STRESS SLAYER: A GAME FOR TEACHING COLLEGE STUDENTS HOW TO MANAGE STRESS

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ABSTRACT

The Lusog-Isip Kabataan Education (LIKE) program is a mental health program focused on teaching stress and stress management in a healthy and effective manner through a series of video module. This study seeks to assist LIKE in achieving its objective by designing a fun, educational, serious mobile game aimed at supplementing LIKE's video modules. The game was built using the Unity Engine 2022.3.9f1 with the Android Build Support module installed. Participants are eighteen years old and above and recruited via convenience sampling. They were asked to answer the pre-test, play the game, then answer a post-test and a modified GUESS-18 survey. Analysis of the tests and the survey were done using paired t-test and the analysis method recommended by GUESS-18's authors respectively. Results found that the game had a statistically significant impact on the participants' learnings and that the game has a fun and engaging user experience. The researchers therefore recommends that further research be conducted into using games for teaching stress and stress management.

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CHAPTER I

INTRODUCTION

1.1 Context of the Study

Literature reviews on the impacts of stress on college students have shown that stress can negatively affect the physical, mental, and emotional wellbeing of a student. Some commonly cited negative effects include elevated blood pressure and higher cholesterol levels, a weakened immune system, mood swings, irritability, increased substance use to cope, onset of health issues, poorer academic performance, lower academic motivation and increased student disengagement with their education [11, 13]. Furthermore, excessive stress also correlates with a deterioration in a person's quality of life, which in turn negatively affects a person's physical and mental wellbeing and also results in burnout syndrome, sleep disturbances, and depression [17] These effects have been observed in college students, and even across cultural contexts [13].

Therefore, interventions are needed to help college students manage their stress correctly. Last year, a psychoeducation intervention program called Lusog Isip Kabataan Education (LIKE) was launched on June 26, 2023 at Ateneo De Manila University to help meet this need [1] One tool LIKE has are a series of video modules focused on teaching about stress and the healthy ways to cope with stress, while also educating the dangers of using substances for stress relief [11]. Although the video modules are targeted towards high school students, their content is universally applicable to all age groups. Including college school students.

Education games (called serious games in academia) can potentially prove to be useful additions to the LIKE program. Reviews on the use of educational games found that games were effective learning tools, improve learning outcomes, improve student motivation for learning, improve student engagement, and improve student satisfaction

[4, 23]. This raises the possibility that educational content of LIKE could be conveyed in a game format.

1.2 Research Objectives

The objective of this study is to supplement the video modules of the LIKE program by developing a game to teach players stress and stress coping strategies. More specifically, this study aims to:

1. Create a useful, fun, and engaging educational game with the goal to supplement the learning objectives of Modules 1 and 2 of the LIKE program.
2. Integrate the educational content of the aforementioned modules into the game's mechanics or game elements.
3. Successfully convey the educational content of the aforementioned modules to the player.

1.3 Research Questions

Given the above research objectives, the following questions are posed:

1. How fun and engaging is the user experience?
2. Which elements of the education content in the aforementioned module can be integrated in the game?
3. How effective is the game in conveying its integrated educational content?

1.4 Scope and Limitations

The game's educational content will be limited to the first two video modules of the LIKE program - *Lahat ng stress ay masama* and *Ano ba ang pwedeng gawin kapag stressed?*. The researcher acknowledges that ideally all six video modules should be

included in the game, but the scope has been reduced to only two to minimize the technical difficulties of designing and building a game.

Furthermore, the game will be designed to run on Android phone only. This decision was made to allow the game to be played by students who do not have access to desktops or laptops.

1.5 Significance of Study

When this study is completed, the game produced can potentially become a useful tool for students to learn about what stress is and the coping strategies to manage stress. This is especially true for students who have difficulty managing stressful situations. Furthermore, LIKE will be able to employ an additional learning tool that could be used to help achieve their objectives and improve the results of their intervention.

CHAPTER II

REVIEW OF RELATED LITERATURE

2.1 Brief Introduction to Stress

Stress refers to the body's physical or mental response to internal and external stressors that affect and influence the behavior and emotion of a person [2, 22]. Contrary to the perception of others, stress in of itself is not bad. Stress is useful for priming and energizing a person to confront and resolve a situation. It allows the body to respond to any threats and challenges that arise [11, 22]. However, the stress a person may experience can exceed their ability to tolerate and respond to difficult situations. And too much stress can cause physical and mental health problems.

The physical and mental problems rooted in excessive stress causes are well documented in literature [2, 11, 13, 14, 22]. Some physical problems include, but not limited to, increased heart rate, tremors, appetite changes, gastrointestinal complaints, sleeping problems, potential substance use to cope, headaches, upset stomach, difficulty sleeping, increased or decreased appetite, palpitations, sweating, dry mouth, shortness of breath, fidgeting, accelerated speech, and generally poorer physical health. Some mental problems include, but not limited to irritability/anger management difficulties, anxiety, depressed mood, nervousness, hopelessness, concentration difficulties, and social isolation. Stress also leads to a poorer quality of life; the higher the level of stress, the poorer the quality of life. Stress also directly contributes to the onset of physical and mental disorders and diseases, which in turn negatively affects the overall physical and mental wellbeing of a person.

Stress is unavoidable; therefore, stress must be managed instead. However, interventions focused on teaching individuals how to manage their stress may prove invaluable in preventing future mental health problems and promote mental wellbeing.

2.2 Lusog-Isip Kabataan Education

Lusog Isip Kabataan Education (LIKE) is a course that aims to develop knowledge and skills in mental health awareness, self-care, adaptive coping, and substance use awareness and prevention in individuals. Their video modules help participants struggling to manage their stress by educating them about the basics of stress, the healthy ways of coping with stress, the consequences of using substances as a means of coping with stress, and how to avoid using substances [9, 10]. Although the primary audience are Filipino high school students, their content is universally applicable to all age groups.

Additions to LIKE's educational materials could also be made to help improve the program's effectiveness. For example, educational video games, or serious games as they are called in literature, have shown themselves to be useful in conveying knowledge to the player in the past. Serious games also promote relaxation and recreation by design. This raises the possibility that serious games may prove useful to LIKE in achieving its objectives.

