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Student Name:	Millamena, Kian C. H.	Student Name:	Panlilio, Nicolei B.
University No:	3035712652	University No:	3035706031
Course Teacher:	Dr Wong Gary K. W.	Supervisor:	Dr Kwan Alvin C. M.
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Examining the Influence of Individual Game Preferences on University Students' Behaviours
in Hong Kong

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**Examining the Influence of Individual Game Preferences on University Students'
Behaviours in Hong Kong**

ABSTRACT

The video game industry has taken the entertainment world by storm over the last decades. Whether or not violent video games manifest aggressive behaviours in players remains a highly controversial topic. The positive and negative behavioural effects of video game playing raise serious debates in popular and scholarly literature. However, there have been limited studies assessing the influence of video game preferences on university students' behaviours in Hong Kong specifically. This study focuses on how video game genre preferences influence the behaviours of Hong Kong university students. Furthermore, the study highlights the motivational reasons contributing to video game playing in university students. The study also examines how video game elements affect individual video game genre preferences. Convenience sampling was adopted in this quantitative study. 100 Hong Kong undergraduate students from 7 major universities were invited to complete a questionnaire. Findings revealed gender differences in video game playing reasons. Females had similar reasons as males for playing video games, except for two, which were marketing and peer pressure. Common reasons were emotional satisfaction, engaging fantasy/imaginative play, socializing, and family influence, while the least common were escapism and looking for challenges. Next, the study found gender differences in video game genre preferences. Behavioural effects varied with clusters' video games preferences. Significant differences were seen in which males preferred more "violent" games than females.

and their preferred genres led to different positive and negative behaviours. There were more positive than negative behavioural effects experienced no matter which genres they preferred. Findings also suggested gender differences in video game element preferences. Similar grouping of preferences of elements resulted in three factors, i.e., "Mastery-Achievement", "Immersion-Creativity", and "Action-Social". Males were "Action-social" while females were "Mastery-Achievement" oriented. Both genders liked "Strategy" and "Challenging" elements. "Destruction" and "Community" were not as preferred, which aligned with the Motivation map. Findings contribute to current understanding of various reasons that motivate adolescents to play video games. This study also offers new insights into gender differences in preferences for video game elements. Findings are of great significance to future research on video game playing and their behavioural effects on players.

Keywords: Video games; Video game elements; Video game genres; Violent video games; Aggression; Positive behavioural effects; Negative behavioural effects

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CHAPTER 1.

INTRODUCTION

1.1 Background

Concept Definitions

The term “video game” can be defined formally as “a game which we play thanks to an audiovisual apparatus and which can be based on a story” (Esposito, 2015). One must understand the definition of “play” to grasp the concept of video game playing. “Even in its simplest forms on the animal level, play is more than a mere physiological phenomenon or a psychological reflex” (Huizinga, 1949). Huizinga suggests that “play” is the act of freedom and is neither “ordinary” nor “real” life.

Increasing Global Popularity

The number of active video gamers reached 2.81 billion globally. These numbers are predicted to exceed the 3-billion mark in the next two years (Clement, 2021b). The increasing popularity of video games has seen young adult gamers play, on average, up to 7 to 12 hours per week (Limelight Networks Inc., 2020). Clement (2021a) further mentioned that in 2020, the Asia Pacific gaming market surpassed 84 billion U.S. dollars in revenues. The gaming industry is experiencing rapid growth in recent decades. The top-ranked public companies include Tencent Holdings, Sony Computer Entertainment and Apple (Newzoo, 2020) based on game revenues. In January alone, Tencent generated 150 million U.S. dollars in mobile game revenues (Clement, 2021c).

Video Games & Genres

Video games enjoyed a growth spurt in popularity since the emergence of *Pong* - the first classic arcade game developed by Atari in the early 1970s (Wolf, 2008). Casual single-player games like *Candy Crush* are the most played video game genres worldwide today. Other genres include First-Person shooter (FPS) games, including *Call of Duty*, and Battle Royale (BR) games like *Fortnite*. These are followed by Multiplayer Online Battle Arena (MOBA) games like *League of Legends (LoL)*, and Massively Multiplayer Online Role-Playing (MMORPG) Games like *World of Warcraft (WoW)* (Limelight Networks Inc., 2020).

Video Game Elements & Platforms

Modern video games boast many game elements, including but not limited to destruction, excitement, community, challenge, strategy, completion, power, fantasy, story, design, and discovery (Quantic Foundry LLC., 2016). Technological advancements have led to new developments in gaming systems. Today, sophisticated systems include consoles, personal computers, and handheld devices. Gamers can play on various platforms, including PlayStation, Xbox, Windows, and smartphones.

Reasons Behind Video Game Playing

Before focusing on the behavioural effects of video game playing on players, it is important to look into their reasons behind playing. Gamers worldwide play video games for various reasons. According to von der Heiden et al. (2019), reasons range from developing online relationships in the virtual world to distracting oneself from everyday hassles. Moreover,

potentially problematic video game playing was associated with emotional coping, escapism, socialisation, and personal satisfaction.

Positive Behavioural Effects

Previous studies discussed how video game players' preferences for certain genres could influence behaviours. American Psychologist (2014) stated that video game playing benefits learning, health, and social interaction. Moreover, players' cognitive functioning were enhanced, i.e., spatial navigation, reasoning, memory, and perception. Surprisingly, these findings applied to violent video games like FPS games. Adolescents who played strategy games also had improved problem-solving skills and academic performances. Video games were also found to enhance players' physical health and psychological functioning. Results revealed that easy-access simple games like Angry Birds, improved player moods, promoted relaxation and eased anxiety (American Psychologist, 2014). Video games that required players to imitate athletes' movements in real life and perform vigorous activities were found to provide players with higher intensity workouts than outdoor play (Warnick, 2019).

Negative Behavioural Effects

Other studies discussed various harmful effects of video game playing on gamer behaviours. Online role-playing games caused internal behaviour issues like withdrawal and anxiety (Holtz & Appel, 2011). Another study found that gaming addiction may be related to internal behaviour problems in adolescents like misconduct and depression (Quwaider et al., 2019). Exposure to violent video game genres, according to conventional belief, may cause measurable effects on players' aggressive behaviours. Holtz & Appel (2011) further suggested

that FPS games may cause external behaviour issues like aggression in adolescent players.

Another study investigated the effects of playing violent video games compared to non-violent video games. Results indicated that child participants who played violent video games responded negatively to ambiguous questions compared to those who did not (Kirsh, 1998). Violent video games induce tendencies to misinterpret others' behaviours as hostile, even if they are not.

Recently, the term "gaming disorder" was added to the World Health Organization's International Classification of Diseases under the section "Disorders due to addictive behaviours" (World Health Organization, 2020). Gaming disorders occur when individuals have uncontrollable tendencies to play video games, to an extent that one starts to experience problems in their personal, family, social, educational, occupational lives.

1.2 Research Objectives

This research study aims to analyse and explore how video game preferences influence the behaviours of Hong Kong university students. Furthermore, the study attempts to identify the motivational reasons contributing to video game playing in university students. This study also examines how certain elements can affect video game preferences of university students. These research objectives will provide more insights into our study.

1.3 Research Significance

There is a significant number of studies concerning the effects of video games on children and adolescent behaviours. However, there is a paucity of studies that concentrate on behavioural effects on university students worldwide. Additionally, not many previous studies examine the influence of video game preferences on the behaviours of university students in

Hong Kong specifically. This research aims to prove or disprove the hypothesis that playing violent video games would affect players' aggressive behaviours.

1.4 Research Questions

Based on the above-mentioned research objectives, the following research questions are proposed for our study:

- I. Which are the elements affecting Hong Kong university students' individual preferences for video games?
- II. What are the various reasons that motivate Hong Kong university students to play video games?
- III. What behavioural impacts do Hong Kong university students experience when playing video games?

CHAPTER 2.

LITERATURE REVIEW

Video game playing reasons

The video game industry is showing no signs of slowing down. In recent decades, there is a worldwide interest concerning the influences of video game playing on behaviours. It is essential to assess the potential reasons why people play video games to understand the growing popularity of video game playing. One study showed that many adolescents are “avoiding real-life problems by engaging in media like TV and video games” (Li et al., 2011). The study explains that escapism is related to managing personal mood. This shows that video game

playing not only allows players to escape reality but also regulate moods and increase emotional satisfaction.

Online video games have become a new form of social medium which allows social interactions and relations (Kline & Arlidge, 2003). The study mentioned that gamers believe in the importance of socialising through joining a clan, seeing old friends playing, and making new friends. This implies that making social connections is one reason for playing video games. Furthermore, Ferguson & Olson (2013) state that young people play video games mainly because of social motives, catharsis motivations, and the search for challenges. Video games also involve the consumption of imagination and fantasy. Molesworth (2009) stated that escapism is highly linked to the desire of being in another environment. This was found to be especially true for imaginative and fantasy play.

Video game marketing campaigns, i.e., influencer marketing, gamer sponsorship and in-game marketing tactics, have been on the rise to maximise video game popularity (Bump, 2019). This shows that the video gaming industry holds great potential in attracting people into playing video games. Today, video game streaming is widely used as marketing strategies. Video game marketing campaigns make use of powerful marketing tools like streaming platforms. Such tools significantly impacted consumers' purchasing decisions of video games (Foster, 2016). Thus, video game developers benefit from streaming platforms like Twitch.

Increases in video game playing are associated with the emergence of factors like environmental and social norms. Individuals desire to relieve themselves from real-life problems and issues to gain emotional satisfaction from playing video games. Escapism and engagement in

imaginative and fantasy play are among the most common motivational factors for video game playing. Many video game players of today are in pursuit of challenging themselves and forging online virtual social connections.

Video game elements

Moreover, video game elements influence individuals' video game preferences. It is imperative to explore the many elements to understand the factors enhancing video game players' gaming experiences. The fantasy element can make video games captivating as they allow players to immerse themselves in a virtual environment (Malone, 1981). Video game designers also take into account video game elements like challenge and community to keep players motivated to play. Challenge and community refer to different levels of video games that require certain skills. They also include video games that allow socialization and collaboration with other people. De Waal (1990) stated that "the fantasy may be the hook to motivate the player but the interactivity and challenge are the line attached to the hook which keeps players engaged in a video game play". This indicates that the interaction and challenge elements in video games can affect individuals' video game preferences.

Furthermore, virtual game environments are attractive to players when they incorporate interesting plots. The storyline element was found to increase video game quality (López-Arcos et al., 2014). The study also mentioned that players' in-game progress can be tracked through video game storylines. Thus, having a narrative adds more depth to video games which increases player attachment. The customization element in video games also enhances the players' gaming experiences as they can experiment and customize characters in the virtual

world. Wise & Reeves (2007) stated that allowing players to customize character's appearances is a motivating factor to increase engagement with video games. The design element in video games is a significant factor that affects video game preferences. Customizing options increase as players level up, which cause players to play and complete more tasks to upgrade characters.

Rewarding and punishment features in video games, i.e., levelling up and earning points are essential in elevating playing experiences (Griffiths & Nuyens, 2017). The completion element allows players to upgrade and design characters which increases their power in-game. Next, destruction and excitement elements in video games have become more desired by video game players. There is a rising popularity of action games that involve destruction as they stimulate excitement and increase overall video game enjoyment (Hartmann & Vorderer, 2010). Besides, social competitions in games significantly affect video game preferences. The competition element allows interactivity and immersion which enhance overall entertainment experiences (Vorderer et al., 2003).

Video game genre preferences

Potential positive behavioural effects

Previous studies documented positive behavioural effects caused by video game playing. Contrary to popular belief, video game playing does not promote laziness. Instead, video game playing was observed to enhance cognitive functioning skills. Such cases were especially true for FPS games that contain violent elements like *Halo 4*. Players were found to display faster attention allocation of higher accuracy and enhanced spatial resolution in visual processing (Bavelier et al., 2011). Such cognitive enhancements were not achievable by playing puzzle or

role-playing games but rather by playing FPS games, as players faced unpredictable and fast-paced changes requiring split-second decisions.

Some studies suggested that video game playing was an excellent way for developing problem-solving skills. All genres, including those violent in nature, were found to enhance problem-solving skills and working memory. Complex puzzles and action sequences required memorisation and analytical skills (Prensky, 2012). Other studies also discussed comparable predictive associations. Adolescents who played role-playing games observed improvements in problem-solving skills, which were evident up to one year later (Adachi & Willoughby, 2013). They also claimed to attain better academic grades after playing strategic video games.

Video game playing was long associated with a range of emotional benefits. Among young children and adolescents, video games were found to be efficient tools to increase positive emotions. Previous studies reported causal relationships between playing video games and enhanced emotional states. Video games generated positive psychological changes and provided players with positive moods. Casual puzzle video games, i.e., *Angry Birds* and *Bejeweled II*, were found to improve moods, promote relaxation, and ease anxiety (Russoniello et al., 2009). Moreover, players' mental stress and depression levels decreased significantly.

