

Influence of MOBA Game Skills to Perceived Cognitive Functions Among Students of Jose Maria College

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Abstract:

MOBA games have become the rage in today's society. This has become the most popular form of entertainment among younger generations. This tendency has caused researchers to focus on its effects on Perceived Cognitive Functions, particularly among Jose Maria College students. The study took place at Jose Maria College, 8000 Davao del Sur, Philippines-Japan Friendship Highway, Davao City. Fifty-four (54) MOBA gamers were chosen to take part in the interviews, which were conducted using survey questionnaires. This research focuses on Multiplayer Online Battle Arena (MOBA) Game Skills, as well as the knowledge and explanation of how MOBAs are currently integrated into Perceived Cognitive Functions. The purpose of this study was to look into the aspects and ideas of MOBA Game Skills and how they connect to Perceived Cognitive Functions. According to the findings, the respondents' mean level of MOBA Game Skills is 3.71, with a standard deviation of 1.081. This demonstrates that the respondents' MOBA Game Skills are quite high. The mean of the respondents' Level of Perceived Cognitive Functions is 4.10, with a standard deviation of .524. This demonstrates that respondents' Perceived Cognitive Functions are high. Students who played MOBA games had no influence on cognitive functions such as decision making, attention and concentration, or social skills, according to the research.

Keywords — Correlational Research, Moba Game Skills, Cognitive Functions, Davao City

I. INTRODUCTION

Background of the Study

Playing video games has become one of the most common entertainments all around world, especially since the introduction of MOBAs. (Multiplayer Online Battle Arena) games have been

the most popular video game genre in the world featuring elements of both cooperation and competition. Video games have been proposed as having the ability to improve cognitive function. Since a more balanced view of the relationship between video gaming and cognitive function is necessary to assess the possible consequences of

commercial video games, which more people have reported playing, this analysis leads to providing more reliable evidence for commercial video gaming. Games can improve human mental processing and can improve skills of individuals in different facets such as psychological, social, and cultural. The aim of video games is to entertain players, and they have been shown to be positively correlated with cognitive functions (e.g. attention, problem solving skills) [1]. Contrary to popular opinion that playing video games is intellectually lazy and sedating, it turns out that they foster a wide variety of cognitive abilities.

However, despite its positive outcomes, some studies have shown that video game participation can become problematic and is often linked to psychological distress and adverse consequences. Internet gaming disorder (IGD) was added to Section III of the DSM-5 in May 2013 as a disease that needs further study (American Psychiatric Association, 2013). This was the first time in psychological nomenclature that Internet gaming was officially recognized as a mental health condition [3]. The WHO claims that, Gaming disorder is classified as a "pattern of chronic or repetitive gaming activity" in which people lose control of their gaming behavior, prioritize gaming over other interests and activities, and continue gaming despite negative consequences such as impairments in family relationships, social lives, work schedules, and other areas [4].

MOBA Games

Multiplayer Online Battle Arena is a type of game in which the player controls a single character and competes against a team of other players. MOBA games have a lot of features that keep players interested and addicted to playing them. It is very common for MOBAs to involve: Players into groups of four or five to take on opposing teams, Action on a map with several "lanes" and an uncharted "jungle" between the bases of the two teams. The aim is to break through the enemy's defenses and destroy their foundation.

The gameplay in MOBAs is highly dynamic and complex, and players experience high levels of

excitement and competitiveness when playing compared to other games, according to research. One important explanation for the escalation of negative circumstances in MOBAs may be the practical impossibility of achieving the game's objectives [5].

Digital gaming has been shown to have an adverse influence on people's psychological, emotional, and physical health. Poor self-efficacy, low self-esteem, and impulsivity are all characteristics of digital game addiction [6]. Gaming has long been a part of humanity's culture and a necessary, useful, and daily practice. Games can develop children's mental abilities and hone individuals' skills in a variety of areas, including psychological, social, and cultural [7].