2.2 Serious Games

Serious games are games whose explicit intention is to convey some knowledge, message, skill, or educational value to the player through an interactive and multimodal experience. They are designed with the goal of educating the player about a topic and the player's knowledge, cognition, behavior and or motor skill [9, 16]. Serious games can be thought of having two components: the entertainment component and the educational component. The entertainment component refers to aspects of a game meant to entertain and engage the player. In other words, what makes a game fun and engaging. The educational component refers to aspects of a game designed to convey knowledge to the player.

Serious games have been applied in a wide variety of areas including business management, training, history education, promoting wellbeing, advertisement, virtual reconstructions of ancient sites and museums, and healthcare. Research into the effectiveness of serious games is overwhelmingly positive. Literature suggests that serious games are effective learning tools while also improving learning outcomes, student engagement, student satisfaction, and motivation for learning [4, 23].

However, designing effective serious games is a difficult challenge. A successful and effective serious game must successfully find a balance between its two components – education and entertainment - otherwise its effectiveness would be diminished. A game too overly focused on the educational component would likely be boring from the perspective of the player. And a game too overly focused on the entertainment component would defeat the purpose of serious games to convey knowledge to the player. Unfortunately, literature on how these two components could be balanced is lacking.

This literature review is divided into three sections. The first section focuses on literature related to the entertainment component of the game while the second focuses on literature on the educational component. The third section will discuss other miscellaneous details that do not fall under the two components, but are nonetheless important in the development of serious games.

2.3 Entertainment Component

The entertainment component is an important part of serious games. As Silva [18] points out, games must be fun first and educational second. The whole premise of serious games stands on the assumption that players are drawn into playing games because it is entertaining. And while a player plays a game, the game could transmit knowledge over time. A boring game or a game that focuses too much on the

educational component will not draw in or keep the player engaged; thus, the mechanisms of transmitting knowledge to the player are useless. Franzwa, Tang, and Johnson [16] also concur with Silva's statement.

On the other hand, successfully making an entertaining serious game makes learning smoother and natural. More enjoyment in playing serious games leads to a higher interest and motivation to study the subject matter [8]. Furthermore, games are an avenue for 'playful learning'. Playful learning is simply learning by playing where students learn new ideas and concepts as they play. A literature review by Hirsh-Pasek and Golinkoff [7] concluded that playing results in better learning on the part of the player. Or in the words of the study, "play=learning". Furthermore, Prensky [15] and Westera [20] notes that playing is a natural way of learning things. Therefore, a successful serious game can be an invaluable tool in the learning process.

To create an entertaining serious game, elements from commercial games must be borrowed and integrated to keep players interested and motivate them with the desire to learn [6]. Fortunately, the commercial game industry already provides principles to develop a good game design. Prensky [15] in his paper on games provides a convenient set of game design principles that serious games can follow.

1. **Good serious game design is balanced.** A serious game is not too hard or too easy. It provides a challenging experience to the player that can be overcome with effort.
2. **Good serious game design is creative.** A serious game adds something original and is not a clone of another game.

3. **Good serious game design is focused**. A serious game focuses on educating the player in an entertaining way. It also means the player is free from any distractions that may take away from the learning experience.
4. **Good serious game design has character.** Like commercial games, the game needs to have richness and depth rather than being superficial and shallow.
5. **Good serious game has tension**. A good game makes a player care about the goal of a game and makes it difficult to achieve.
6. **Good serious game design has energy.** A good game is not stagnant but is active. There is something always happening or about to happen on the screen.

Prenskey also discusses in his paper the concept of 'flow'. Flow is a state of mind in which the player is completely immersed into the game. Their focus is directed primarily on the game and what it offers. In this state, the challenges the player faces and their ability to resolve them align almost perfectly, which results in the player achieving objectives that he or she otherwise didn't believe wasn't possible along with a great dose of satisfaction. In the context of serious games, designing a game in which the player could be consistently kept in the flow state is highly desirable because it improves player engagement and consequently the time spent learning new concepts and ideas.

One other important aspect of good game design is interactivity. Interactivity is the means and ways in which the player can interact with the serious game's virtual world. Serious games should avoid complex interfaces and instead provide a simple and straightforward interface because not everyone in the target audience plays games regularly and may be unfamiliar with it. They noted that in one instance, novice players did not use a game's world map or inventory; two features that are essentially basic and fundamental. However, the study raises the possibility that players can be given the

option to change their interface if desired. Therefore, a simple interface can then be provided at first and players can be informed that they could change it to their preferences later [16].

Aside from having a good game design, another crucial part of entertaining the player is to keep them engaged with the serious game. Ravyse et al. [16] recommends serious games to develop a strong game narrative or story. While audio and visual elements initially capture a player's attention, game narrative is what retains their attention and keeps them engaged and motivated to play the game. There are a few important details that need to be noted while designing a game narrative. First, it's important that game narrative must be closely related to the source material. A game about horse riding would not do well with a game narrative about hygiene. Second, a good game narrative does not produce credible learning and therefore the learning material must be integrated into the narrative.

Serious games could also leverage certain fun factors to boost the game's entertainment value. Wang, Shen, and Ritterfeld, U. [19] looked into the different fun factors that made a game entertaining by analyzing the reviews left by game reviewers in game review websites such as IGN. They found that the certain fun factors - overall game design, visual presentation, control, audio presentation, and complexity and diversity - were frequently mentioned in their reviews under a positive light. The implication here is that certain fun factors have more bearing in affecting how entertaining a game is than others. The five fun factors that consistently appeared throughout the reviews the study analyzed - overall game design, visual presentation, audio presentation, complexity and diversity, and control - have the most positive impact on how entertaining a game is. Therefore, serious games can focus on these five factors to boost its entertainment component.

However, this does not mean that other factors should be neglected. As the study points out, its likely that these other factors were neglected or taken for granted and that their loss might negatively impact the entertainment component. Furthermore, game elements related to control, usability, challenge, and artificial intelligence were noted to frequently appear in reviews expressing frustration and disappointment. Serious game designers should then must ensure these game elements are designed and implemented properly to ensure they do not reduce entertainment.