Furthermore, Granic et al. (2014) mentioned that video game playing activates powerful positive emotional experiences. When playing video games, players regularly experience a phenomenon called "fiero". This Italian word implies the intense pride experienced by players after gaining success against great adversity. Another positive emotional experience is called "flow", which occurs when players are engaged in rewarding activities in-game. This

phenomenon was associated with positive behavioural effects in adolescents, i.e., reduced anxiety levels and higher self-esteem.

A range of social benefits has also been reported from video game playing. Video games that required cooperation enhanced collaboration among teammates. Ewoldsen et al. (2012) investigated the effects of playing cooperative violent video games. There was an increase in uses of "tit-for-tat" strategies when gamers played violent video games cooperatively. Strategies involved imitating opponents' behaviours by responding to cooperation with cooperation, and competition with competition. Granic et al. (2013) stated over 7 out of 10 players played cooperatively with friends and built relationships in virtual social communities. This is apparent in social networking games like *Farmville* and multiplayer fantasy games like *WoW*.

Video game players are often forced to plan and make informed decisions on whether to trust or reject other players. Moreover, players learn how to lead groups effectively in virtual worlds. Other studies reported that video game players learn social skills and develop prosocial behaviour (Gentile et al., 2009). Such effects were evident in peer and family relationships outside of gaming. Ferguson & Garza (2011) concluded that players who played cooperative violent games were more likely to display helpful behaviours in-game and in real life than those who played non-violent games. When played cooperatively, violent video games lowered player engagements in aggressive behaviours (Schmierbach, 2010). Similarly, another study found out that those who played violent video games in large groups had reduced hostility than when playing alone (Eastin, 2007).

Potential negative behavioural effects

The increasing popularity of video games drove concerns about negative behavioural effects of video game playing. Previous studies found associations between violent video game exposure and hostile behaviours that supported the GAM framework. Gentile et al. (2004) reported that adolescents had lower school grades and were highly likely to be involved in arguments and physical fights. Next, Internet gaming disorder (IGD) refers to pathological gaming. In previous studies, clinical distress and impairment in sleeping habits were associated with IGD (Altintas et al., 2019). Results indicated that over half the participants reported poor sleep quality, which demonstrated that problematic video game playing and sleep disturbance remains an issue facing youth. Higuchi et al. (2005) investigated the effects of video game addiction on sleep quality. Disturbances in sleep latency, slow-wave sleep, and REM sleep were labelled psychological symptoms of IGD.

Moreover, other studies analysed addictive behaviours associated with excessive video game playing. Today, *EverQuest* remains one of the most popular MMORPGs in the world. Chappell et al. (2006) found that current and former *EverQuest* players demonstrated symptoms of addiction, including salience, mood modification, conflict, and withdrawal. IGD entails psychological and mental distress symptoms, in depression, anxiety, and social phobia. One study observed these symptoms in youth who pathologically played video games (Mihara & Higuchi, 2017). Another study investigated relationships between social anxiety, loneliness, and interactive online gameplay. Despite feeling lonely, players preferred virtual worlds as they felt

safe. They believed they could avoid experiencing social anxiety and interpersonal problems by escaping the social world (Caplan, 2007).

Furthermore, Anderson et al. (2010) provided evidence that violent video game exposure led to decreased empathy and prosocial behaviour. Previous studies studied the effects of video games on interpersonal relationships and social anxiety levels (Lo et al., 2005). Results revealed that interpersonal relationship quality decreased, while the amount of social anxiety in heavy video game players increased when playing online. Previous studies demonstrated that low self-esteem resulted from problematic gaming of MOBAs. Among video game players who played *DOTA 2*, there was a positive association between escapism and self-esteem (Goh et al., 2019). Overall, players had low self-esteem and poorer psychological wellbeing post gameplay.

Aggression and hostility

Besides the adverse behavioural effects of video game playing, previous studies also examined various effects on aggression. Anderson et al. (2010) found strong evidence suggesting that violent video game playing significantly increases aggressive thoughts, behaviour, and hostility. Repeated encounters with in-game violence resulted in a lack of empathy and emotional desensitization to violence. Moreover, fast-paced and challenging games stimulated aggressive thoughts, e.g., increased frustration and anger.

Next, players often face raging situations in violent games, particularly multiplayer FPS games that result in problematic behaviour like violently disconnecting video game equipment - or "rage-quitting" (Behnke et al., 2021). After playing *Counter-Strike: Global Offensive (CS: GO)*, one player stated: "Sometimes I only want to teleport myself in the cheater room and

destroy his face in his computer". Similarly, another study found that participants who played violent video games were less willing to back out of a hypothetical fight and believed they would do better in a physical confrontation than those who played non-violent games (Denson et al., 2020). Next, Hasan et al. (2013) revealed that violent video games decreased cardiac coherence, which was inversely related to aggression. As violent video games stress people out, players tend to become irritated and aggressive.

Also of interest to researchers is the relationship between aggression and competitive playing. Adachi & Willoughby (2016) corroborated that competitive play increased aggressive affect in players. This was true for violent video games due to their competitive nature like *Mortal Kombat*. Furthermore, highly competitive violent and non-violent games produced more aggressive behaviour than less competitive ones. Next, Eastin (2007) examined that players displayed more hostility when verbalizing aggression during competitive playing. There was a bivariate relationship between in-game killing, verbal aggression, and state hostility.

Studies have also investigated cardiovascular changes associated with video game playing aggression like increased physiological arousal (Anderson, 2004). Players experienced increased heart rates, blood pressure, and respiration rates after playing video games containing direct combat or shooting, including *Mortal Kombat* and *Call of Duty* (Porter & Goolkasian, 2019). In contrast, players reported lower respiration rates and blood pressure after playing puzzle and fighting games, including *Bejeweled* and *LEGO: Marvel Superheroes*.

CHAPTER 3.

THEORETICAL FRAMEWORKS

3.1 Social Learning Theory Model (SLTM)

The Social Learning Theory Model (SLTM) will be adopted in our study (see Appendix A). The model addresses how environmental factors interact with personal factors to influence behaviour. Aggressive behaviour development occurs through observational learning and personal experience (Bandura, 1977). Our research study aims to identify various behavioural effects on university students caused by video game playing. SLTM helps to identify internal factors, e.g., cognitive influences, and external factors, e.g., environmental and social influence. Thus, SLTM would determine whether individuals acquire and imitate aggressive behaviours present in violent video games.

3.2 General Affective Aggression Model (GAM)

The General Aggression Model (GAM) will be adopted in our research study (see Appendix A). The model integrates existing theoretical models, e.g., SLTM. The model is a bio-social-cognitive, developmental approach that evaluates aggression by merging different aspects of various aggression theories (Rössler et al., 2017). GAM acknowledges interactions between individuals and the environment through inputs, routes and events. By affecting present internal states, input variables (i.e., affect, cognition, arousal) influence moods and encourage hostility. GAM is relevant as our study examines the potentialities that playing violent video games may induce aggression.

3.3 Gamer Motivation Model (GMM)

The Gamer Motivational Model (GMM) and Map of Gaming Motivations will be adopted in our research study (see Appendix A). GMM overviews video game elements and categorizes them into six detailed clusters (Quantic Foundry LLC., 2016). The clusters include Action, Social, Mastery, Achievement, Immersion and Creativity. Within each cluster, there are two associated video game elements. The model will provide insights into our study by distinguishing various reasons that motivate university students to play video games. Hence, GMM is appropriate as it helps identify correlations between video game element preferences and various behavioural effects caused by video game playing.

CHAPTER 4.

METHODOLOGY

4.1 Research Approach

Our research study adopts a quantitative analysis to understand the in-depth association between video games and the behavioural effects on video game players. The study includes various statistical techniques for statistical analysis. The collection and computation of quantifiable measures will then aid and be of great significance to our research findings. The quantitative data was obtained through online survey questionnaires, i.e., Google forms. Responses were filtered into subsets and raw data was manipulated using data wrangling.

Besides extracting primary data from the survey, the study will also collect secondary sources from academic journals and historical records. This will assist in the questionnaire

preparation phase and literature review. The secondary data will provide a better comprehension of the research and help identify areas requiring further analysis. The research study aims to analyze the impact of video games on university students' behaviours in Hong Kong. There is a research paucity that focuses on Hong Kong specifically. Thus, it is important to gather substantial data for higher analysis accuracy.

4.2 Research Design & Procedure

The research adopted a convenience sampling method to reach out to target participants. Since it was time-sensitive research, convenience sampling was the most efficient and direct way to achieve a larger sample size. A consent form was provided to the participants before taking the questionnaire (see Appendix B). Participants were informed about their right to withdraw at any time without negative consequences. The forms indicated that private information collected will be treated with confidentiality and used for research purposes only. Responses were recorded using Google Forms, which was distributed via a link to target participants. Upon completion of the questionnaire, respondents were invited to share the survey with others who they deemed to be relevant for the study.

The sampling size of our research study was $N = 100$ undergraduate university students in Hong Kong. Participants were between the ages of 18 to 25 (Mean age = 20.84 years, SD = 1.22; 55 males, 45 females). The questionnaire consisted of various types of questions essential for statistical analysis. The collected data was then further analyzed by using Rstudio software. Our study adopted three data analysis techniques - cluster analysis, factor analysis, and

multidimensional scaling (MDS). These techniques will interpret and evaluate relationships between different variables that concern video game playing.

4.3 Apparatus & Instruments

Our research study uses online survey software Google forms (see Appendix C) to collect data from participants. The following questionnaire sections are designed for the implementation of various statistical methods.

Demographics

The questionnaire adopts a combination of demographic-related factors. Participants were asked for their age, gender, study year, home faculty, host university, playing history and playing frequency. This questionnaire section makes use of multiple-choice and text-entry question types.

Video game playing reasons

Participants were asked to rate various environmental and social factors that influence video game playing based on likelihood. Participants were provided with eight different items to select from for preference measurement. This questionnaire section makes use of a five-level Likert Scale question type. All items were scaled from 1 = “least likely” to 5 = “most likely”.

Video game genre preferences

Participants were requested to rank various video game genres based on preferences.

Participants were provided with ten different items to select from for preference measurement.

This questionnaire section contains a five-level Likert Scale question type. All items were scaled from 1 = “least favourite” to 5 = “most favourite”.

Potential positive behavioural effects

Participants were asked whether they often experienced any positive behavioural effects when playing video games. Participants were provided with seven different items related to cognitive functioning and another seven related to social and psychological functioning. This questionnaire section contains multiple-choice question types (Yes or No).

Potential negative behavioural effects

Participants were again asked whether they often experienced any negative behavioural effects when playing video games. Participants were given seven different items related to cognitive, social and psychological functioning and another seven related to aggression and hostility. This questionnaire section contains multiple-choice question types (Yes or No).

Video game element preferences (a)

Participants were requested to rate various video game elements based on preferences.

Participants were provided with twelve different items to select from for preference measurement. This questionnaire section contains a five-level Likert Scale question type. All items were scaled from 1 = “least enjoyable” to 5 = “most enjoyable”.

Video game element preferences (b)

Again, participants were requested to rank their favourite video game elements based on preferences. This time, participants were asked to enter a number to rate the twelve items for preference measurement. This questionnaire section contains text entry question types. All items were scaled from 12 = “most favourite” to 1 = “most favourite”.

4.4 Data Analysis

Our research study uses RStudio for statistical analysis of results and generating graphics.

Hierarchical cluster analysis

Participants were asked to rate video game playing reasons and genres based on preferences. Our research study adopts hierarchical clustering. Participants were categorized into different clusters based on their data. First, Ward’s method was applied to examine clustering history. Next, a dendrogram was used to visualize hierarchical relationships between variables, recommend cluster solutions, and display group means of standardized values. Profiles of mean values were plotted to investigate the clusters and draw deductions. By relating results to the profile plot, we could visualise how clustering is related to demographic variables. Thus, we could see whether certain genres cause particular behavioural effects by adopting cluster analysis.

Factor analysis

Factor analysis was adopted to find insights on student’s preferences of video game elements. Hidden correlations amongst preferences could be figured out. First, a scree plot was

plotted based on the twelve dimensions to visualize the number of factors. Once the factor solution was assumed, factor analysis was conducted. Varimax rotation was employed to clarify relationships among the different factors. Different factors were labelled based on observations. Then, a dendrogram was used to highlight relationships between variables. Next, a profile plot that separates the participants into groups based on genre preferences was plotted. Lastly, we could visualise how the preference of attributes is related to demographic variables.

Multidimensional scaling (MDS)

Factor analysis is a method used for variable interrelation analysis. However, MDS was used to provide visual representations that further show the nature of variable relationships. The relationships between the twelve variables were visualized in a visual map. The variables showed up closer in the visual map if they were highly correlated.

CHAPTER 5.