Cognitive Functions

Cognitive function is a general concept that encompasses mental processes such as knowledge acquisition, information manipulation, and reasoning. Perception, memory, learning, concentration, decision-making, and communication skills are all examples of cognitive functions.

Video gaming's ability to improve cognitive functions was restricted to tasks or performances that required the same cognitive functions. Furthermore, since many variables (such as age and gender) have been established as modulators of cognitive enhancement, individual differences in the relationship between video game playing and cognitive function have been discovered.

According to study, children and teenagers who play video games are more likely to have impulsive behaviour issues. Furthermore, playing video games can lead to a slew of other issues, particularly among gamers who engage in excessive or otherwise problematic behaviour, and especially among those who suffer from a video game addiction [8].

This research focuses on MOBA skills, as well as the perception and explanation of how MOBAs are actually incorporating cognitive functions. In this case, the aim of the research was

to look into the factors and principles of MOBA skills as they contribute to perceived cognitive function.

Gap Statement

The current study will use descriptive correlation analysis to fill a knowledge gap in previous research [9] by concentrating on the factors involved in MOBA Game Skills (e.g., Play Pattern, Game Knowledge, and Game Experience). Consequently, the objective of the research paper is to explore the associations between MOBA Game Skills to Perceived Cognitive Functions among a sample of highly involved MOBA Game players/students of Jose Maria College.

Rationale

The researchers will look into the impact of MOBA game skills on perceived cognitive functions, and they'll face a few obstacles along the way, the first of which is a lack of clear evidence on the subject [10]. The scientific field is much too vast and needs further study. One of the main goals is to find studies that focus on the use of MOBA Game Skills for Perceived Cognitive Functions and to analyze the results by contrasting them to previous research findings. The review analysis will be driven by six research questions.

Theoretical framework

This study is anchored in Skill Concept theory developed by Patrick Larkey (1997) for the MOBA Game Skills variable and Cognitive theory for the Perceived Cognitive Functions variable.

The Skill Concept

This theory indicates that in all types of games, players must take three important acts. First, they typically have a say in the games they play; there are usually far more games available than a player has the time, money, or resources to play. Second, once players have decided to play, they must devise a strategy for doing so. Third, after making the decision to play and devising a strategy, players must carry out their plan

Each of these three acts necessitates a distinct set of abilities: (a) Strategic Skill is the

ability to choose which games to play; (b) Planning Skill is the ability to devise tactics in response to specific opponents in a specific game. (c) The ability to carry out a well-planned strategy is known as execution skill. [11]. This theory holds that researchers will expect that the independent variable MOBA Game Skills to influence or explain the dependent variable Perceived Cognitive Functions seeing as this theory is essential to this research since it focuses on describing game concepts and skills.

Cognitive Theory

The Social Cognitive Theory (SCT) is a social learning theory aimed at predicting, understanding, and changing human actions. Behavioural adjustment is made possible by a sense of power, according to SCT. People who think they should take steps to address a problem instrumentally have the desire and commitment to do so. Human behaviour is thought to be influenced by a combination of personal, environmental, and behavioural factors, according to the SCT. The interplay of personal determinants such as attitudes and motivation is captured by the SCT theory. [12].

Conceptual Framework

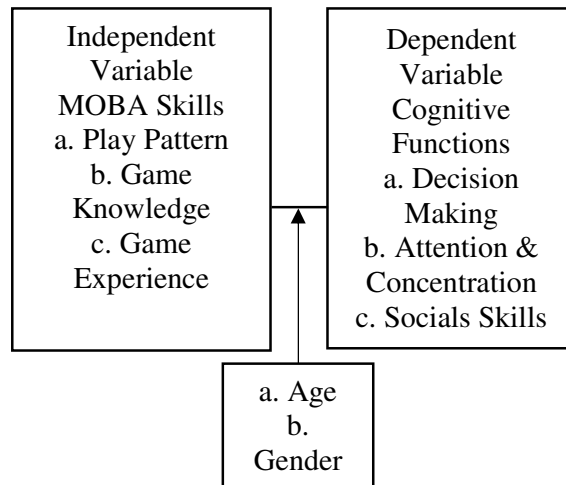


Fig. 1 Conceptual Framework

Research Questions

This study determines the relationship between strategy MOBA game skills and perceived cognitive functions among students of Jose Maria College. Specifically, this research seeks to answer the following questions:

RQ1. What is the demographic profile of the participants of the study in terms of:

- a. Age
- b. Gender
- c. Course

RQ2. What is the level of MOBA Game Skills in terms of:

- a. Play Pattern
- b. Game Knowledge
- c. Game Experience

RQ3. What is the level of Perceived Cognitive Functions in terms of:

- a. Decision Making
- b. Attention & Concentration
- c. Social Skills

RQ4. Is there a significant difference in the level of MOBA Game Skills according to:

- a. Age
- b. Gender
- c. Course

RQ5. Is there a significant difference in the level of Perceived Cognitive Functions according to:

- a. Age
- b. Gender
- c. Course

RQ6. Is there a significant relationship between the level of MOBA Game Skills and the level of Perceived Cognitive Functions?

Null Hypothesis

HO1. There is no significant difference in the level of MOBA Game Skills according to:

- a. Age
- b. Gender
- c. Course

HO2: There is no significant difference in the level of Perceived Cognitive Functions according to:

- a. Age

b. Gender

c. Course

HO3: There is no significant relationship between the level of MOBA Game Skills and the level of Perceived Cognitive Functions.

II. METHODOLOGY

Research Design

The research design for the methods and techniques in conducting the study. Descriptive research is a systematic method that entails watching and explaining a subject's actions without manipulating it in any way. This method is used by many scientific disciplines, especially social science and psychology, to get a broad overview of the topic [13]. Because of the design, researchers will concentrate on testing methods that are suitable for the subject matter and set up their studies for success.

On the other hand, Correlational research analysis is a non-experimental research approach in which a researcher tests two variables, understands and evaluates their statistical relationship, and does so without the use of any other variables. In this case, correlational analysis will be used by the researchers to assess the prevalence and relationships between variables, as well as to predict events based on current data and experience.

The researchers will use a descriptive correlation research design to look at the relationship between MOBA skills and perceived cognitive function. Also, the researchers will use descriptive correlation since they will investigate and examine two variables. These models are used to see whether changes in one or more variables are linked to changes in another variable [14].

Research Locale

The study will be conducted at Jose Maria College, Philippine-Japan Friendship Highway, Davao City, 8000 Davao del Sur. Where MOBA

gamers make up the majority of the students at the respective school.

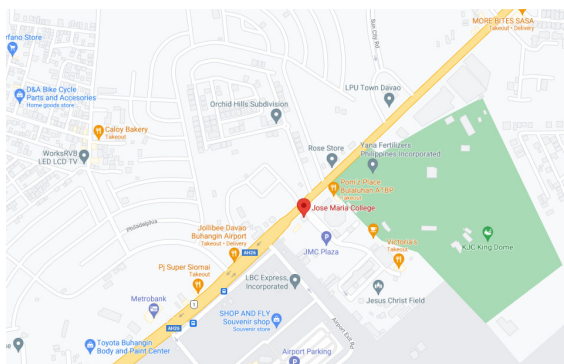


Figure 2. Jose Maria College, Philippine-Japan Friendship Highway, Davao City, 8000 Davao del Sur

Participants of the Study

The respondents of the study will be selected using a purposive sampling strategy in which it is used to select MOBA Game players from different courses of college students in Jose Maria College. All participants of the study will be chosen using a purposive sampling strategy regardless of their gender and age, which ranges from 18 and above.

Sampling Techniques

In this study, the researcher will select more than fifty (50) MOBA gamers. It is already fulfilling the standard minimum acceptable sample size for the correlational study. The minimum acceptable sample size for the correlational study is not less than 30.