2.4 Education Component

Various frameworks were proposed by some researchers [3, 21, 23], but the framework designed by Silva [18] provides the most comprehensive and practical step by step methodology to build serious games. Or in the context of this section, develop the educational component of a serious game.

Silva suggests two ways in which the educational component of a serious game could be constructed. First, a serious game could make use of the common mechanics of a particular genre and use it as a learning mechanism. In an example, a game about viruses in the shooter genre where the player is a white blood cell shooting to destroy viruses. And with each destroyed virus, the player gets points that could be spent to upgrade skills. This teaches the player that white blood cells destroy bacteria and that the points attained can be used to build immunity. Second, a serious game should also include learning layers to supplement the learning mechanisms. These learning layers are explicitly designed to transmit knowledge to the player and can come in the form of minigames, narration, tips, cutscenes, or a quiz format.

Aside from Silva, several studies offer many insights into the factors influencing the effectiveness of the educational component of games. The study conducted by

Franzwa and his colleagues [16] implemented useful learning methods to assist players in their serious game *Sustain City*. The game takes the approach of incremental learning, where one topic is gradually introduced after the other and the connections between different topics are shown. It also emphasizes showing the interconnectedness of each topic to one another, integrating several topics into one coherent whole. In the event where a player's progress is stalled, *Sustain City* uses a series of question prompts to help pinpoint what the issue is and provides references and external help to aid the player to overcome any obstacle.

Aside from methods in which the education component could be developed, there are some challenges that can potentially detract the learning experience. Ravyse [16] notes that fidelity or realism could potentially detract the player from learning. They found in their review that serious games do not need to have a high level of fidelity. In fact, the literature they surveyed indicated that high levels of fidelity might actually distract players from learning because it adds unnecessary cognitive load to the player. Therefore, it's important the game graphics are not too demanding or eye catching to the player but still pleasing enough that it can hook their attention.

Westera [20] also raises two key issues about serious games that need to be addressed. First, most serious games focus on rote learning rather than deep understanding. In other words, many serious games teach players new ideas and concepts superficially. Serious games can convey new knowledge and operation skills to the player, but have a tendency not to explain the conceptual background the new knowledge and operational skills are rooted in. Although this is not necessarily a game breaking issue, it does detract from the learning process. The second is that serious games are designed with a minimal guidance approach. That is, serious games tend to let the player explore a topic on their own without the guidance of an instructor. Westera

points out that this method is generally ineffective and students learn better with the guidance of some instructor.

2.5 Other Design Principles

Aside from the two components above, there are a few other suggestions current literature offers to the design of serious games.

Rayvse et al., [16] advises serious game designers to involve their audience to provide feedback even during the design process. By involving the target audience, one can save a considerable amount of time during the iteration process. This also can give insight to the preferred learning styles of the audience, which can better benefit the audience's learning.

Laamarti [9] also suggests that serious games should be based on the curriculum and have a higher chance to be accepted and integrated in the class program by teachers. Serious games however should not be designed to replace classroom learning, but instead be used to supplement and support it. Furthermore, debriefing post-game provides an opportunity for players to consolidate their in game learning experiences [16].

2.6 Games Dealing With Stress

A game conducted by Nicoliadou and his colleagues [12] found that there are a limited number of game-based apps available to help children identify and manage stress on their own. The game. To address this gap, the researchers developed an interactive storytelling user centered mobile serious game for mobile devices called Kids Stress Relief. Its goal is to help children identify body signs of stress and overcome it through relaxation techniques.

This study investigated evaluating the game's acceptability and usability, focusing on design characteristics with wide applicability in future prevention interventions in children. Participants were eleven children between 4 to 10 years old. Three sources were used: a) a researcher-led usability evaluation protocol used when children interacted with the game, b) the System Usability Scale (SUS) with 10 statements on a 5-point Likert scale ranging from completely disagree to completely agree, and c) automatically-collected data capturing children's interaction with the app.

The game seems to have high usability and is generally effective in identifying stress and practicing relaxation techniques. The game was also enthusiastically accepted by all participants. One of the factors contributing to the success of the game was its short, direct to the point stories. These stories also mirrored real world situations (e.g. in game story about stress in school mirrored stress in school in real life) which may improve the chances the participants will apply the lessons they learned in game in real life.

CHAPTER III

METHODOLOGY

3.1 Pre-Development Research

The pre-development stage involves gathering data on the subject matter. The subject matter for the game is stress and the stress management techniques. The educational videos that accompany the six modules of LIKE mentioned above provide a convenient source of information that has been vetted and validated as fact by the Department of Health. These videos will be the primary source of the game's educational content. The scope of the game's content is outlined in the 'Game Design' section.

In addition, other factual sources of information covering stress and stress management techniques can be used to help supplement the educational videos. This information however will first be validated by a subject matter expert before they are included in the game. In addition, the researcher will also seek the expertise of a subject matter expert to consult and assist with the game's educational content.

3.2 Game Design

This section of the methodology will briefly summarize the contents of the Game Design Document. For more details, please see Appendix A.

Silva's methodology [18] on designing serious games will be used to help guide the design process as the researcher found it useful and practical. In his methodology, the first step is to define the learning outcomes. The learning outcomes are as follows:

1. Upon completing the game, students should understand why stress is useful for confronting problems and situations.

2. Upon completing the game, students should understand why stress is bad only if it becomes chronic or excessive.
3. Upon completing the game, students should be able to learn multiple self care practices as a means of managing and destressing themselves.
4. Upon completing the game, students should be able to learn how to develop their own work life balance between destressing and focusing on their academics.
5. Upon completing the game, students should be able to understand using S.A.D (sigarilyo, alak, droga) or any other drug substances are dangerous.

To achieve the objectives listed above, the researcher created a game called Stress Slayer. "Stress Slayer" is a 2D game where players control a character named Juan, a high schooler experiencing high levels of stress as the five-day long exam period of his high school begins. In this game, players must engage in a variety of self care practices found in the LIKE Module to reduce his ‘stress meter’ - a measure of how stressed Juan is as exam period progresses – prevent it fom being completely filled. All while learning how to balance his self care practices with the stress from preparing for the exam (or in other words, develop a work life balance to balance between studying for the exam and destressing from the exam).