FINDINGS AND RESULTS

5.1 Video Game Playing Reasons

To investigate respondents' video game playing reasons, we conducted cluster analysis on collected data. We defined similarity measures and classified respondents into clusters, which would be further interpreted.

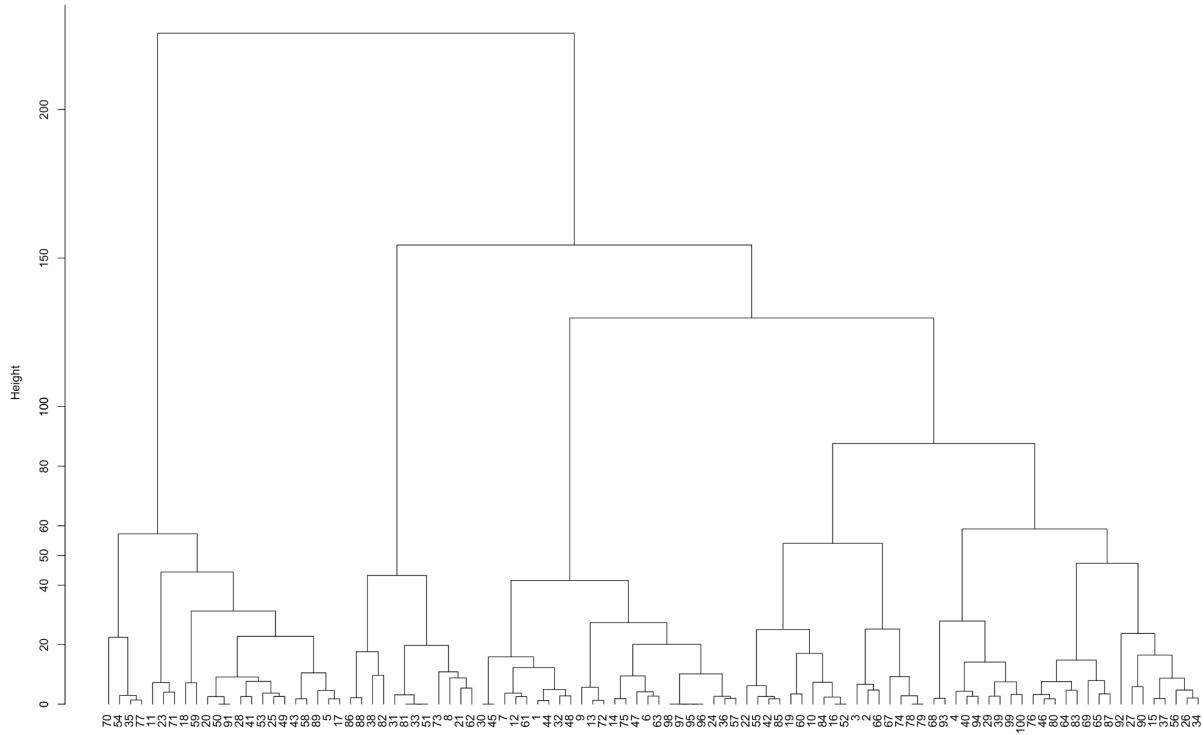


Fig. 1 Dendrogram

Data observations were first standardized. To facilitate analysis, Squared Euclidean Distances were calculated as a measure of “closeness” or “similarity”:

$$d(\mathbf{x}, \mathbf{y}) = \sum_{i=1}^p (x_i - y_i)^2$$

Ward's method was selected to define Sum Of Squares for hierarchical cluster analysis.

The distance matrix is as follows:

$$d_{(UV)W} = \frac{(N_W + N_U)d_{UW} + (N_W + N_V)d_{VW} - N_W d_{UV}}{N_U + N_V + N_W}$$

Regarding the above 2-dimensional dendrogram, merge distances between clusters were displayed on the y-axis which suggested a 5-cluster solution.

	tb	ptb
1	24	0.24
2	17	0.17
3	25	0.25
4	22	0.22
5	12	0.12

Fig. 2 Cluster means

Cluster means were displayed to investigate cluster sizes. Clusters 1 and 2 had 24 and 17 respondents. Cluster 3 had 25 respondents - the largest out of all clusters, cluster 4 had 22 respondents, while cluster 5 had the lowest number (12) of respondents.

cluster	Challenge	Emotion	PPressure	Family	Escapism	Socialise	Engagement	Marketing
1	1	0.168	0.81	-0.62	-0.18	0.5637	-0.34	0.665
2	2	0.051	0.33	0.63	-0.42	-0.3649	-0.26	-0.966
3	3	0.625	-0.23	0.46	-0.37	0.0081	0.71	0.562
4	4	-0.792	-0.98	-0.64	-0.25	-0.6496	-0.64	-0.634
5	5	-0.260	0.18	0.56	2.18	0.5637	0.75	0.029

Fig. 3 Group mean of standardized values

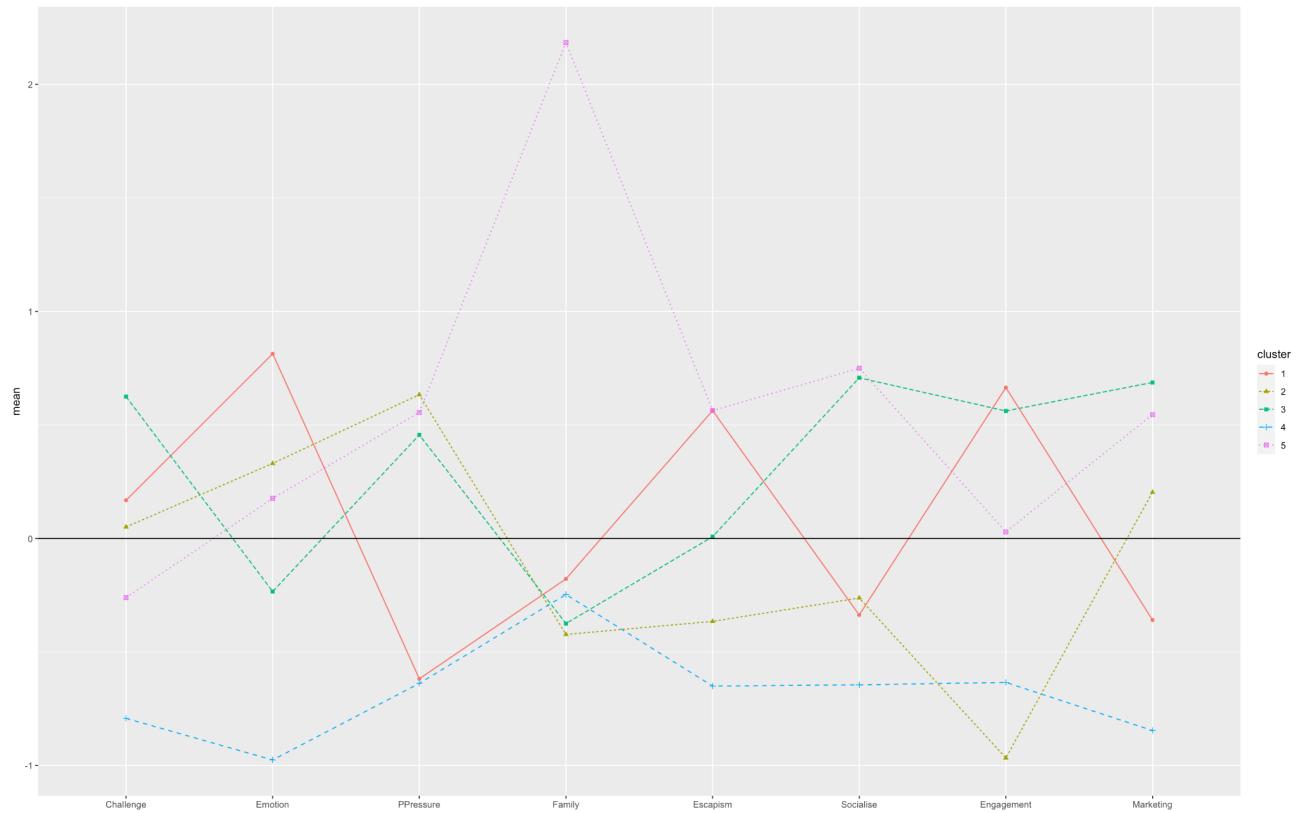


Fig. 4 Profile plot

To investigate similarities in respondents' video game playing reasons, the group mean of standardized values for the 5-cluster solution were displayed. Negative values indicated a lower importance value. The top reasons for video game playing of respondents in cluster 1 were “*Emotion*” and “*Engagement*” at 0.81 and 0.665. These individuals craved emotional satisfaction, followed by a desire to engage in imaginative and fantasy play. Meanwhile, those in cluster 2 play due to “*PPressure*” and “*Emotion*” at 0.63 and 0.33. They played due to peer pressure and craved emotional satisfaction. Respondents in cluster 3 considered “*Socialize*” (0.71) and “*Marketing*” (0.69) as the most important reasons to play video games. Participants played to make online social connections and were swayed by video game marketing campaigns.

Next, participants in cluster 4 did not consider given reasons as main priorities for video game playing. However, their preferences were “*Family*” and “*Engagement*” at -0.25 and -0.634. Family influence and engaging in imaginative and fantasy play were their primary reasons for video game playing. Those in cluster 5 rated “*Family*” and “*Socialize*” as their most preferred reasons for playing. “*Family*” had a high value of 2.18, while “*Socialize*” was at 0.75. Family influence was their most important reason and making online social connections came close. The above profile plot provides a visual representation of group mean standardised values. Based on results, clusters 1 to 5 were labelled “Emotional satisfaction-oriented”, “Peer pressure-oriented”, “Social connection-oriented”, and “Family-oriented” respectively.

Demographic information:

	cluster	x
1	1	21.25000
2	2	20.70588
3	3	20.60000
4	4	20.40909
5	5	21.50000

Fig. 5 Mean age

From the above, respondents' mean age in clusters 1 and 5 were highest in comparison to others (> 21 years). Meanwhile, respondents in clusters 2, 3 and 4 had a mean age of 20 years.

cluster	Female	Male
1	0.54166667	0.45833333
2	0.47058824	0.52941176
3	0.28000000	0.72000000
4	0.27272727	0.72727273
5	0.91666667	0.08333333

Fig. 6 Gender

Male and female respondents in clusters 1 and 2 consisted of similar numbers. Females (54%) slightly edged out males in cluster 1, while males (53%) slightly edged out females in cluster 2. Participants in clusters 3 and 4 were males-dominated (72%). An overwhelming 92% of respondents in cluster 5 were female.

5.2 Video Game Genre Preferences

Hierarchical clustering was again conducted on respondents' data concerning video game genre preferences. Similarity measures were defined and participants were categorized into clusters.

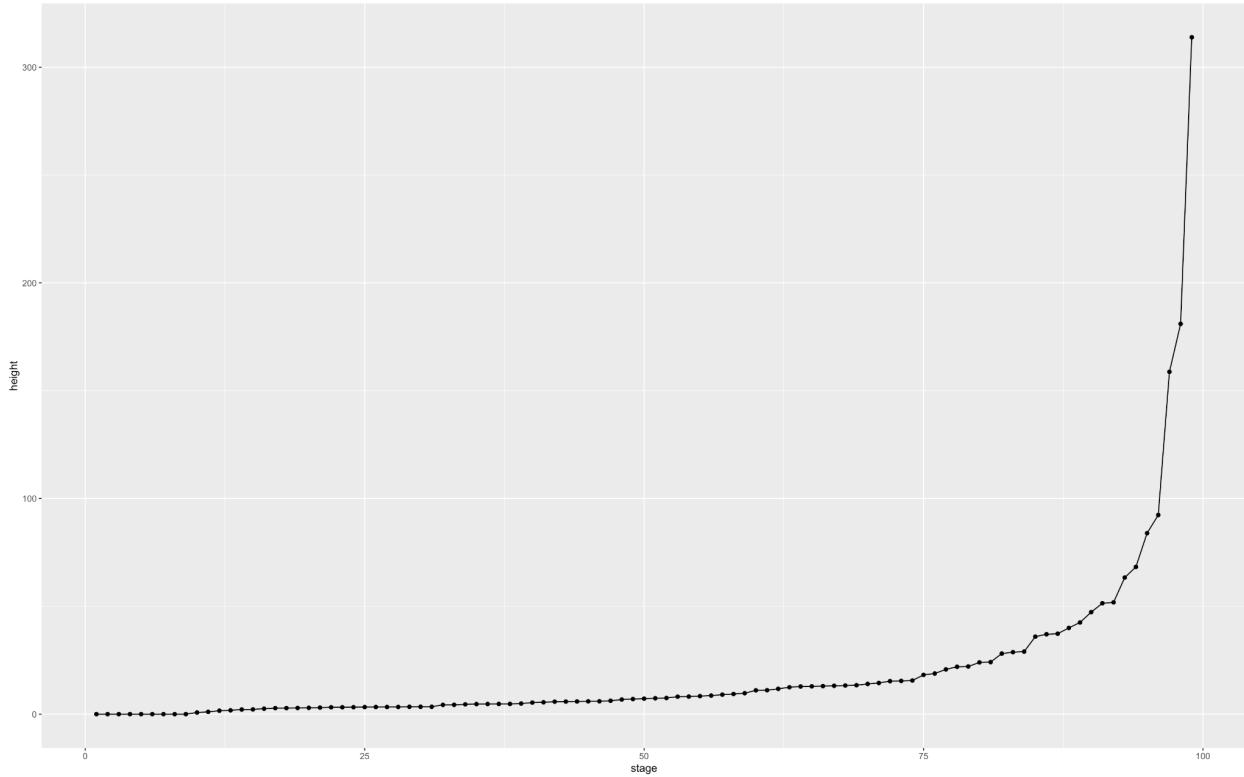


Fig. 7 Distance plot

The “elbow” method is used to find out the number of clusters for k-means clustering - an ML algorithm that categorizes data into a specified number of clusters. By looking at the point where the curve experiences a sharp increase, we can see a jump from the 4 to the 3-cluster solution. Hence, we concluded the number of clusters is 4.