The main reason why researchers use purposive quota sampling is that it helps them to survey a subgroup of people who are particularly relevant to the study.

Purposive sampling, also known as judgment sampling, entails the researcher using their knowledge to pick a sample that is most beneficial to the study's goals [15]. A purposive sample's main goal is to generate a sample that can

be assumed to be representative of the population. This is often achieved by using expert knowledge of the population to pick a sample of elements that reflects a cross-section of the population in a nonrandom manner [16].

Statistical Treatments

The following are the statistical methods that will be used in the study:

- The levels of MOBA Game Skills and Perceived Cognitive Functions will be determined using this weighted average.
- The T-test is a statistical study that compares the means of two populations. This will be used to see whether there is a substantial difference between MOBA Game Skills and Perceived Cognitive Functions when people are identified by their age, gender, socioeconomic status, and civil status. Also, this method will also be used to see whether MOBA Game Skills have a major impact on Perceived Cognitive Functions.
- ANOVA is a statistical analysis of variance. A method for assisting the researcher in determining whether the null hypothesis should be rejected or the alternative hypothesis accepted. This will also be used to see whether there is a substantial difference in MOBA Game Skills and Perceived Cognitive Functions when people are identified by their age, gender, socioeconomic status, and civil status.
- Pearson r it is widely regarded as the most accurate tool for determining the relationship between variables. This will be used to determine the degree to which MOBA Game Skills and Perceived Cognitive Functions are related.

Data Collection Procedure

For data collection, the researchers will use materials and tools, as well as online survey

questionnaires with the help of Google Forms. Online surveys have a number of benefits over other types of surveys. An online survey is a logical way to collect data from the target group by inviting them to participate in the research [17].

In order to conduct the analysis, the researcher will first obtain permission from the students of Jose Maria College Davao City participants and explain the research's objectives to them. Also, the researcher will advise the target people of the potential effects, providing them with a complete understanding of the costs and benefits of participating in this study. This will be achieved by informed consent. By assigning codenames to each respondent, the informed consent would cater to the security of the respondents' confidentiality. The researcher will distribute the questionnaires by sending a link to the survey questionnaire in Google Forms to the participants through Facebook Messenger after they agreed to participate in the study and sign the informed consent form. In addition, the data will be collected electronically and counted before being subjected to statistical analysis using suitable statistical methods.

Research Instrument

Questionnaires and assessments are the two most commonly used research tools in quantitative research studies [18]. In this case, the researcher will collect, measure, and analyse data from study participants using a questionnaire in the form of an online survey and test material (Google form). Online surveys have a number of advantages over other types of surveys, and survey functions are becoming increasingly common [19]. Also, Questionnaire for variable 1 is Researcher-Made Questions. For variable 2, questionnaire is revised and adopted from [20], [21] and [22]. Furthermore, researcher created a questionnaire with a series of questions to collect information from the respondent. This includes the following:

- Instrument validity and reliability: Validity refers to how well an instrument measures what it claims to measure. Validity and

reliability refer to the accuracy and precision of a survey/questionnaire, which are important aspects of study methodology [23].

- Items for the questionnaire: Each item on the questionnaire was linked to and designed to measure a particular aspect of the study's objectives, according to the researcher.

Ethical Considerations

The researchers will follow ethical scientific practices by providing informed consent. The goals of science, such as understanding and reality, are promoted by rules. Ethics principles promote values that are essential to collaborative work, such as trust, integrity, mutual respect, and fairness, since research also requires a great deal of cooperation and expertise among many different people from various disciplines and organizations [24]. One of the most critical aspects of research is ethical concerns, and dissertations that lack this component are likely to fail [25].

The following are the most essential ethical consideration criteria that researchers will dissert.