3.3 Game Development

The game was built using the Unity Game Engine version 2022.3.9f1 with Android Support. Unity was chosen for its proven reliability in Android-based game development, strong community support, and numerous resources that could be used to guide the researcher in its development.

3.4 Deployment and Analysis

3.4.1 Research Design

This study will follow a pre-test, post-test research design. Quantitative data will be measured to gauge the participants' understanding of stress and stress management strategy using an educational test. Qualitative data will be gathered will be measured to assess how fun and engaging the user experience was while the participants play the game.

3.4.2 Participant Eligibility and Recruitment

Participants aged eighteen years old and above are eligible for this study. There are no other requirements aside from age, but ideally participants are those who have minimal background about stress and stress management. Participants will be selected through convenience sampling for ease of access.

The researcher will look for participants through email or social media sites such as Facebook and Messenger. These platforms will also be used to contact and invite them to partake in the study. When the researcher contacts a potential participant, he will share a short recruitment script containing details about what the study is about, why they are eligible to participate in the research study, what they will do if they choose to participate in the research study, and an invitation to participate. The script can be seen in Appendix B.

The researcher will look for participants by inviting them to participate in the study personally through email or social media sites such as Facebook and Messenger. These platforms will also be used to contact and invite them to partake the study. When the researcher contacts a potential participant, he will share a short recruitment script containing details about what the study is about, why they are eligible to participate in

the research study, what they will do if they choose to participate in the research study, and an invitation to participate. Please see Appendix B entitled Recruitment Material Script to see the script.

Should the participant respond, the researcher will schedule an onsite or online meeting with the participant and discuss the details of the study: what the study is about, why it is being conducted, what the participant will do in the study, and the data privacy and ethical guidelines of the study. The researcher will also provide the participant an informed consent form (physical copy if onsite, digital copy if online) and discuss it. Questions the participant may have will also be addressed here.

Once the details of the study and informed consent form has been discussed, the researcher will formally ask the participant to join the study. If the participant is willing, the researcher will ask them to sign the informed consent form. If meeting onsite, the researcher will ask the participants to sign two copies of the informed consent form: one for the researcher and the other for the participant. If meeting online, the researcher will ask the participant to digitally sign the form instead and send a copy to the researcher. If the participant is unable to digitally sign the form but is willing to participate in the study, the researcher will ask the participant to sign it before the experiment starts instead.

If the participant signs the consent form, the researcher and participant will schedule a convenient date for the study to take place.

3.4.3 Data Privacy and Ethical Guidelines

During this study, the following data privacy guidelines will be followed:

1. Participants will be given a copy of their informed consent form as a record that they have consented to partake in the study.

2. The participants will be made aware that their personal information will not be collected as the study does not require their personal data. Each participant instead will receive a unique numeric code to identify their data points in the dataset.
3. The participants will be made aware that they reserve the right to withdraw from the study for any reason. The data of the participant will be destroyed immediately after the request is made.
4. The participants will be made aware that they reserve the right to request to not include their data in the results of the study. The data of the participant will be destroyed immediately after the request is made.
5. The participants will be made aware that the data gathered in the study will not be shared with outside parties or used for any other purpose other than the study.
6. The participants will be made aware that once the study is completed, all their data will be destroyed.

Furthermore, it is expected that participants will face minimal risks of psychological and physical harm. That is, any harm or discomfort experienced by participants is not expected to surpass what is commonly encountered in everyday life or routine situations. The researcher will also ensure that the participants will be made aware of this by reiterating the information in the consent form.

3.4.4 Data Collection Instruments

Two data collections instruments will be used for this study:

First, a test will be administered to measure the participants' knowledge about stress and how to best manage stress. This quiz will be based on the educational content of the LIKE modules and will take the form of a multiple-choice questionnaire format. The same quiz will be used for both pre-test and post-test.

Second, the researcher will also administer GUESS-18 to survey how fun and engaging the game is, as well as the user experience in general. GUESS-18 is a brief but practical and comprehensive survey used by researchers to measure how satisfying a video game is [5]. However, two categories of assessment used in GUESS-18 - creative freedom and social connectivity – were removed as they have been deemed irrelevant to the game. The categories relevant to the assessment are Usability/Playability, Narratives, Play Engrossment, Enjoyment, Audio Aesthetics, Personal Gratification, and Visual Aesthetics. In addition, a short open-ended question asking for comments and feedback in the game was added after the survey itself.

Both test and GUESS-18 forms can be found in Appendices C and D respectively.

3.4.5 Research Procedure

The study will be conducted onsite at Room 206 Faura Hall, also known as the Ateneo Laboratory for the Learning Sciences, with researcher present to guide and assist the player. Sessions will be conducted one participant at a time. The study is expected to last only one hour or at least one hour.

Prior to the procedure, if the participant is willing to participate in the study but has not signed the consent form, the researcher will first ask the participant to sign it.

The procedure is as follows:

1. The researcher will ask the participant to answer the pre-test to assess their knowledge of stress and stress management prior to playing the game.
2. The researcher will then let the participant play the game for thirty to forty-five minutes.
3. Once the thirty to forty-five minutes are finished, the researcher will ask the participant to take pre-test again to assess what the participant learned while

playing the game. This will serve as the post-test. Once the post-test is complete, the researcher will ask the participant to answer the GUESS-18 survey to assess how fun and engaging the user-experience was.

4. Participants will be given an honorarium upon finishing the test and promptly dismissed.

3.4.6 Data Analysis

To analyze the pre-test and post-test scores, a combination of descriptive statistics and a paired t-test will be used. Basic descriptive statistics for both pre-test and post-test scores will be calculated separately including mean, median, standard deviation, minimum, and maximum values. A paired t-test will be employed if there are any significant changes between the pre-test and post-test score. The results here will be used to answer the second research question. The hypotheses for the paired t-test are as follows:

$H_0: \mu = 0$. That is, there is no difference between the pre-test and post-test scores.

$H_a: \mu > 0$. That is, the post-test scores are greater than pre-test scores.