	tb	ptb
1	44	0.44
2	28	0.28
3	11	0.11
4	17	0.17

Fig. 8 Cluster means

Cluster means were displayed to reveal the cluster sizes. Cluster 1 had the highest number of respondents at 44, followed by cluster 2 at 28. Cluster 3 had the lowest out of the clusters at 11, while cluster 4 had 17 respondents.

cluster	MMORPG	MOBA	FPS	BR	Fighting	FE	Strategy	Sports	Adventure	Racing
1	1	0.23	0.037	-0.043	-0.182	-0.036	-0.025	0.259	0.014	0.39 -0.273
2	2	0.45	0.657	0.841	1.010	0.786	-0.071	0.059	0.753	-0.12 0.679
3	3	-0.67	-0.422	0.011	0.015	-0.527	-0.733	-1.553	-1.053	-1.57 -0.777
4	4	-0.92	-0.906	-1.282	-1.202	-0.861	0.655	0.236	-0.595	0.21 0.091

Fig. 9 Group mean of standardized values

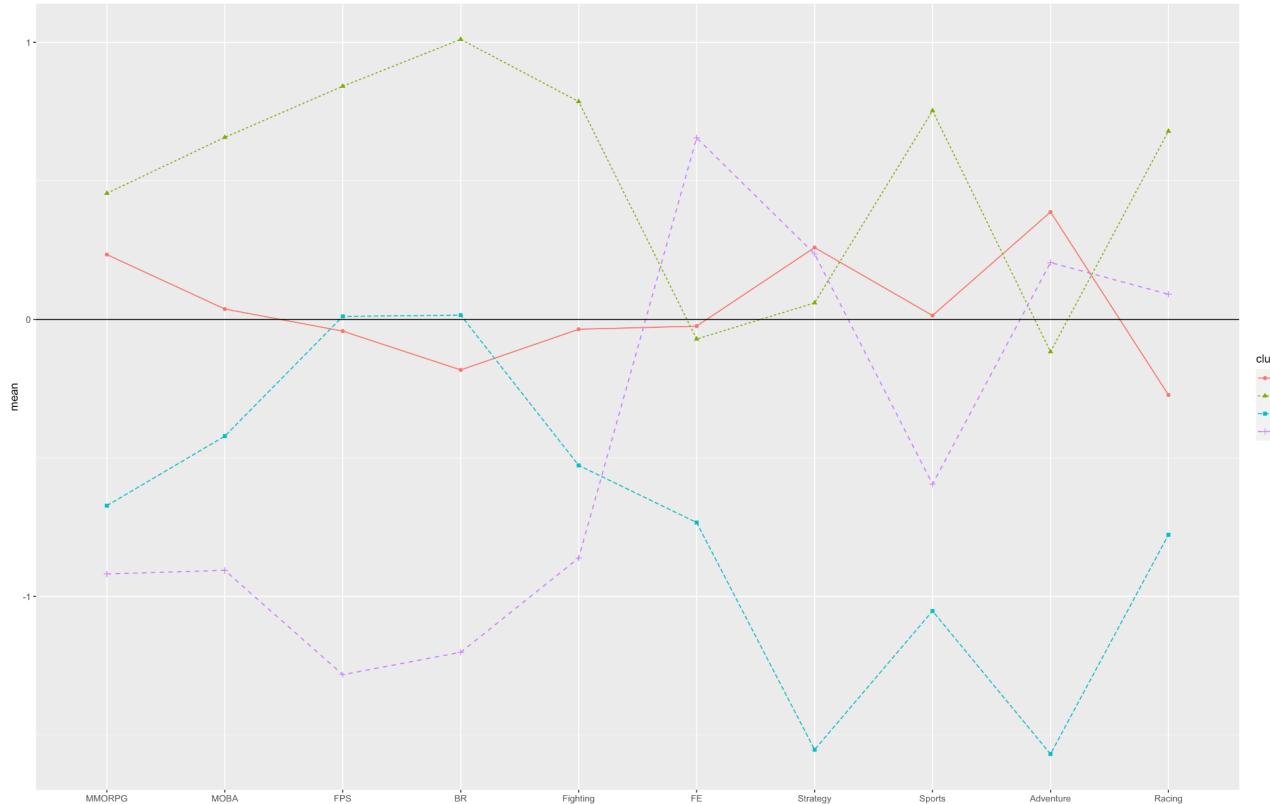


Fig. 10 Profile plot

Once more, the group mean of standardized values for the 4-cluster solution was displayed to explore similarities in respondents' preferred genres. The genres respondents in

cluster 1 preferred were “*Adventure*”, “*Strategy*” and “*MMORPG*” at 0.39, 0.259 and 0.23. These individuals preferred to explore in-game and enjoyed video game online social communities. Cluster 2 had highest values in “*BR*”, “*FPS*”, and “*Fighting*” genres at 1.01, 0.841 and 0.786. They disliked the “*FE*” (-0.071) and “*Adventure*” (-0.12) genres. Similarly, respondents in cluster 3 had high preferences for “*FPS*”, “*BR*” as well. These individuals disliked all genres, especially “*Strategy*” and “*Adventure*” video game genres at -1.553 and -1.57, opposite to respondents in cluster 1. Meanwhile, respondents in cluster 4 ranked “*FE*” (0.655), “*Strategy*” (0.236), and “*Adventure*” (0.21) genres the highest. Meanwhile, “*FPS*” and “*BR*” genres had extremely low values, which was similar to cluster 1 and opposite to respondents in clusters 2 and 3.

Demographic information:

	cluster	x
1	1	20.88636
2	2	20.60714
3	3	20.54545
4	4	21.29412

Fig. 11 Mean age

The above results indicate that respondents in clusters 1, 2, and 3 had a mean age of around 20 years. Meanwhile, respondents' mean age in cluster 4 was highest relative to other clusters (> 21 years).

Gender

cluster	Female	Male
1	0.5227273	0.4772727
2	0.2142857	0.7857143
3	0.4545455	0.5454545
4	0.6470588	0.3529412

Fig. 12 Gender

Respondents in clusters 1 and 3 consisted of similar numbers for both genders. Females (52%) slightly edged out males in cluster 1, while males (54%) slightly edged out females in cluster 3. Participants in cluster 2 were male-dominated (78%), while more participants in cluster 4 were females (64%).

5.2.1 Positive behavioural effects

Cognitive Functioning

<u>Enhanced Concentration</u>		<u>Enhanced Hand-eye Coordination</u>		<u>Enhanced Working Memory</u>		<u>Enhanced Spatial Navigation</u>	
cluster	0	1	cluster	0	1	cluster	0
1	0.06818182	0.93181818	1	0.06818182	0.93181818	1	0.1590909
2	0.03571429	0.96428571	2	0.00000000	1.00000000	2	0.2142857
3	0.18181818	0.81818182	3	0.00000000	1.00000000	3	0.2727273
4	0.11764706	0.88235294	4	0.17647059	0.82352941	4	0.2352941
							0.8409091
							1 0.1590909 0.8409091
							2 0.2500000 0.7500000
							3 0.2727273 0.7272727
							4 0.1176471 0.8823529

<u>Increased Processing Speed (Reaction Time)</u>		<u>Improved Problem-Solving</u>		<u>Higher Levels of Logical Thinking</u>	
cluster	0	1	cluster	0	1
1	0.02272727	0.97727273	1	0.1136364	0.8863636
2	0.03571429	0.96428571	2	0.1785714	0.8214286
3	0.09090909	0.90909091	3	0.3636364	0.6363636
4	0.17647059	0.82352941	4	0.2352941	0.7647059
					1 0.2272727 0.7727273
					2 0.2500000 0.7500000
					3 0.4545455 0.5454545
					4 0.1764706 0.8235294

Fig. 13 Cognitive functioning (cluster means)

All clusters agreed on experiencing improvements in cognitive functioning after video game playing. For “*Enhanced Concentration*”, all clusters had a significant percentage of respondents who replied “yes”, with cluster 1-4 at 93%, 96%, 82% and 88%. “*Enhanced Hand-eye Coordination*” and “*Increased Processing Speed (Reaction Time)*” had equally high percentages. 93%, 100%, 100%, and 82% of respondents in clusters 1-4 said “yes” for “*Enhanced Hand-eye Coordination*”, while 97%, 96%, 90% and 82% said “yes” for the latter. All clusters also had high percentages who responded with “yes” to “*Enhanced Working Memory*”, “*Enhanced Spatial Navigation*”, and “*Improved Problem-Solving*” (60% - 90%). For “*Higher Level of Logical Thinking*”, a high percentage of 75%-82% of respondents in clusters 1, 2 and 4 replied “yes”. However, for cluster 3, responses were nearly equal, with those who responded with “yes” at 55% and “no” at 45%.

Social & Psychological Functioning

<u><i>Enhanced Emotional Awareness</i></u>		<u><i>Improved Relationships</i></u>		<u><i>Improved Strategic Planning</i></u>		<u><i>Improved Social Skills</i></u>	
cluster	0	1	cluster	0	1	cluster	0
1	0.4318182	0.5681818	1	0.5681818	0.4318182	1	0.09090909
2	0.5714286	0.4285714	2	0.5714286	0.4285714	2	0.10714286
3	0.8181818	0.1818182	3	0.6363636	0.3636364	3	0.27272727
4	0.4117647	0.5882353	4	0.4117647	0.5882353	4	0.05882353
							0.94117647
							0.5882353

<u><i>Improved Team Collaboration</i></u>		<u><i>Ease Stress</i></u>		<u><i>Ease Anxiety</i></u>	
cluster	0	1	cluster	0	1
1	0.13636364	0.86363636	1	0.09090909	0.90909091
2	0.03571429	0.96428571	2	0.21428571	0.78571429
3	0.27272727	0.72727273	3	0.18181818	0.81818182
4	0.17647059	0.82352941	4	0.47058824	0.52941176
					1
					0.1590909
					0.8409091
					2
					0.3214286
					0.6785714
					3
					0.3636364
					0.6363636
					4
					0.5294118
					0.4705882

Fig. 14 Social & psychological functioning (cluster means)

Not all cluster groups agreed on experiencing behavioural changes related to social and psychological functioning. All clusters had high percentages of respondents (73% - 96%) that

experienced “*Improved Strategic Planning*” and “*Improved Team Collaboration*”. Similarly, clusters 1, 2 and 3 had 78% - 90% agreeing with “*Ease Stress*”, but cluster 4 had lower percentages - only 53 % of respondents said “yes”. Next, results indicated for “*Enhanced Emotional Awareness*”, a significant percentage of respondents (81%) in cluster 3 mentioned they did not experience such behaviours. Similarly, most respondents in cluster 2 (57%) also said “no”. Clusters 1 and 4 had most respondents replying "yes" to "*Enhanced Emotional Awareness*", i.e., 57% and 59%. Moreover, all clusters besides cluster 4 disagreed on having “*Improved Relationships*”. Clusters 1, 2 and 3 had 57%, 57% and 64% of respondents disagreeing while 59% of cluster 4's respondents agreed. Next, results indicated clusters 1, 2 and 4 agreed on experiencing “*Improved Social Skills*”, which ranged between 57-59%. However, results showed 64% of respondents in cluster 3 disagreed on experiencing “*Improved Social Skills*” when playing video games. Lastly, for “*Ease Anxiety*”, results indicated 84%, 68% and 64% of respondents in clusters 1, 2 and 3 replied "yes", with 53% of respondents in cluster 4 disagreeing.