Prioritize respect for the integrity and privacy of study participants. This is to ensure that all participants will be aware of the research's intent and objectives before they begin. Participants have the option to decline their participation at any time without affecting their ability to participate in future programs or the current research.

Prior to the study, the participants' full consent will be sought. The researcher will make sure that everybody involved in the project is well-informed about the study's goals. They will be given written consent in order to obtain their approval.

Researchers will have access to all personally identifiable information. In addition, researchers will consider how reports will be arranged to ensure that individuals cannot be identified even though their names are not

mentioned. Damage may be psychological or physical, resulting in stress, discomfort, anxiety, lowered self-esteem, or breach of privacy. The researcher guarantees that participants will not be harmed in any way during the assessment process, whether intentionally or unintentionally.

III. RESULTS AND DISCUSSIONS

This section contains the analysis and interpretation of the data received from the participants' responses. The presentation of data are arranged in the following sequence: the demographic profile, the level of Strategy MOBA skills in terms of Play Pattern, Game Knowledge, Game Experience, the level of Perceived Cognitive Functions in terms of Decision Making, Attention & Concentration, Social Skills, test of significant difference in the level of MOBA Game Skills according to age, gender, test of significant difference in the level of Perceived Cognitive Functions according to age, gender, test of significant difference in the level of MOBA Game Skills and in the level of Perceived Cognitive Functions.

RQ1. What is the demographic profile of the participants of the study in terms of:

- a. Age
- b. Gender
- c. Course

Table 1. Results
Age Group

		Freque ncy	Perce nt	Valid Percent	Cumulati ve Percent
Valid	18-24	53	98.1	98.1	98.1
	25-35	1	1.9	1.9	100.0

		Freque ncy	Perce nt	Valid Percent	Cumulati ve Percent
Valid	Male	34	63.0	63.0	63.0
	Female	19	35.2	35.2	98.1
	Others	1	1.9	1.9	100.0
	Total	54	100.0	100.0	

Table I present the demographic characteristics of respondents. In this study, there were a total of 54 participants: 34 males and 19 females and 1 other. The highest percentage of the respondents belonged to 18 – 24 years old and most of the gamers are belong to BSIT department.

RQ2. What is the level of MOBA Game Skills is in terms of:

- a. Play Pattern
- b. Game Knowledge
- c. Game Experience

Table 2. Results

Table 2. Level of MOBA Game Skills, n=54

Indicators	\bar{x}	SD	Description
a. Play Pattern	3.57	1.045	HIGH
b. Game Knowledge	3.70	1.125	HIGH
c. Game Experience	3.85	1.074	HIGH
Overall	3.71	1.081	HIGH

Interpretation:

RANGE OF MEAN	DESCRIPTION INTERPRETATION
1.00 – 1.80	VERY LOW
1.81 – 2.60	LOW
2.61 – 3.40	MODERATE

		Course			
Val id		Freque ncy	Perce nt	Valid Percent	Cumulati ve Percent
	BSI T	21	38.9	38.9	38.9
	BSB A	2	3.7	3.7	42.6
	BSA	3	5.6	5.6	48.1
	BSE D	3	5.6	5.6	53.7
	BSC	11	20.4	20.4	74.1
	BSC E	5	9.3	9.3	83.3
	BSP	5	9.3	9.3	92.6
	BEE D	3	5.6	5.6	98.1
	BSS W	1	1.9	1.9	100.0
	Tota l	54	100.0	100.0	
3.41 – 4.20		HIGH			
4.21 – 5.00		VERY HIGH			

The mean of the level of MOBA Game Skills in terms of Play Pattern is 3.57 with a standard deviation of 1.045. This reveals that the level of MOBA Game Skills in terms of Play Pattern is high. Also, the mean of the level of MOBA Game Skills in terms of Game Knowledge is 3.70 with a standard deviation of 1.125. This indicates that the level of MOBA Game Skills in terms of Game Knowledge is high. In addition, the mean of the level of MOBA Game Skills in terms of Game Experience is 3.85 with a standard deviation of 1.074. This illustrates that the level of MOBA Game Skills in terms of Game Experience is also high. Overall, the mean of the level of

MOBA Game Skills of the respondents is 3.71 with a standard deviation of 1.081. This confirms that the level of MOBA Game Skills of the respondents is high.