The chosen significance level for this study is .10. This value was chosen arbitrarily.

As per the procedure laid down by Keebler (2020), the GUESS-18 forms of the participants are analyzed by averaging the scores of all questions in each subcategory, while the overall or composite score is obtained by summing the averaged scores together. The results here will be used to answer the first research question.

CHAPTER IV

RESULTS

Seven participants were successfully recruited for the study and underwent the procedure described in the methodology. The results of the pre-test and post-test are as follows:

Table 4.1 T-test Results

Participant ID	Pre-Test	Post-Test	Difference
1	7	8	1
2	5	7	2
3	8	8	0
4	9	9	0
5	7	9	2
6	7	7	0
7	9	10	1

The paired t-test was performed using the Data Analysis Tool Pack in Microsoft Excel. The degrees of freedom df was calculated to be 6, while the calculated one-tailed p-value is 0.02263. As mentioned before, the chosen significance level for this study is .10. This value was chosen arbitrarily.

The GUESS-18 scores of each participant are as follows. Note that the scores of each participant per category has already been averaged.

Table 4.2 Modified GUESS-18 Survey Results

Participant ID	Usability/Playability	Narratives	Play Engrossment	Enjoyment	Audio Aesthetics	Personal Gratification	Visual Aesthetics	Score
1	5	5	5	4.5	5	6.5	4	35
2	6	6.5	6.5	6	6.5	7	7	45.5
3	2	6	4	5	7	7	7	38
4	5.5	4	4.5	3	4.5	6	4	31.5
5	6	6	6	4	4.5	7	6.5	40
6	6.5	6	6	5.5	7	6	5	42
7	6	6	6	5	5	7	6	41

The max score of the GUESS-18 form is 49. The mean score of the GUESS-18 forms answered by the participants is 39, while the median is around 40.

CHAPTER V

CONCLUSION

5.1 Effectiveness of Educational Component

One of the questions of the study is *'How effective is the game in conveying its integrated educational content?'* This question was answered using a paired t-test. The effectiveness of the game is determined by the paired t-test. The hypotheses for the paired t-test are as follows:

$H_0: \mu = 0$. That is, there is no difference between the pre-test and post-test scores.

$H_a: \mu > 0$. That is, the post-test scores are greater than pre-test scores.

Since the tailed p-value is 0.02263 and is less than the significance level for this study is .10, the researcher rejects the null hypothesis and accepts the alternate hypothesis. Therefore, there is a significant statistical difference between the participants' understanding of stress before and after the game. This implies that the game is effective in conveying its educational content to the player. However, whether there is a practical significance remains questionable because of the low number of participants.

5.2 Elements of the Stress Education Integrated in the Game

One of the questions of the study is *'Which elements of the education content in the aforementioned modules can be integrated in the game?'* This question was answered during the development of the game.

As mentioned in the Scope and Limitations, only the educational content of the first two modules were included to minimize the technical difficulties of designing and building a game. Throughout the game's development, the modules were successfully integrated and transformed into workable game mechanics. Therefore, the educational

elements of the LIKE Modules 1 and 2 can be integrated in the game. However, the researcher noted two challenges during their implementation.

1. The second LIKE Module emphasizes that emotions – happiness, anger, sadness, fear, and disgust - play a role in the stress response. Accordingly, the game implements all the emotions except for disgust. However, because computer games are fundamentally quantitative and emotions are qualitative in nature, implementation was much more difficult than expected. The game was unable to properly express the full range of the potential emotional responses the character may have as the character experiences higher levels of stress.
2. Although the stress hormone cortisol can be quantified, stress itself is qualitative. And for the same reasons above, the game was unable to properly express the full stress responses the character may have as they experience higher levels of stress.

5.3 Effectiveness of Entertainment Component and User Experience

One of the questions of the study is '*How fun and engaging is the user experience?'*. The GUESS-18 surveys provide the answer to this question. The surveys report that the entertainment component and user experience is both fun and engaging. Although there have been issues noted in the open question section of the survey, no game breaking bugs were found. However, similar to the paired t-test, the lack of participants casts doubt whether or not the game will still be a fun and engaging experience for players outside the participants.

5.4 Recommendations

First, the main issue encountered was the lack of participants. Despite the best attempts of the researcher, this study was only able to gather seven participants to join in the study. The use of convenience sampling may have played a role in this, as the

method limited the researcher's pool of potential participants to those he can approach in-person or through social media. Sampling methods that can reach larger and broader audiences may prove useful in solving this problem. Incentives or honorariums that have more value to the participant than snacks may potentially be more appealing and thus draw more participants to join the study.

Second, the researcher recommends that any future game-based stress education studies be performed on a different target population. All participants were college students with an advanced educational background; thus, it is likely that they already have some knowledge about handling stress. It may be worthwhile to focus on younger and less-educated populations, as interventions may be more effective and useful for these.

Third, the researcher also recommends that if future studies plan to include emotions in their game, then it is worth investigating the use of affective computing. Affective computing is a field of computer science that focused on interpreting, processing, and simulating human emotions. Affective computing may be able to better capture the fulness of emotional responses in stressful situations.

Fourth, the researcher recommends that future game-based stress education studies to focus on one or two of the most common stressful situations experienced by most of the population to narrow down the scope of the game.

Finally, the researcher also recommends further study into the use of games for teaching stress and stress management, as this study has proven that the concept is potentially viable and worthwhile.

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APPENDIX A

GAME DESIGN DOCUMENT

This document specifies the design of the gameplay of Stress Slayer. The following sections will describe the necessary elements of the game such as gameplay mechanics, objectives, progression, features, visual and auditory elements, and development

A.1 Introduction

Core Game Genre and Summary

"Stress Slayer" is a 2D game where players control a character a high schooler experiencing high levels of stress at school. In this game, players must engage in a variety of self-care practices to reduce his stressnometer – a meter tracking how stressed Juan is – and prevent it from being filled.