5.2.2 Negative behavioural effects

Cognitive, Social, and Psychological Functioning:

<u>Low Self-esteem</u>		<u>Poor Sleeping Habits</u>		<u>Gaming Addiction/Disorders</u>		<u>Relationship Issues</u>	
cluster	0	1	cluster	0	1	cluster	0
1	0.90909091	0.09090909	1	0.2954545	0.7045455	1	0.6363636
2	0.92857143	0.07142857	2	0.2500000	0.7500000	2	0.6428571
3	0.63636364	0.36363636	3	0.4545455	0.5454545	3	0.7272727
4	0.64705882	0.35294118	4	0.5294118	0.4705882	4	0.8235294
							0.1764706
							1
						1	0.86363636
						2	0.89285714
						3	0.81818182
						4	0.94117647
							0.05882353

<u>Social Disconnection/Withdrawal</u>		<u>Lack of Interest/Motivation</u>		<u>Poor Academic Performance</u>	
cluster	0	1	cluster	0	1
1	0.6590909	0.3409091	1	0.4318182	0.5681818
2	0.6785714	0.3214286	2	0.6785714	0.3214286
3	0.8181818	0.1818182	3	0.6363636	0.3636364
4	0.8823529	0.1176471	4	0.8235294	0.1764706
					1
					0.7272727
					0.22727273
				2	0.82142857
				3	0.72727273
				4	0.94117647
					0.05882353

Fig. 15 Cognitive, social & psychological functioning (cluster means)

A majority of cluster groups did not experience negative behavioural effects, i.e., cognitive, social, and psychological functioning after video game playing. “*Relationship Issues*” had the highest number of respondents who responded with “no” for all clusters, i.e., 81-94%. “*Poor Academic Performance*” came in a close second, with 77%, 82%, 72% and 94% of respondents from clusters 1 to 4 replying “no”. “*Low Self-esteem*” received relatively high percentages, with 90-92% of respondents in clusters 1 and 2 saying “no” and around 64% of respondents in clusters 3 and 4 replying “no”. Next, results indicated 66%, 68%, 82% and 88% of respondents from clusters 1 to 4 responded with “no” to “*Social Disconnection/Withdrawal*”. Contrastingly, “*Gaming Addiction/Disorders*” received similar percentages which ranged between 64-82% for all clusters. Meanwhile, “*Lack of Interest/Motivation*” and “*Poor Sleeping Habits*” were the only negative behavioural effects that received “yes” responses. For “*Lack of Interest/Motivation*”, results showed 57% of respondents in cluster 1 replied “yes”. Meanwhile,

68%, 64% and 82% of respondents in clusters 2-4 said “no”. Lastly, many respondents responded with “yes” for “*Poor Sleeping Habits*”. 70%, 75%, and 55% of respondents in clusters 1-3 experienced “*Poor Sleeping Habits*” after video game playing. Results for those in cluster 4 were close, with 53% saying “no” and 47% saying “yes”.

Aggression & Hostility

<u><i>Violent Thoughts</i></u>		<u><i>Irritability/Restlessness</i></u>		<u><i>Elevated Blood Pressure</i></u>		<u><i>Confrontational Behaviour</i></u>	
cluster	0	1	cluster	0	1	cluster	0
1	0.7727273	0.2272727	1	0.5909091	0.4090909	1	0.7727273
2	0.8214286	0.1785714	2	0.4642857	0.5357143	2	0.4285714
3	0.6363636	0.3636364	3	0.7272727	0.2727273	3	0.7272727
4	0.7647059	0.2352941	4	0.5294118	0.4705882	4	0.5294118
							0.2500000
						1	0.7500000
						2	0.6071429
						3	0.6363636
						4	0.8823529
							0.3928571
							0.3636364
							0.1176471

<u><i>Excessively Competitive Thoughts</i></u>		<u><i>Verbal Hostility</i></u>		<u><i>Destruction of Property</i></u>	
cluster	0	1	cluster	0	1
1	0.5000000	0.5000000	1	0.6136364	0.3863636
2	0.5714286	0.4285714	2	0.3928571	0.6071429
3	0.3636364	0.6363636	3	0.6363636	0.3636364
4	0.5294118	0.4705882	4	0.7058824	0.2941176
					1
					0.95454545
					0.04545455
					2
					0.78571429
					0.21428571
					3
					0.81818182
					0.18181818
					4
					1.00000000
					0.00000000

Fig. 16 Aggression & hostility (cluster means)

Similarly, results indicated many respondents from all cluster groups did not experience aggression and hostility after video game playing. “*Destruction of Property*” had the largest number of respondents who denied experiencing such, with 95%, 79%, 82% and 100% of respondents in clusters 1-4 responding with “no”. For “*Violent Thoughts*”, 77%, 82%, 64% and 76% of respondents in clusters 1-4 responded with “no”. Next, clusters 2 and 3 had 61% and 64% of respondents who replied “no” to “*Confrontational Behaviour*”, while 75% and 88% of respondents in clusters 1 and 4 also responded with “no” respectively. Meanwhile, “*Irritability/Restlessness*”, “*Elevated Blood Pressure*”, “*Verbal Hostility*”, and “*Excessively Competitive Thoughts*” received mixed responses. For “*Irritability/Restlessness*”, 54% of

respondents in cluster 2 replied “yes”, while 59%, 73% and 53% of respondents in clusters 1, 3 and 4 said “no”. Next, 57% of respondents in cluster 2 replied with “yes” for “*Elevated Blood Pressure*”. Those who said “no” consisted of 77%, 73% and 53% of respondents who belonged to clusters 1, 3 and 5. Similarly, 61-71% of respondents in clusters 1, 3 and 4 said “no” for “*Verbal Hostility*”, while more respondents in cluster 2 (60%) replied “yes”. Lastly, a large majority of respondents experienced “*Excessively Competitive Thoughts*”. Respondents in cluster 1 had equal “yes” and “no” responses at 50%. 64% of those in cluster 3 responded with “yes”, while 57% and 53% of respondents in clusters 2 and 4 replied “no”.

5.3 Video Game Element Preferences

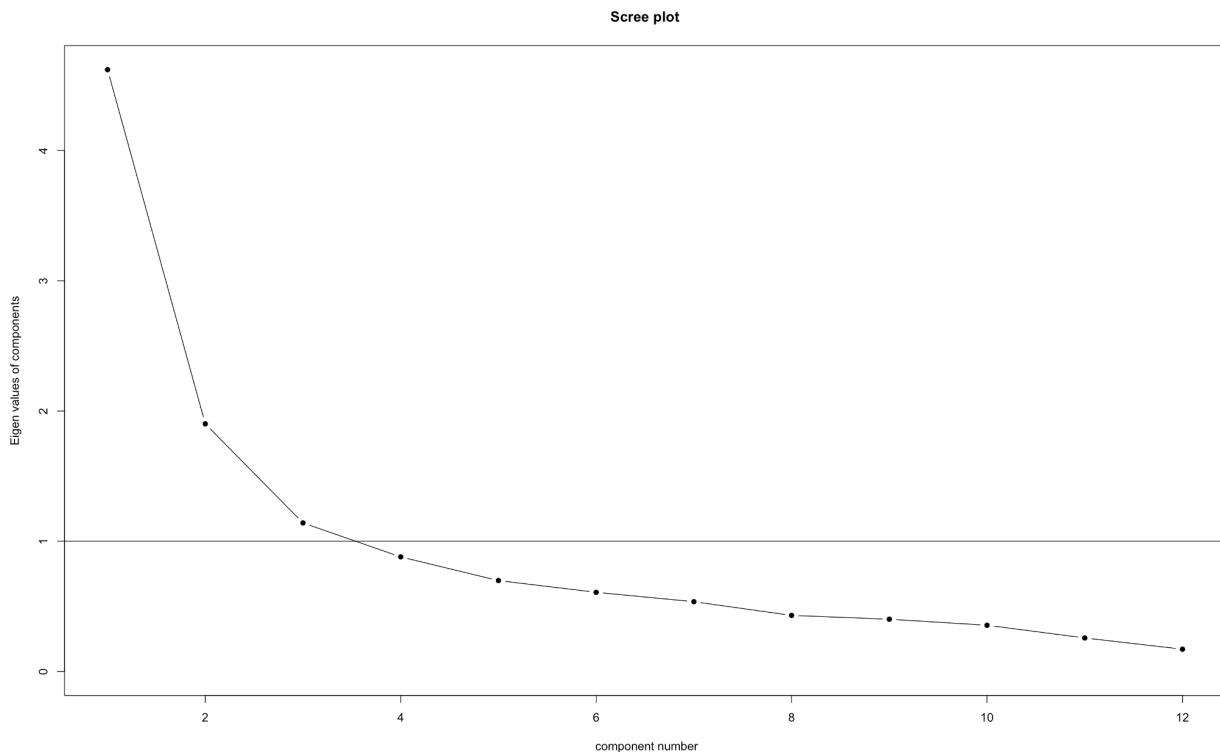


Fig. 17 Scree plot

The scree plot is a line plot that helps determine the number of factors by displaying eigenvalues. In reference to the above, there is an “elbow” from the third point, suggesting 3 factors to retain in the factor analysis.

```
Factor Analysis using method = ml
Call: fa(r = data[7:18], nfactors = 3, rotate = "varimax", scores = "regression",
      fm = "ml")
Standardized loadings (pattern matrix) based upon correlation matrix
      ML2   ML3   ML1   h2    u2 com
Destruction  0.04  0.53  0.12  0.29  0.710 1.1
Excitement   0.27  0.74  0.15  0.64  0.359 1.4
Competition -0.07  0.67  0.10  0.47  0.532 1.1
Community    0.10  0.37 -0.11  0.16  0.841 1.3
Challenging  0.34  0.59  0.28  0.54  0.462 2.1
Strat        0.28  0.61  0.26  0.51  0.488 1.8
Completion   0.16  0.17  0.97  1.00  0.005 1.1
Power        0.41  0.43  0.40  0.51  0.494 3.0
Fantasy      0.76  0.11  0.21  0.64  0.363 1.2
Storyline    0.93  0.02 -0.03  0.87  0.125 1.0
Design       0.61  0.13  0.13  0.40  0.598 1.2
Discovery    0.65  0.26  0.05  0.49  0.511 1.3
```

Fig. 18 Factor loadings (factor analysis)

With the 3-factor model and employment of varimax rotation, results can illustrate variability in the data. Relationships of each variable to underlying factors is illustrated by a factor loading. Factor loadings indicated “Completion” is highly associated with Factor 1 with a factor loading of 0.94, followed by “Power” at 0.40. The other two variables associated with Factor 1 were “Challenging” and “Strategy”, with factor loadings of 0.28 and 0.26. Next, Factor 2 is highly associated with “Storyline” and “Fantasy” as it had factor loadings of 0.93 and 0.76. The other two variables associated with Factor 2 were “Design” and “Discovery”, which had factor loadings of 0.65 and 0.61. For Factor 3, “Excitement” and “Competition” were their most

associated variables with factor loadings of 0.74 and 0.67, followed by “Strategy” and “Challenging” at 0.61 and 0.59, which overlaps with Factor 1.

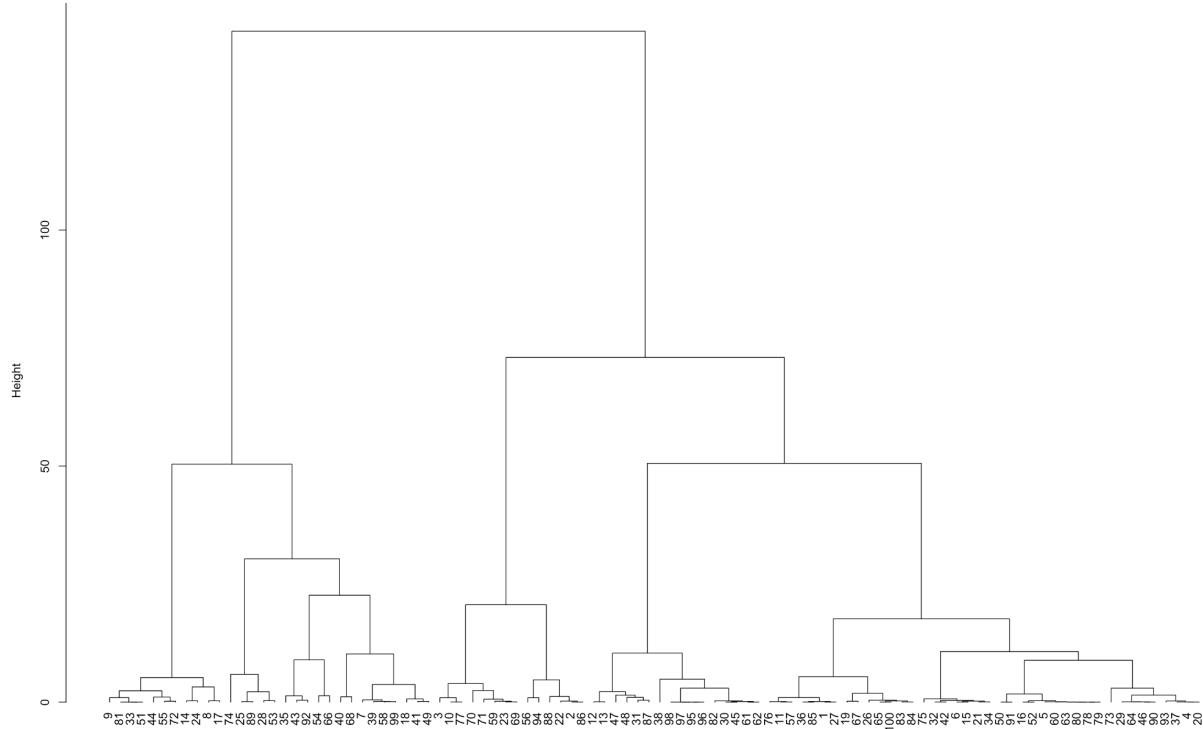


Fig. 19 Dendrogram

Once again, Squared Euclidean Distances were calculated to measure similarities. With reference to the above, a dendrogram was created to determine the number of clusters for the 3-factor solution. Results indicate a 5-cluster solution is deemed appropriate.

