)
02-May	13	Ethical clearance document
15-May	18	Research methodology (for feedback) /
02-Jun	45	Research methodology (for assessment) /
17-Jul	87	Literature review (for feedback)
12-Oct	4	Literature review (for assessment)
16-Oct	14	Demonstrations of projects (for assessment)
30-Oct	0	Documentation - all chapters (for feedback)

***Table 2**. Gantt Table*



	Documentation - all chapters (for feedback)	Demonstrations of projects (for assessment)	Literature review (for assessment)	Literature review (for feedback)	Research methodology (for assessment) /	Research methodology (for feedback) /	Ethical clearance document	Project planning and research proposal / chapter 1 (for assessment)	Project planning and research proposal / chapter 1 (for feedback)
Due Date	30-Oct	16-Oct	12-Oct	17-Jul	02-Jun	15-May	02-May	24-Apr	10-Apr
Days To Complete	0	14	4	87	45	18	13	8	14

***Figure 5**. Gantt Chart*

6.2 Project/Module Plan

Date	Activities	Person Responsible
	SEMESTER 1	
23 February 2023	Lecture: Introduction and discussion of the process.	Prof E Taylor
02 March 2023	Lecture: EndNote.	Me Linda Redelinghuys
09 March 2023	Lecture: Academic writing and the correct handling of source referencing.	Dr A vd Merwe
16 March 2023	Lecture: Research paradigms.	Prof R Goede
23 March 2023	Lecture: Research paradigms (cont.) +	Prof E Taylor
	Project planning and research proposal.	
	Recess 27 – 31 March	
06 April 2023	Lecture: Empirical research.	Prof T du Toit
10 April 2023	Submission: Project planning and research proposal (for feedback).	Students
11 April 2023	Feedback: Project planning and research proposal.	Supervisors
20 April 2023	Lecture: Ethical clearance.	Prof L Drevin
24 April 2023	Re-submission: Project planning and research proposal (for assessment).	Students.
	Submission: Ethical clearance	
02 May 2023	Submission: Research methodology (for feedback)	Students
09 May 2023	Feedback: Research methodology	Supervisors
11 May 2023	Lecture: Literature review	
15 May 2023	Re-submission: Research methodology (for assessment).	Students
02 June 2023	Submission: Literature review (for feedback)	Students
15 June 2023	Feedback: Literature review	Supervisors
	SEMESTER 2	
Date	**Activities**	**Person Responsible**
17 July 2023	Re-submission: Literature review (for assessment)	Students
27 July 2023	Lecture: Quantitative and qualitative data analysis.	Dr J Liebenberg
21 September 2023	Lecture: Project demonstration day.	Prof E Taylor
	Recess 2 October – 6 October	
12 October 2023	Demonstrations of projects (for assessment).	All staff and students
16 October 2023	Submission of complete documentation (for feedback).	Students
23 October 2023	Feedback on complete documentation.	Supervisors
30 October 2023	Re-submission: Complete documentation (for assessment).	Students
20 November 2023	Final assessment completed.	Supervisors and moderators

***Table 3**. Module Plan*

6.3 Project Scope and Limitations

Definite Research Questions: How effective are serious games in advancing concentration and executive function in children with ADHD? Are there differences regarding the effectiveness of Serious Video Games for infantile aged between 5 to 11 years old and other different age groups or severity levels of ADHD?

Research Methodology: No trial will be undertaken; only expert reviews of the Serious Game will be considered.

Sample Size and Demographics: The study will not conduct and test the game on any participants for assessment and evaluation.

Time Frame: The study will be conducted from the month of February 2023 to the end of October 2023, with a baseline assessment, excluding, the intervention period, and post-intervention assessment.

6.4 Risk Analysis Graphical Representation

6.4.1 Risk Criterion

- Risk 1: Lack of participant engagement
- Risk 2: Data loss due to technical issues
- Risk 3: Overschedule, not finishing the project in the required time frame.

6.4.2 Risk Matrix Table

	HIGH	MODERATE	LOW
HIGH	Risk 1		
MODERATE		Risk 2	
LOW			Risk 3

***Table 4**. Risk Matrix*

7 Rigour / Validity & reliability

Reliability

Polit & Hungler (1995:651), defines reliability as the gradation of constancy or reliability with which an apparatus measures attributes but specifically focusing on the confidence of how the data is analysed and used. This function obligates the research and data used in this research to be conceptualized as tools, non-biased, standardized, and neutral (Mason, 1996:145). Moreover, Brink (1991:176) suggests three qualitative reliability tests be implemented in this research, namely:

- **Stability** refers to when asking at different times, duplicate questions of the same research leading to producing consistent results.
- **Consistency** suggests the integrity of problems that may arise in a singular data collection tool, this is done to produce concordant topic responses.
- **Equivalence** refers to the testing through using alternative formats of data collection tools with similar meanings during a single data collection tool process.

Validity

Wood & Haber (1998:561), defines validity being the fortitude of how why, and if a data collection tool quantifies, evaluates, and collects whatever it is purporting. Moreover, Long & Johnson (2000:31), suggest the following aspects be considered in this research:

- **Content validity** refers to the scale to which the research topic is addressed, and the findings produced appear to be thorough and accurately reputable, and knowledgeable to the audience.
- **Criterion-related validity** refers to the comparison of the data collection tool and findings which can verify the connection to actual or measured performance.
- **Construct validity** refers to the association with the concern of the immediacy of the data collection tool in constructing the research topic.