Subject Matter and Learning Objectives

This game focuses on teaching players about stress and stress management. More specifically, this game attempts to achieve the following learning objectives are on Bloom's hierarchy:

1. Upon completing the game, players should **understand** why stress is useful for confronting problems and situations.
2. Upon completing the game, students should **understand** why stress is bad only if it becomes chronic or excessive.
3. Upon completing the game, students should **understand** why stress is useful for confronting problems and situations.

Throughout the document, references to these learning objectives may be made to highlight how each part of the game is relevant to achieving these objectives.

Other Design Considerations

This serious game will follow the serious game design methodology outlined in the research paper *Practical methodology for the design of educational serious games* by Silva. The study can be accessed for free through this link.

The game is meant to supplement the curriculum of the Lusog Isip Kabataan Education (LIKE), a mental health awareness program. More specifically, meant to supplement the first three video modules of the program. The video modules can be found here.

A.2 Specifications

Plot/Story

The player takes the role of a high school student who finds school to be stressful and tiring. Before the school begins on a Monday morning, his teacher notices how stressed he is and teaches him a technique to destress himself: deep breathing. The player then uses deep breathing to keep his stress levels controlled as the day progresses.

Once the day ends, his teacher teaches him the importance of self-care activities in reducing stress then encourages him to find ways to keep his stress level. Afterwards, the player is now given the task to survive the whole week managing his stress to prevent it from being excessive.

Other Design Considerations

The overall objective of the game is to survive the until Friday ends while ensuring the player's stress level does not completely fill up. The win/lose conditions are as follows:

1. **Win:** The player clears the fifth in-game day (Friday) while keeping his stress levels under control.
2. **Lose:** The player's stressnometer is completely filled up, which results in a game over. The player is then given a choice to repeat the game from the last checkpoint.

Gameplay Elements

Character and Stress Mechanic

The player starts out with an initial movement speed, base attack damage, and an initial number of ten (10) hearts/health points at the start of the game. However, base stats can be increased by partaking in a variety of levels in the Overworld Level.

The character also possess a statistic called the **stress meter**, which measures how much cortisol has in his bloodstream. Base attack damage and movement speed increases by increments of 25%, 50%, 75%, and 100% as the stress meter fills up (see Stress Mechanic), but number of health points cannot be increased by the stress meter. Details on how the stress meter mechanic can be found in the mechanic section.

Enemies

In keeping with the story/plot, the main theme of the combat levels are stressors in school. Hence, the combat levels and their unique challenges and boons are themed after common subjects thought in school. The main enemy is the Exam Question Grunt. It takes the form of a book armed with a sword. Meant to engage the player in melee combat.

Gameplay Progression

The game takes place over the course of five in-game days. In those five days, the player will often alternate between two types of levels: the overworld level and the combat levels. This system is like the system implemented in the game *Persona 5*, where the player can also partake in a variety of activities outside of normal gameplay for in-game bonuses and items.

Overworld Level

The overworld level is an explorable, interactive world accessible to the player in-between the combat levels of the game. The goal of the overworld level is two-fold: teach the player different self-care and relaxation activities they can undertake to reduce

their stress level while, if the player chooses to do so, teach them about the dangers of drug use to reduce stress and its effects. This aligns with objectives three and five stated above.

The overworld level provides the player access to a series of self-care activities taken from the LIKE video modules. The player is given nine in-game hours to participate in these activities, starting from 3pm (time the school ends classes ingame) to midnight. The player can also choose how much time he or she may spend in these activities, and the bonuses the player recieves scale depending on how much time he/she spends.

The player may partake in the following activities:

1. **Studying activity:** Juan can choose to prepare for the exam instead of engaging in self-care activities. Studying will reduce the difficulty of the next combat level.
2. **Work activity:** Juan can choose to spend some time working in his family's business in exchange for some extra cash, which he can spend on purchasing in-game boost items.
3. **Social bonding activity:** Listed as a stress buster in LIKE Video Module 2. Players can spend time with Juan's friends and engage with a variety of activities, resulting in a reduction in stress level. When the player spends enough time with his friends, he can also invite them to participate in some of the activities listed here to reap extra benefits. For example, the player can invite with his friends to also undertake the studying activity while also spending time with them; resulting in a reduction of stress and reduction in game difficulty.

4. **Basketball activity:** Listed to practice self-care in LIKE Video Module 1. The module notes that physical exercises can help reduce stress. Hence, players can spend their time engaging in Juan's favorite hobby, basketball.
5. **Book reading activity:** Listed to practice self-care in Module 1. Players can spend time in Juan's favorite activity book reading. According to LIKE, partaking in hobbies can help reduce stress and help the player engage in self-care. Partaking in this activity reduces stress, but also increases Attack damage.

In addition to these activites, the player is granted access to an in-game shop in the form of a grocery store. The player can buy there an item called ‘Fruits and Vegetables’, which reduces the stress level of the player.

There are also a variety of interactable items and NPCs in the world in which the player can interact with and potentially gain insight from.

Combat Levels

Combat levels are hack and slash style levels where the player must defeat all enemies.

Each level is divided into ‘rooms’, which has a set of enemies that the plyaer must defeat before proceeding to the next room. A level can have upwards of two or five rooms that needs to be cleared before the level ends. Each room contains a group of enemies that the player must clear before leaving the room. The difficulty of these levels depends on how much time was spent in the studying activity, though the stress meter can also provide bonuses to player stats to make each level easier.

Gameplay Mechanics

Two core mechanics exist during the Combat Level: stress tolerance meter and stress management via mindful breathing.

Stress Tolerance Meter

In real life, stressful situations release the hormone cortisol which gives the person a boost of energy and alertness to confront difficult situations. The more cortisol, the more energy a person has to face and resolve a situation. High levels of cortisol indicate a person is in a state of high alertness and are ready to work through a situation quickly. The opposite is also true: the less cortisol, the less energy a person has to face and resolve situations. However, excessive stress/cortisol can cause damage to health.

This game attempts to educate the player of these facts through the stress tolerance meter mechanic (learning objective 1 and 2). In-game, the player possesses a **stress tolerance meter** that represents how stressed the student is. The meter fills if (a) there are many enemies on the screen and (b) the player takes damage. Stress is reduced passively (when no enemies are on screen) or by practicing mindful breathing (discussed below).