K-means clustering with 5 clusters of sizes 36, 19, 11, 15, 19

Cluster means:

	ML2	ML3	ML1
1	0.4471569	0.53122998	0.3291812
2	-1.3974916	0.09856697	0.5076285
3	-0.2057849	-1.27552571	-1.4055553
4	0.1557499	0.68984288	-1.3286253
5	0.5464253	-0.91125854	0.7313171

Fig. 20 Cluster means

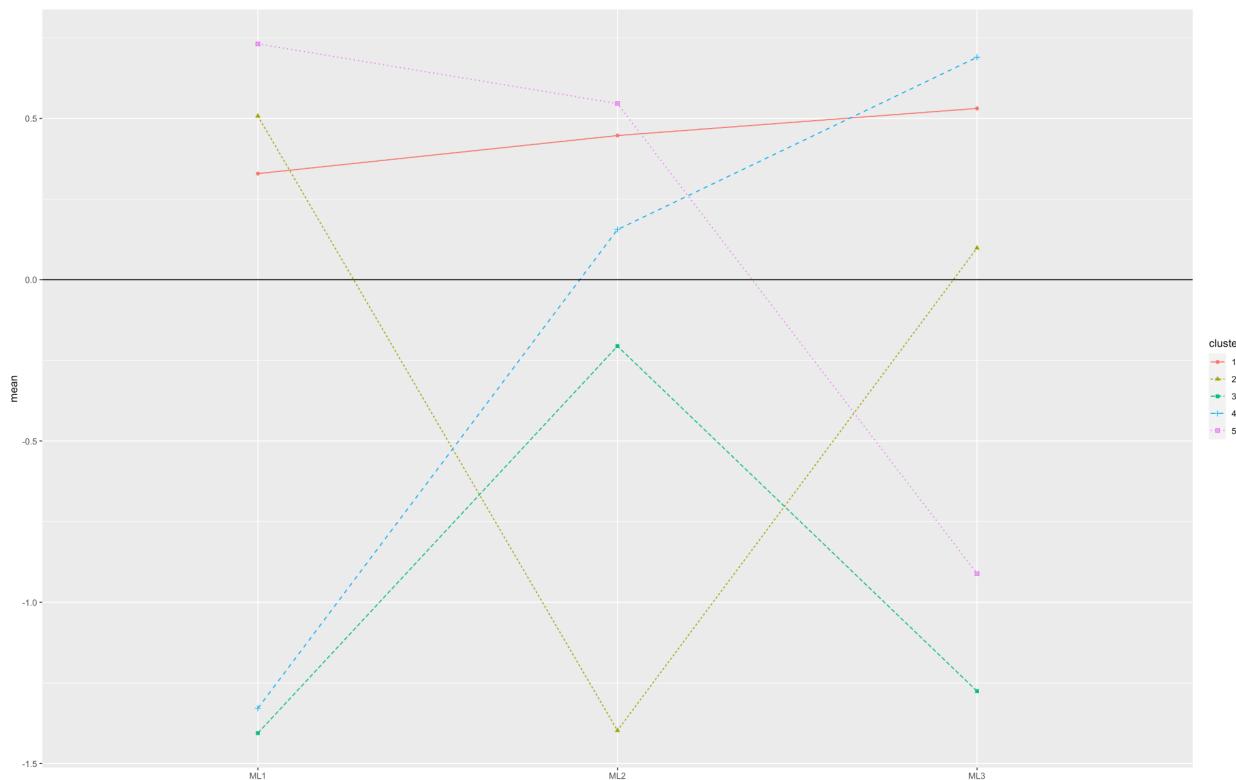


Fig. 21 Profile plot

The above plot indicates cluster 1 had a high cluster mean for factor 3 (0.531), meaning it is highly associated with factor 3. This suggests respondents in cluster 1 mostly preferred “Excitement”, “Competition”, “Strategy” and “Challenging” elements in video games. Next,

cluster 2 was highly associated with factor 1 with a cluster mean of 0.507, which indicated respondents preferred “*Completion*”, “*Power*”, “*Strategy*” and “*Challenging*” video game elements. Meanwhile, cluster 3 correlated with factor 1 and 3 with cluster mean values of -1.405 and -1.275, which suggests respondents preferred “*Completion*”, “*Power*”, “*Challenging*” and “*Strategy*”, followed closely by “*Excitement*”, “*Competition*”, “*Strategy*” and “*Challenging*”. Cluster 4 was most associated with factor 3 as it has a cluster mean value of 0.689, which implies they preferred “*Excitement*”, “*Competition*”, “*Strategy*” and “*Challenging*” elements in video games. Lastly, cluster 5 was highly correlated with factor 1 with a cluster mean value of 0.731. Respondents preferred video game elements such as “*Completion*”, “*Power*”, “*Strategy*” and “*Challenging*”.

Demographic information:

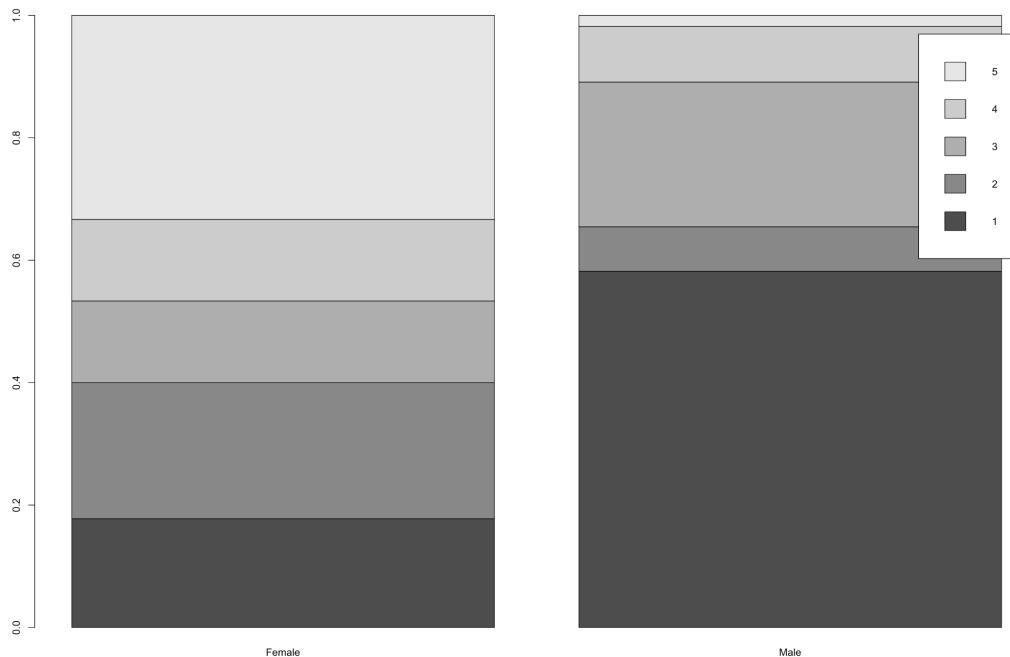


Fig. 22 Gender

Clusters 1 and 3 were male-dominated and correlated with factor 3 and factor 1, which suggests males preferred the following video game elements: “*Excitement*”, “*Competition*”, “*Strategy*”, “*Challenging*”, “*Completion*”, and “*Power*”. Meanwhile, clusters 2, 4 and 5 were mainly females. Clusters 2 and 4 corresponded to factor 1, while cluster 5 corresponded to factor 3. Thus, females preferred “*Completion*”, “*Power*”, “*Challenging*” and “*Strategy*”, followed by “*Excitement*”, and “*Competition*”.

5.4 Perceptual Map

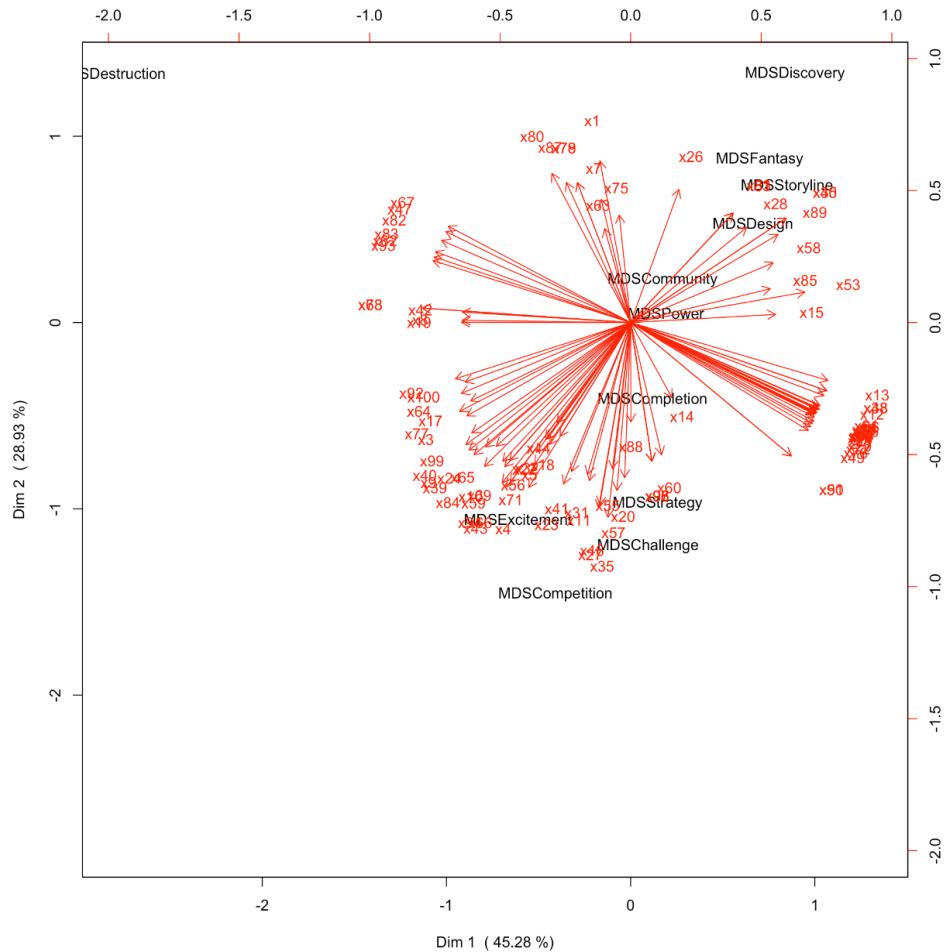


Fig. 23 Perceptual map

By visualizing relationships between the twelve video game elements, the above perceptual map provides a better visual representation of results. Fundamentally, the variables positioned closer if they were highly correlated and further away if they were not. Referring to the map, “*Fantasy*”, “*Storyline*”, “*Design*”, and “*Discovery*” were congregated in the top-right area. “*Strategy*”, “*Challenging*”, “*Completion*”, “*Power*”, and “*Destruction*” congregated in the bottom-right area, while “*Excitement*” and “*Competition*” congregated in the bottom-left area. An outlier located in the top-left of the map - “*Community*” was positioned far from all variables.

CHAPTER 6.

DISCUSSION

6.1 Varying Reasons for Play Between Genders

Among adolescent participants in all cluster groups, “*Emotion*”, “*Engagement*”, “*Peer Pressure*”, “*Socialize*”, “*Marketing*”, and “*Family*”, were among their top 2 choices for video game playing reasons. Interestingly, “*Escapism*” and “*Challenging*” were not in any respondents’ top choices.

Cluster 1 had the second-highest number of respondents, which implies emotional satisfaction and engaging in fantasy/imaginative play are important reasons for game video playing. There were slightly more females (54%), thus, gender stereotypes where women are more emotional than men may appear to be true. Research purports females play video games for personal preoccupation, e.g., satisfying emotional needs (Lopez-Fernandez, Williams, Griffiths,

et al., 2019). Findings further add to existing literature about gender differences in video game playing, in which girls are more drawn to imaginative play, e.g., *SimCity* than boys (Kinzie & Joseph, 2008).