The term "cognitive functions" refers to the mental processes involved in knowledge acquisition, information manipulation, and thinking. In terms of the respondent's Perceived Cognitive Functions about Decision Making, Attention & Concentration, and Social Skills, statistics show that the level of Perceived Cognitive Function of the gamers are highly affected with these three aspects with a computed means of 4.23, 3.99, and 4.09, respectively, as shown in Table 3.

- RQ3. What is the level of Perceived Cognitive Functions in terms of:
- Decision Making
 - Attention & Concentration
 - Socials Skills

Table 3. Results

Table 3. Level of Perceived Cognitive Functions, n=54.

Indicators	\bar{x}	SD	Description
a. Decision Making	4.23	.527	Very High
b. Attention & Concentration	3.99	.516	High
c. Socials Skills	4.09	.530	High
Overall	4.10	.524	High

The mean of the Level of Perceived Cognitive Functions in terms of Decision-Making is 4.23 with a standard deviation of .527. This means that Level of Perceived Cognitive Functions in terms of Decision Making is very high. Also, the mean of the Level of Perceived Cognitive Functions in terms of Attention & Concentration is 3.99 with a standard deviation of .516. This means that Level of Perceived Cognitive Functions in terms of Attention & Concentration is high. In addition, the

Test Variables (ANOVA)	Level	Mean	SD	F	Sign.	Decision
Age	18-24	3.70	1.01	0.33	0.857	Accept HO
	25-35	3.89	(n/a)			
Gender	Male	4.13	.642	16.076	.000	Reject HO
	Female	3.09	.1036			

mean of the Level of Perceived Cognitive Functions in terms of Social Skills is 4.09 with a standard deviation of .530. This means that Level of Perceived Cognitive Functions in terms of Social Skills is high. Overall, the mean of the Level of Perceived Cognitive Functions of the respondents is 4.10 with a standard deviation of .524. This confirms that Level of Perceived Cognitive Functions of respondents is high.

RQ4. Is there a significant difference in the level of MOBA Game Skills according to:

- a. Age
- b. Gender

The results of the survey, as shown in Table 4, reveal that the gamer's age has no impact on their MOBA Game Skills towards playing MOBA games. With a p-value of 0.857, the null hypothesis is accepted, and the alternative hypothesis rejected.

Table 4 also explains the result for HO2. It shows there is a significant difference on the level of Moba Game Skills when grouped according to gender with a p-value of .000. Hence, gender is a factor in the respondent's MOBA Game Skills towards playing MOBA games.

Table 4. Results

Table 4. Significant Difference on the level of MOBA Game Skills When Analysed According to Age and Gender.

Since, p-value $0.857 > 0.05$ then we do not reject the null hypothesis. There is no significant difference on the level of MOBA Game Skills when grouped according to Age Group.

Since, p-value $0.000 < 0.05$ then we reject the null hypothesis. There is a significant difference on the level of MOBA Game Skills when grouped according to Gender. However, post hoc tests are not performed for MOBA Game Skills because at least one group (others) has fewer than two cases.

RQ5. Is there a significant difference in the level of Perceived Cognitive Functions according to:

- a. Age
- b. Gender

The results of the survey, as shown in Table 5, reveal that the gamer's age has no impact on their cognitive functions towards playing MOBA games. With a p-value of 0.688, the null hypothesis is accepted, and the alternative hypothesis rejected.

In addition to this, table 5 explains the result for HO2. It shows there is no significant difference on the level of Perceived Cognitive Functions when grouped according to gender with a p-value of 0.383. Hence, gender is not a factor in the respondent's cognitive function towards playing MOBA games.