Because stress gives more energy to a person in real life to handle stressful activities, the game will also provide the player bonuses to their base stats proportional to the level of stress. The stress tolerance meter are divided as follows into the following zones:

- **Green Zone:** The student is facing an enemy or group of enemies, but nothing too serious. This is the stress level the player is on at the start of the game. No bonuses are given.
- **Yellow Zone**: The student is facing an enemy or group of enemies that demand his attention. Movement speed, base attack, and base attack speed increased by 25%.

- **Orange Zone:** The student is facing an enemy or group of enemies that is more powerful than average. Movement speed, base attack, and base attack speed increased by 50%.
- **Red Zone:** The student is facing an enemy or group of enemies that are far more powerful than he is used to, or is overwhelmed by their numbers. Movement speed, base attack, and base attack speed increased by 75%.
- **Black Zone:** The student is in a state of extreme stress. Movement speed, base attack, and base attack speed increased by 100%. However, the player's health will take damage every five seconds because in real life extreme stress can harm a person's health. Health regeneration will be disabled during this time.

In game, stress is calculated with the following formula:

*stressChange = enemyCount * stressDelta * Time.deltaTime*

stressDelta is a constant float type with value 0.1 within the Unity Engine. This value was attained through trial and error to determine what the best value would be. deltaTime ensures that any increase or decrease in stress level is done in sync with the system clock and not with game framerate. In effect, it would mean that any change in stress level happens per second rather than per frame.

enemyCount refers to how many enemies are visible on screen. If enemyCount is zero, then the resulting calculated value of stressChange is negated.

Mindful Breathing

During lulls in combat, the player's stress levels usually are elevated and must come down. The Mindful Breathing mechanic reduces the stress level to more manageable levels, though it also reduces the bonuses the player has from having a higher stress level.

The mechanic is triggered by long-pressing a button (designated as RelaxButton in-game). When long-pressed, the breathing meter increases. The breathing meter represents how deep the player breathes. Once the button is released, the breathing meter drops but a reduction to the stress level will also be applied. The level of stress reduced is proportional to how high the meter was when it was reduced.

The stress reduction is calculated as follows:

```
stressReduced = -1 * breathLevel * 15
```

Where `breathLevel` represents how the level to the breathing meter is at the time the function was called. Fifteen was chosen through trial and error.

The change in the level of the breathing meter is flat - increasing and decreasing by `breathDelta`. `breathDelta` is a float constant with a value of 0.01 in the Unity Engine system. This value was chosen through trial and error. The level increases if the mechanic is triggered; otherwise, the level decreases.

Movement

The player can move left and right using the joystick. The joystick when pushed to its leftmost and or rightmost position will cause the player to sprint.

Level Design

Level design was based on a typical Filipino neighborhood and high school layout. Real life examples were used as a source of inspiration to help design and build the levels.

Combat

Combat between player and the enemy occurs in close quarters. Furthermore, the player's attack inflicts area of effect damage and harm multiple enemies simultaneously. The player's attack can also push enemies back to give them breathing space.

Damage inflicted is calculated by multiplying the base stat by the percentage of the current level of the stresnometer and adding it to the base attack. In a math equation,

Damage inflicted = Base attack + (base attack x percentage of the current level in the stress tolerance meter)

Control

Control of the player character is achieved by using a virtual joystick. The attack and interact with object button share the same button (bottom-right). However, the ability to attack is restricted to Combat Level while the ability to interact with objects is limited to the Overworld Level.

User Interface

Figure A1. Stress Slayer Main Menu

Figure A2. Stress Slayer Gameplay (Overworld Level)

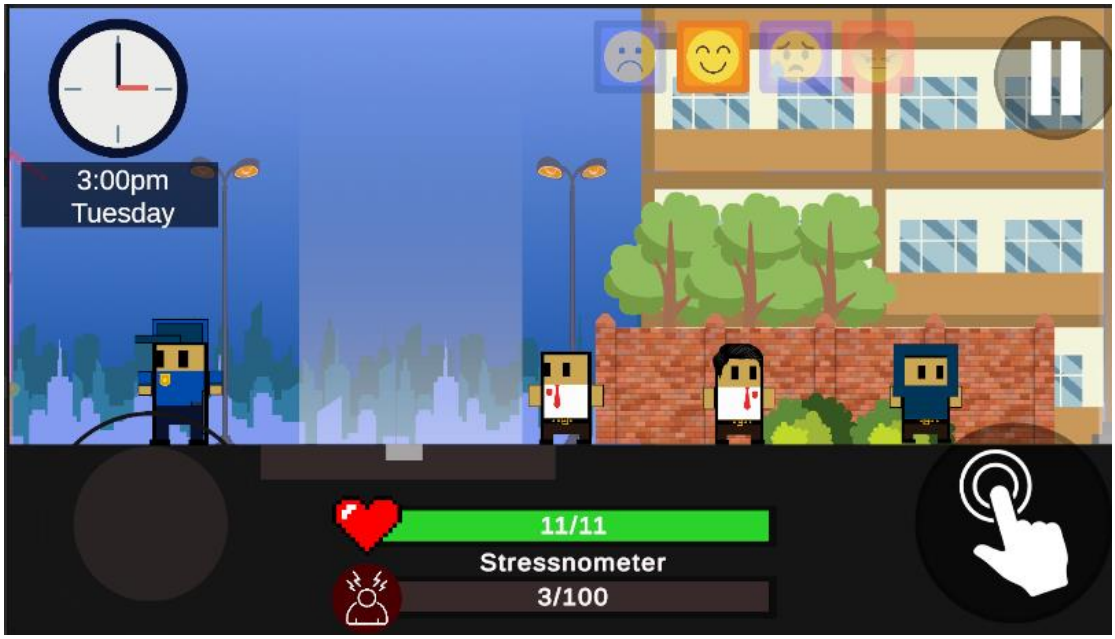

Figure A3. Stress Slayer Gameplay (Combat Level)

A.3 Aesthetics

Experience

The game aims to create a casual, relaxing and enjoyable gaming experience both to entertain and educate the player.