Respondents in cluster 4 were male-dominated (73%) and their main reasons for video game playing were family influence and desire to engage in fantasy/imaginative play. Results showed their families influenced them, which previous research supports. Exposure to gaming family environments was an influential factor in video game playing (Wong & Lam, 2016). Another study speculated siblings often spend time playing video games together during their adolescence (Coyne et al., 2016). Moreover, boys enjoyed playing video games related to imaginative play like *Halo*. Thus, family influence may seem to be a primary motivator for video game playing, with fantasy/imaginative play being favourable.

In cluster 5, results indicated females (92%) mainly play video games because of family influence and socializing to make connections. Results aligned with existing literature, which observed females discovering new games through their social circles, including family (Newzoo, 2017). Therefore, it may be likely they play video games through family influences. Moreover, respondents in this cluster seek social connections in video games. This is consistent with previous research stating socialising is a main motivator for females to play video games (Zorrilla, 2010).

Similarly, socializing and making new connections is one main reason for video game playing, according to respondents in cluster 3. Video game marketing campaigns came in a close second. This cluster contained the highest number of respondents, of which a majority was

male-dominated (72%). Results may seem to imply video games are most appealing to adolescents. Particularly, this applies to males, who are keen on making social connections with new people. Findings may seem to insinuate games emphasizing social design increased player acquisition and retention by utilizing viral marketing techniques (Hamari & Järvinen, 2011).

Respondents in cluster 2 shared similarities with those in cluster 1. Peer pressure was their most important reason for playing video games, followed by emotional satisfaction. The gender ratio was similar - there were slightly more males (53%). However, this cluster contained the second-lowest number of respondents. Thus, results may not prove males perceive emotional satisfaction as a more important reason than females. Research may appear to support ideas that peer effect in video game playing is more influential among adolescent males than females, which aligned with earlier studies (Amialchuk & Kotalik, 2016).

6.2 Violent vs Nonviolent Genres: Gender and Behavioural Differences

Altogether, there are four groups of behavioural effects, with two positive and negative respectively: Cognitive functioning (Table 6.2.1); Social and psychological functioning (Table 6.2.2); Cognitive, social & psychological functioning (Table 6.2.3); and Aggression & hostility (Table 6.2.4). If a behavioural effect in a particular group had more “yes” response counts than “no”, that behavioural effect was labelled “YES” in the respective table and vice-versa (see Appendix D).

Cluster 1 was the largest cluster which was neither male nor female-dominated. There were, however, slightly more females (52%) than males. It appears respondents preferred playing “Adventure”, “Strategy”, and “MMORPG” video games genres most and disliked “Racing”, “BR”, and “FPS” genres. Popular games including *EVE Online* and *World of Warcraft (WoW)* fit into this category, where respondents are intrigued by exploration and social communities.

Respondents experienced all 7 positive cognitive functioning behaviours. These aligned with studies that suggested adventure games improved visual monitoring and accuracy. These occur when players scan environments for resources that help them progress through games (Zelinski & Reyes, 2009). MMORPGs enhance player response speeds and working memory when managing collected items or magic spells and memorizing enemy weaknesses. Another study found MMORPG student players had enhanced logical and numerical skills (Campello de Souza et al., 2010).

Next, respondents experienced 6 out of 7 positive social & psychological functioning behaviours, i.e., enhanced emotional awareness, strategic planning, social skills, team collaboration, and ease of stress and anxiety. Past studies provided support for this where *WoW*, an Adventure-strategy MMORPG, allowed players to experience emotions and practice team coordination skills, including social communication, group cooperation, and strategic planning pre-battle (Chang & Lin, 2014). Results also aligned with Martončík & Lokša (2016), where *WoW* players used MMORPGs to reduce stress and experienced less social anxiety online than in real life.

Respondents interestingly only experienced 2 out of 7 negative cognitive, social & psychological functioning behaviours. Respondents experienced poor sleeping habits and lack of interest/motivation. It aligns with prior research, with Rusia & Gravoso (2009) finding that playing MMORPGs had negative impacts on players' health, i.e., sleeping quality. Another study observed a negative association among adventure-strategy video game players, e.g., *Animal Crossing* and *Pokémon*, and sleep duration (Pujol et al., 2016).

Next, respondents surprisingly experienced only 1 out of 7 negative behaviours related to aggression & hostility. "Excessively competitive thoughts" was 50/50 for "yes" and "no" responses. Previous research had suggested MMORPGs are reportedly known for their sociability and competitive elements. These aspects may seem to result in increases in MMORPG players' aggressive behaviours (Hussain et al., 2015).

Cluster 2 was male-dominated (78%) and had similar preferences as cluster 3, except cluster 2 also preferred "Fighting" games. Based on their preferences, cluster 2 liked "Survival-Shooter-Combat" games like *PUBG*, *COD* and *Mortal Kombat* etc, which in some sense, are the most "violent" genres. Moreover, participants in cluster 2 only disliked FE and Adventure games. Both clusters 2 and 3 participants believed they experienced all 7 positive behaviours under cognitive functioning. A study in which neurologists observed how BR games, particularly *PUBG* caused multiple positive effects, i.e., increased situational awareness, high level of hand-eye coordination, improved quickness of action etc. (Narayanan & Ramanathan, 2019). It further explains having such behaviours is due to different tasks involved in-game.

Cluster 2 differs from cluster 3 in terms of social and psychological functioning, in which respondents in cluster 2 experienced 6 out 7 positive behaviours, i.e., enhanced emotional awareness, strategic planning, social skills, team collaboration, ease stress and anxiety. It is similar to cluster 3 responses except that among the 6 positive behaviours, they denied having enhanced emotional awareness and improved social skills. Most of these positive behaviours experienced by cluster 2 and 3 are aligned with previous studies. When playing FPS games, players had to evaluate the game which pushed them to figure out best strategies to win (Badatala et al., 2017). Not only will improvement of strategic thinking occur but also enhanced teamwork and collaboration. Players made joint strategic decisions to keep teammates alive in *COD*. Moreover, Park et al. (2016) found social anxiety is reduced when playing FPS games which are correlated to feeling less distressed.

Under negative cognitive, social and psychological functioning, participants in both cluster 2 and 3 interestingly disagreed on having all negative behaviours except one, i.e., poor sleeping habits. Prior research by Wolfe et al. (2014) mentioned the consequences of playing FPS game *Bioshock Infinite* among adolescents, which also included later bedtimes, decreased sleep duration, and increased tiredness or sleepiness.

Next, cluster 2 participants agreed on only 3 out of 7 negative behaviours in aggression and hostility. Particularly, participants agreed on having irritability/restlessness, elevated blood pressure and verbal hostility. It is aligned with previous research that increased blood pressure was correlated with playing fighting games like *Mortal Kombat* (Porter & Goolkasian, 2019). Another study conducted proved exposure to such violent video games like *PUBG* led to

aggressive traits like verbal aggression, which correlates to verbal hostility and irritability (Yao et al., 2019).

In the third cluster, there are slightly more males (54%) than females. Cluster 3 was the smallest group, and participants preferred playing video game genres "BR" and "FPS". Meanwhile, they disliked all genres, particularly video games related to "Strategy" and "Adventure". These respondents would also enjoy popular games like *PUBG* and *COD*. For aggression and hostility, respondents in cluster 3 surprisingly denied having all negative behaviours except for having competitive thoughts. Results may provide support for views that playing FPS games increases player competitiveness. As Hollingdale & Greitemeyer, (2014) mentioned, survival games involving shooting battles contain a lot of competitive content.

Similar to cluster 1, respondents in cluster 4 were mainly female (64%) and preferred playing the "*Family Entertainment*" video game genre most, followed by "*Adventure*" and "*Strategy*" genres too. Also, similar to cluster 1, respondents disliked "BR" and "FPS" genres too, which is opposite to group 2 and 3. Players in this cluster would enjoy popular games, i.e., *Mario Kart* and *Minecraft*.

Respondents experienced all 7 positive cognitive functioning behaviours. Results align with findings of Mackey et al. (2011), where video game players, including those who played *LittleBigPlanet*, had improvements in cognitive and executive functioning after video game playing. Such video games allowed players to adapt to fast-changing environments and situations quicker. Players also had improvements in problem-solving, as they learnt how to make better decisions and think logically for optimal approaches to finish certain levels.

Next, respondents experienced 6 out of 7 positive social & psychological functioning behaviours, i.e., enhanced emotional awareness, strategic planning, social skills, team collaboration, ease stress and improved relationships. Results are consistent with previous research that found *Pokémon GO* players (family entertainment/adventure-strategy game) spent more time with family/household members. Kogan et al. (2017) mentioned “Poke-walks” were used as an excuse to hang out with friends or connect with other players. Such video games were also observed to positively influence players’ psychological and emotional well-being.

Next, respondents interestingly did not experience any of the 7 negative cognitive, social & psychological functioning behaviours. For instance, past studies provided support for this, where female adolescents in Germany who played games of skill and strategy did not experience impairments in academic performances (Gnambs et al., 2018). Respondents’ reading and mathematical grades were evaluated over three years. Contrary to popular saying, results indicated playing such games seemed to have tiny/negligible effects on academic performance.

Next, respondents did not experience any of the 7 negative aggression & hostility behaviours. These results are unsurprising because Family Entertainment, Adventure, and Strategy games are not violent games that promote aggressive behaviour and hostility. Again, referring to Kogan et al. (2017), such games impact psychological and emotional well-being positively and are not detrimental. Thus, results are opposite to 7 negative aggression & hostility behaviours.

Based on these numbers, we deduce that all cluster groups experienced positive effects in cognitive functioning (28 out of 28 “YES”) social & psychological functioning (22 out of 28 “YES”) when playing video games. An observable pattern was clusters 1, 2, and 3 did not experience improved relationships, while cluster 3 had the highest number of “no” responses to enhanced emotional awareness, improved relationships and social skills.

Meanwhile, we deduce that all cluster groups did not experience negative effects in cognitive, social & psychological functioning (25 out of 28 “NO”), as well as aggression & hostility (24 out of 28 “NO”) when playing video games. An observable pattern was clusters 1, 2, and 3 had poor sleeping habits. Both clusters 1 and 3 experienced excessively competitive thoughts, while cluster 2 had the highest number of “yes” responses to experiencing irritability/restlessness, elevated blood pressure, and verbal hostility.

Overall, males preferred “violent” video game genres: BR and FPS, while females preferred “nonviolent” video game genres: Family Entertainment, Adventure, and Strategy (excluding MMORPGs). The positive effects of playing video games outnumbered the negative. Contrary to popular belief, we deduce playing violent video games does not promote aggression.

6.3 Action-Social & Mastery-Achievement Dominant

Based on the factor analysis, Factor 1 seems to be the "Mastery-Achievement" factor as “*Completion*” and “*Power*”, “*Challenge*” and “*Strategy*” had highest preference values. Factor 2 may be labelled as "Immersion-Creativity" as “*Fantasy*” and “*Storyline*”, “*Design*” and

“Discovery” had the highest preference values. Factor 3 may be considered the “Action-Social” factor because “Excitement” and “Competition”, “Challenge” and “Strategy” had the highest preference values. “Destruction” and “Community” seem to be excluded from Factor 3 and were replaced by “Challenge” and “Strategy”. This may likely be since they are not part of anyone’s top choices of video game elements.

Cluster 1 was the largest cluster which was male-dominated. It appears males enjoy playing video games boasting “Excitement”, and “Competition”, followed by “Strategy” and “Challenging” elements. This may support the known idea that, compared to females, action-social game elements appealed to males more (Yee, 2016). Relative to females, males looked for fast-paced action, surprises, and thrilling gameplay in video games. They also preferred duels, matches, and having higher rankings than others. Moreover, males enjoyed video games with challenging and strategic elements. Interestingly, clusters 2 and 5 had the same number of respondents and were mostly females, which may imply females had a higher preference for “Completion” and “Power”, followed by “Challenging” and “Strategy” elements.

Cluster 5 had strong dislikes for “Excitement”, “Competition”, which aligned with previous research (Yee, 2016). Females preferred finishing video games compared to males, e.g., finding all collectables, completing all missions, unlocking all characters etc. Similarly to males, females enjoyed games that challenged their abilities, e.g., completing difficult missions, and games requiring careful planning/decision-making.

Contrastingly, cluster 4 was the exact opposite of cluster 5, in which females liked *Excitement*” and “*Competition*” and disliked “*Completion*” and “*Power*”. Research purports there is a rise in female gamers who enjoy playing video games boasting action and social elements like “*Excitement*” and “*Competition*”. Previous research suggested females had highest preferences for MMORPGs, FPSs, and MOBAs - action games may seem to have above-average violence content (Lopez-Fernandez, Williams, & Kuss, 2019). Moreover, females also enjoyed the competition element in video games, like beating other opponent players.