Table 5. Results

Table 5. Significant Difference on the level of Perceived Cognitive Functions When Analysed According to Age and Gender.

Since, p-value $0.857 > 0.05$ then we do not reject the null hypothesis. There is no significant difference on the level of Perceived Cognitive Functions when grouped according to Age Group.

Since, p-value $0.383 > 0.05$ then we do not reject the null hypothesis. There is no significant difference on the level of Perceived Cognitive Functions when grouped according to Gender.

RQ6. Is there a significant relationship between the level of MOBA Game Skills and the level of Perceived Cognitive Functions?

Table 6. Correlations between MOBA Game Skills and Perceived Cognitive Function. It also uncovers the correlation between the level of MOBA Game Skills and the level of Perceived Cognitive Functions.

Table 6. Results

Table 6. Correlations between MOBA Game Skills and Perceived Cognitive Function

Independent Variable	\bar{x}	SD	r-value	P-value
MOBA Game Skills	3.71	1.006	0.181	0.189
Perceived Cognitive Function	4.10	.4484		

The Pearson's r-value is 0.181 which means that there is a negligible positive relationship in the MOBA game skills and Perceived Cognitive Functions.

Since, p-value is $.189 > 0.05$, then we do not reject the null hypothesis. There is no significant relationship between MOBA Game Skills and Perceived Cognitive Function.

This study is related to [28] and [29]. According to the conclusions of the study, there are benefits of video game training on cognitive and emotional abilities in healthy adult populations, particularly in young adults. Commercial video games, as well as non-commercial video games and

Test Variables (ANOVA)	Level	Mean	SD	F	Sig.	Decision
Age	18-24	4.10	.452	0.163	0.688	Accept HO
	25-35	4.28	(n/a)			
Gender	Male	4.13	445	.977	.383	Accept HO
	Female	4.03	.454			
	Others	4.62	(n/a)			

commercial brain-training programs, have been shown to be effective. Somehow, the result of our study is opposite to the mentioned study it might be because it is limited only among of the students of Jose Maria College.

IV. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The goal of the study was to look into the components and concepts that go into MOBA Game Skills and how they connect to Perceived Cognitive Functions.

The following were the hypotheses proposed in this study:

The demographic profile of the study's respondents is the first research question. There were 54 people in total: 34 men, 19 women, and 1 other. The majority of respondents are between the ages of 18 and 25, and the majority of gamers are enrolled in a BSIT course. The second research issue concerns the level of MOBA game skills in terms of play pattern, game knowledge, and game experience, with a high level of strategy as the overall result. MOBA game skills indicate that respondents have a high level of MOBA game abilities. Furthermore, research question number 3 concerns the level of Perceived Cognitive Functions

in terms of Decision Making, Attention & Concentration, and Social Skills when playing MOBA games. The results suggest that respondents have a high level of perceived cognitive functions. The importance of MOBA Game Skills and Perceived Cognitive Functions in terms of moderating variables is investigated in research questions 4 and 5. (Age and gender). The majority of the findings demonstrated that the moderating variables had no effect on the two variables, although gender has no effect on MOBA Game Skills when it comes to playing MOBA games. For the sixth research question, the goal is to establish a link between strategy MOBA games and learning behaviour. According to the findings, there is no statistically significant difference between the values of two variables. In addition to this, findings shows that among Jose Maria College students, there is a Negligible Positive Relationship between MOBA Game Skills and Perceived Cognitive Functions. To conclude, the findings found that students who played MOBA games had no effect on cognitive functions including decision making, attention and concentration, or social skills.

RECOMMENDATIONS

Many online game genres, such as FPS, RTS, and ADVENTURE GAME, are fast growing in popularity, especially MOBA Games, in which players are eager to achieve their objectives through gameplay. Future researchers should undertake a study focusing on the tactics used by gamers to grind and then become top players in the globe by placing their names in relevant leaderboards, according to the academics.

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