Rigour

Long & Johnson (2000:35), highlight the importance of rigor to be followed in this research for the results to convey persuasion and forte.

In conclusion, this research project is a no-risk project; thus, expert reviewers will be used to review the Serious Game.

8 Ethical considerations

This research project entails a low-risk project, thereby warranting the involvement of seasoned or expert reviewers to evaluate the Serious Game. Consequently, ethical considerations are deemed unnecessary, given that no data will be solicited from individuals.

9 Executive Summary

In summary, this research project intends to explore the efficacy of developing Serious Video Games (SVGs) for assessing, therapeutic treatment, and cognitive training of children between the ages of 5 and 11 who have been diagnosed with ADHD. The background of the study shows

that the development of engaging and stimulating SVGs for children with ADHD poses a challenge due to the lack of entertainment and motivation that traditional video games offer. The project aims to develop an SVG that achieves the objective of behavioral pedagogy in the form of amusement for children with ADHD. Additionally, the project aims to analyze the need for developing an effective SVG that stimulates excitement and motivation through physical movements, music, attention, and cognitive training using neural feedback technologies. The problem statement highlights that while there has been comprehensive development of gamification with a focus on Serious Games, there remains a dearth of understanding regarding the efficacy of these games in enhancing motivation and engagement in children with various therapeutic interventions, including cognitive training. The Paradigmatic perspective to look for in the interpretivism method involves ontological, epistemological, axiological, and methodological assumptions, and this project will follow the 7 rules for Design Science Study Methodology. The agreed data gathering, or collection method has been concluded to be based on using an expert reviewer. Moreover, the method, methodology, and metatheory of successfully developing and realising this project are specified, this includes the integration of SDLC and the IDEAL – Game framework. The research project has presented a thorough project plan and module plan, accompanied by a clear delineation of the limitations and scope of the research, which has been supplemented by a graphical representation of the risk analysis. Furthermore, the project has expounded on the development platform, resources, and environments that will be utilized. The conclusion of the document encompasses an evaluation of the rigor, reliability, and validity of the study, in addition to the discussion and analysis of the ethical considerations.

BIBLIOGRAPHY

Brink, P. 1991. Issues of reliability and validity. Qualitative nursing research: a contemporary dialogue. London: Sage. p 164–186.

Dervin, B. 2003. Sense-making's journey from metatheory to methodology to the method: an example using information seeking and use as a research focus. (*In Drevin, B., Wernet, L.F. & Lauterbach, E., eds. Sense-Making Methodology Reader: Selected Writings*. Creskill NJ: Hampton Press. pp. 63-133).

Hevner, A. & Chatterjee, S. 2010. Design science research in information systems. (*In* design research in information systems. Integrated Series in Information Systems, vol 22. Springer, Boston, MA)

Hevner, A.R., March, S.T., Park, J. & Ram, S. 2004. Design Science in information systems research. *MIS Quarterly*, 28(1):75-106.

Inmaculada, P.C., Lin, K.J.L., Braulio, G.S., David, D.G., Rocio, N.J., Enrique, B.G. & Alejandro, P.S. 2020. Video games for the assessment and treatment of ADHD: a systematic review. *European Child & Adolescent Psychiatry* 2022(31):5–20

Johan, L.P. 2017. International and comparative librarianship: concepts and methods for global studies. (Unpublished).

Kreiner, G. E., Hollensbe, E. C., & Sheep, M. L. 2009. Balancing borders and bridges: Negotiating the work-home interface via boundary work tactics. *Academy of Management Journal, 52*, pp. 704–730.

Long, T. & Johnson, M. 2000. Rigour, reliability, and validity in qualitative research. *Clinical Effectiveness in Nursing*, 4(1):30–37.

Mahalakshmi, M. Sundararajan, M. 2013. Traditional SDLC vs scrum methodology – a comparative study. *International Journal of Emerging Technology and Advanced Engineering,* 6 (3): 192-196.

Mason, J. 1996. *Qualitative Researching*. 1st ed. London: Sage.

Muñoz, J. E., Montoya, M. F. & Boger, J. 2022. From exergames to immersive virtual reality systems: Serious games for supporting older adults. *Smart Home Technologies and Services for Geriatric Rehabilitation*, 141-204.

Polit, D. & Hungler, B. 1989. *Essentials of Nursing Research: Methods, Appraisal, and Utilization*. 2nd ed. Lippincott, Philadelphia.

Ranganathan, P. & Aggarwal, R. 2018. Study designs: part 1 – an overview and classification. *Perspectives in Clinical Research*, 9(4):184-186.

Rijo, R., Costa, P., Machado, P., Bastos, D., Matos, P., Silva, A., Ferrinho, J., …Fernandes, S. 2015. Mysterious Bones Unearthed: development of an online therapeutic serious game for children with attention deficit-hyperactivity disorder*. Procedia Computer Science,* 64(1):1208 – 1216, e512.

Sújar; A., Moratinos, M.M., Yanguas, M.R., Fernández, M.B., Tardón, C.G., Gómez, D.D. & Fontecilla, H.B. 2022. Developing Serious Video Games to Treat Attention Deficit Hyperactivity Disorder: Tutorial Guide. *JMIR Serious Games*, 10(3): e33884

Wood, L.G. & Haber, J. 1990. Nursing Research: Methods, Critical Appraisal and Utilisation, 2nd ed. Mosby, St Louis.

Zayeni, D., Raynaud, J.P. & Revet, A. 2020. Therapeutic and preventative use of video games in child and adolescent psychiatry: a systematic review. Frontiers in Psychiatry, 11(1), e36.