Theme Setting

The game is set in both a typical Filipino high school and a typical Filipino neighborhood to enculturate the game in the Philippine setting. The setting also helps the player connect their game experience to an environment they are familiar in.

Visual

All game visuals were created by the researcher, with theme and setting and intended game experience as a guide on what kind of visuals to develop.

The game visuals are made as simple as possible in accordance to Ravyse's conclusion that high levels of fidelity might distract players because it adds unnecessary cogntiive load to the player. Furthermore, bright and calming colors were used to help soothe the player into a relaxing and more enjoyable game experience.

Soundtrack

All sounds used in the game were not copyrighted and free to use, with the theme and intended game experience as a guide on what music to use. Music was used to help achieve the intended game experience. Credits are listed as follows:

The background music entitled ‘Meloyd of Nature’ in the Overworld Level was created by Zakhar Valaha and downloadable on Chosic.

The background music entitled ‘School’ played in the School subarea in the Overworld Level was created by Komiku and downloadable on Chosic.

The battle music entitled ‘Neon+On’ in the Combat Level was created by DSTechnician and downloadedable on Pixabay.

Foley/SFX

All foley/SFX used in the game were not copyrighted and free to use. These SFX are used to help make the game world feel ‘livelier’ while also serving as audio cues for different actions performed. Credits are listed as follows:

1. Button tapping sounds (entitled ‘Click’) are made by 66HeroHero and downloadable on Pixabay
2. Walking sounds made by Fesliyan Studios and downloadable on their website.
3. SFX for opening and closing doors in the world on Pixabay.
4. SFX for unable to interact with certain objects by Universfield on Pixabay.
5. SFX for ‘ka-ching’ sound by Modestas123123 on Pixabay.
6. SFX for pinging sound during tutorial by Pixabay.
7. SFX for taking damage by Pixabay.

A.4 Development

Software

The game will be developed on Unity 2022.3.9f1 with Android Support built in. The Universal Render Pipeline was used for rendering the graphics of the game.

Hardware

The game will be deployed on Android Phones with at least an Android API level of 10.

APPENDIX B

PARTICIPANT RECRUITMENT SCRIPT

Good day!

My name is Ray Rafael S. Abenido, a fourth-year BS Computer Science student working on his thesis. I am currently conducting a study entitled "Stress Slayer: A Game for Teaching Stress Management." This study looks into the possibility of using educational games for teaching players about stress and how to manage their stress.

I am messaging you about the possibility of participating in my research study because you are eligible in this study as you are eighteen (18) years old and above.

As a participant, you will be tasked to answer questions and play the game. The questions will not ask you for any sensitive personal information and are focused on how much you have learned while playing the game and your experience while playing the game. The time you will spend participating in this study should only last one hour or less than one hour

This is completely voluntary. You can choose to be in the study or not, and there will be no consequences. If you'd like to participate, reply to this email/message so that we can schedule a time for me to meet with you so I can discuss with you further about my research and address concerns you may have.

If you have more questions about this study, or if you need to contact me about participation, you may reply to this email/message.

Your immediate response is greatly appreciated.

Thank you!

APPENDIX C

GUESS-18 SURVEY

Game User Experience Satisfaction Scale-18

Participant ID Number: _____

Instructions: Based on your experience playing the game, please rate the following statements on a scale from "Strongly Disagree" to "Strongly Agree".

	Statements	Strongly Disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly Agree
1	I find the controls of the game to be straightforward.							
2	I find the game's interface to be easy to navigate.							
3	I enjoyed the game's story from the beginning.							
4	I enjoy the story provided by the game.							
5	I feel immersed while playing the game.							
6	I do not care to check events that happen in the real world during the game.							
7	I think the game is fun.							
8	I feel bored while playing the game.							
9	I enjoy the sound effects in the game							
10	I enjoy the game's audio feel the game's audio enhances my gaming experience.							
11	I am focused on my own performance while playing the game							

Game User Experience Satisfaction Scale-18

Participant ID Number: _____

Instructions: Based on your experience playing the game, please rate the following statements on a scale from "Strongly Disagree" to "Strongly Agree".

11	I want to do as well as possible during the game							
12	I think the game is visually appealing.							
13	I enjoy the game's graphics.							
14	I think the game is visually appealing							

Final Question: Do you want to add any more comments or feedback about the game? Please add them here. Feel free to leave it blank if you have none.

APPENDIX D

PRE-TEST AND POST-TEST

Knowledge Assessment (Pre-Test, Post-Test)
Participant ID Number: _____

Encircle the letter of the best answer in the following questions:

1. What chemical in our body has something do with stress?
   a) Adrenaline
   b) Serotonin
   c) Cortisol
   d) Dopamine
2. The following are the effects of stress on the body except:
   a) Stomach ache
   b) Acne
   c) Hair loss
   d) Increased immunity
3. The following are the effects of stress on our emotions except:
   a) Being stubborn
   b) Being sad
   c) Being anxious or restless
   d) Able to sleep peacefully
4. Which of the following are not one of the common emotions associated with stress?
   a) Anger
   b) Disgust
   c) Fear
   d) Calm
5. This is part of the 'Bilog ng Buhay' that has to do with our thoughts, feelings, and standards of action.
   a) Kakayanan
   b) Kalooban
   c) Kapwa
   d) Kabuluhan
6. What is the reframing strategy?
   a) Asking other people for advice?
   b) Avoiding stressful situations
   c) Getting a different perspective on a situation
   d) Giving meaning to evens that happened in your life
7. What is the emotional center of the brain?
   a) Limbic region
   b) Parietal lobe
   c) Occipital lobe
   d) Pre-frontal cortex
8. At what age is the brain fully developed?
   a) 18 years old
   b) 15 years old
   c) 21 years old
   d) 25 years old

Knowledge Assessment (Pre-Test, Post-Test)
Participant ID Number: _____

9. All of the following are stress busters except:
   a) Eating healthy food
   b) Having regular exercise
   c) Having enough sleep
   d) All of the above are stress busters
10. The following are all part of the 'Bilog ng Buhay' but:
   a) Kakayanan
   b) Kalooban
   c) All are part of the 'Bilog ng Buhay'
   d) Kabuluhan