Results indicate respondents in cluster 3 may appear to be video game element “omnivores”, or a “hybrid” group. There were slightly more males in this cluster and respondents enjoyed both “*Completion*” and “*Power*”, as well as “*Excitement*” and “*Competition*” elements. Again, these were followed by “*Challenging*” and “*Strategy*”. They seemed to enjoy “*Excitement*” and “*Competition*” like the other males did, but also seemed to enjoy “*Completion*” and “*Power*” as the females did. This may appear to break down gender stereotypes around video game players, where males only liked action-social elements and females only liked mastery-achievement elements.

Results imply that in all clusters, males and females alike seemed to prefer “*Strategy*” and “*Challenging*”. No clusters were ‘Immersion-Creativity’ oriented, as no one picked “*Fantasy*” and “*Storyline*”, “*Design*” and “*Discovery*” as their top preferences. Attribute preferences may seem to correlate to gender. Males seemed to prefer “*Excitement*” and “*Competition*” video game elements, while females preferred “*Completion*” and “*Power*” video game elements, although there was a hybrid group who enjoyed both pairs equally.

6.4 Perceptual vs Motivation Map: Similarities & Differences

The perceptual and Motivation Maps (see Appendix A) were near-identical regarding cluster group positions. In the perceptual map, “*Discover*”, “*Fantasy*”, “*Storyline*”, and “*Design*” were concentrated together. These elements appeared to belong to the yellow “Immersion-Creativity” cluster in the Motivation Map. This also seemed to apply to “*Challenge*”, “*Strategy*”, “*Completion*”, and “*Power*”. These elements were positioned closely in the perceptual map, which shared similarities observed in the Motivation Map. They belonged to the blue “Mastery-Achievement” cluster. Nevertheless, we could observe minor differences between both maps. In the Motivation Map, “*Excitement*”, “*Competition*”, “*Community*”, and “*Destruction*” belonged to the red “Action-Social” cluster. However, in the perceptual map, only “*Excitement*” and “*Competition*” were positioned closely. “*Community*” and “*Destruction*” were scattered, meaning they are not highly correlated or preferred by respondents, which aligned with the factor analysis results.

CHAPTER 7.

FUTURE RESEARCH DIRECTIONS

This research study is subject to some notable limitations. The insufficient sample size made it difficult to define the optimal number of clusters and factors when referring to respective dendograms. Demographic data collected was similar due to the limited range of participants. Thus, identifying significant relationships from the data proved challenging. The sample could be increased to ensure more precise results generalized to a broader population. Second, there

were issues concerning convenience sampling. The research was highly vulnerable to selection bias and influences. There was limited access to the appropriate population concerned, i.e., video game players. Stratified sampling could be implemented to improve the accuracy of statistical analysis. Third, part of the questionnaire design was unclear. There was a lack of descriptions for each behavioural variable. Participants had different interpretations affecting their responses, and thus, the accuracy of results. Future research could include further explanations for each variable to reduce misunderstandings. Fourth, there were potential inaccuracies in the statistical analysis. Cluster analysis was conducted only with data provided, without assumptions on any correlated information. For factor analysis, interpretations of the factors' meanings were subjective. Various highly correlated attributes varied by nature. Hence, labelling factors proved challenging. Other statistical methods could be utilized to minimize such limitations.

CHAPTER 8.

CONCLUSION

This paper discusses various reasons that motivate Hong Kong university students to play video games. Results demonstrate correlations between participants' reasons and their demographic information. This study has generated insightful data to build more understanding into video game playing reasons. There are noticeable differences in reasons between genders - only males used marketing and peer pressure as one of their reasons, while females could relate with all the other reasons that males used, i.e., emotional satisfaction, engaging fantasy/imaginative play, socializing, and family influence. The least-used reasons were

escapism and looking for challenges. Next, this paper highlights the behavioural impacts Hong Kong university students experience when playing video games.

Four clusters were grouped based on their preferred video genres and respective behavioural effects. In the positive behaviour types, i.e. Cognitive and Social & Psychological, there were several notable results: the clusters experienced 9 out of 14 positive behaviours, whereas in the negative behaviours type, i.e., Cognitive, Social, Psychological and Aggression & Hostility, they experienced 7 out 14 of the behaviours. The majority of the behavioural effects experienced were more positive than negative. Males preferred the “violent” genres - BR and FPS, while females preferred the “nonviolent” genres - Family Entertainment, Adventure, and Strategy. Implications suggest how findings may be significant for research on behavioural effects of video game playing, as the positive effects outnumbered the negative effects for both “violent” and “nonviolent” video game genres. Lastly, this paper examines the elements affecting Hong Kong university students’ individual preferences for video games. Findings found there were three factors: "Mastery-Achievement", "Immersion-Creativity", and "Action-Social". “*Destruction*” and “*Community*” were excluded as they were none of the respondents’ top preferences. None of the clusters was ‘Immersion-Creativity’ oriented. Results aligned with the Motivation map. This study provides insights into gender differences in element preferences - males preferred “Action-Social” while females preferred “Mastery-Achievement”. Likewise, both genders enjoyed “*Strategy*” and “*Challenging*” elements.

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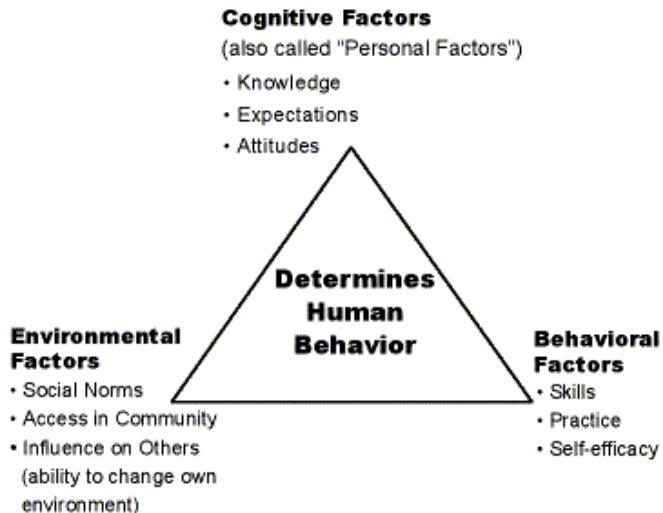
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APPENDICES

Appendix A (Theoretical Frameworks)



Social Learning Theory Model

OVERVIEW OF MOTIVATION MODEL



Action "Boom!"	Social "Let's Play Together"	Mastery "Let Me Think"	Achievement "I Want More"	Immersion "Once Upon a Time"	Creativity "What If?"
Destruction Guns. Explosives. Chaos. Mayhem.	Competition Duels. Matches. High on Ranking.	Challenge Practice. High Difficulty. Challenges.	Completion Get All Collectibles. Complete All Missions.	Fantasy Being someone else, somewhere else.	Design Expression. Customization.
Excitement Fast-Paced. Action. Surprises. Thrills.	Community Being on Team. Chatting. Interacting.	Strategy Thinking Ahead. Making Decisions.	Power Powerful Character. Powerful Equipment.	Story Elaborate plots. Interesting characters.	Discovery Explore. Tinker. Experiment.

Gamer Motivational Model

MAP OF GAMING MOTIVATIONS



The 3 High-Level Clusters

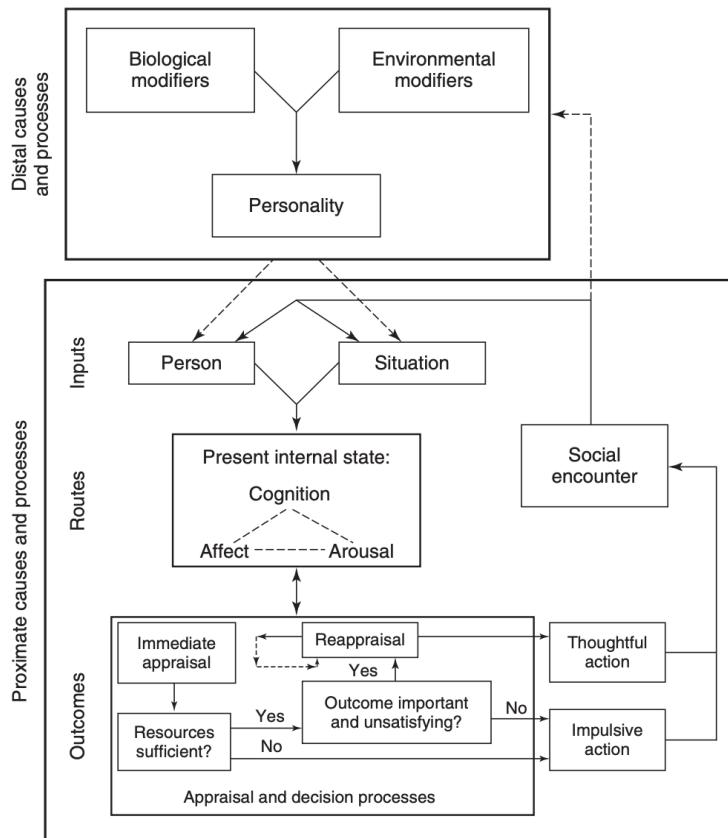
1. Action-Social
2. Mastery-Achievement
3. Immersion-Creativity

Bridges

- Discovery is a bridge between Immersion-Creativity and Mastery-Achievement.
- Power is a bridge between Action-Social and Mastery-Achievement.

Map of Gaming Motivations

GENERAL AGGRESSION MODEL



General Affective Aggression Model

Appendix B (Consent Form)

Examining the Influence of Individual Game Preferences on University Students' Behaviours in Hong Kong

Dear participants,

You are invited to participate in an undergraduate research project conducted by final-year students, Mr Millamena, Kian Cedrick Hilario and Miss Panlilio, Nicolei Bautista, of Bachelor of Arts and Sciences in Social Data Science programme under the Faculty of Education at The University of Hong Kong (HKU) under the supervision of Dr Kwan, Alvin C.M..

The research is designed to study whether playing violent video games would have any potential impact on players' aggressive behaviour of Hong Kong university students through an online survey. This study attempts to explore Hong Kong university students' preferences towards various video game genres, and identify players' reasons and motivations to play video games. This study also aims to understand how video game preference impacts university students' behaviours in Hong Kong. We would like to collect basic demographic information and information related to your cognitive, social and psychological behaviours. This questionnaire will take approximately 15-20 minutes to complete.

According to HKU's policy on the ethical conduct of research, we are writing to ask your consent for these procedures. Your participation is entirely voluntary. You have the right to terminate the survey and withdraw at any time without negative consequences. All information provided by participants will be treated with the utmost confidentiality and anonymity. Your collected information will be kept in our password-protected computers and will be used for academic and research purposes only. The collected data will be kept until 31 August 2024 and will be destroyed afterwards.

If you have any questions regarding the research, please feel free to contact Mr. Millamena, Kian Cedrick Hilario at (852) 5468-3723, Miss Panlilio, Nicolei Bautista at (852) 5636-6229, or Dr Kwan, Alvin C.M. at (852) 2241-5324. This study has received human research ethics approval from the Faculty Research Ethics Committee, Faculty of Education, HKU. If you have questions about your rights as a research participant, please contact the Human Research Ethics Committee, HKU (852) 2241-5267.

If you understand the content described above and agree to participate in this research, please tick box and proceed to next part.

Do you agree to the procedures set out above, and would like to participate in the above project?

- I agree to participate in this study.
- I do not agree to participate in this study.

Appendix C (Survey Questionnaire)

Examining the Influence of Individual Game Preferences on University Students' Behaviours in Hong Kong

1.1 What is your age? *

Your answer _____

1.2 What is your gender? *

- Male
- Female
- Prefer not to say
- Other

1.3 What is your study year? *

- 1
- 2
- 3
- 4
- 5

1.4 What is your home faculty? *

- Business
- Social Science
- Science
- Engineering
- Arts
- Education
- Architecture
- Other

1.5 What is the name of your host university?

- The University of Hong Kong
- Hong Kong University of Science and Technology
- The Chinese University of Hong Kong
- City University of Hong Kong
- The Hong Kong Polytechnic University
- Hong Kong Baptist University
- Lingnan University
- Others

1.6 What is your ethnicity? *

- Chinese
- Korean
- Japanese
- Indian
- Pakistani
- Nepali
- Filipino
- Indonesian
- Mixed
- Others

Examining the Influence of Individual Game Preferences on University Students' Behaviours in Hong Kong

2.1 Rate the following reasons for playing video games based on your preference.
(1=least likely, ... 5=most likely) *

	1	2	3	4	5
Looking for a challenge	<input type="radio"/>				
Emotional satisfaction	<input type="radio"/>				
Peer pressure	<input type="radio"/>				
Family influence	<input type="radio"/>				
Escapism	<input type="radio"/>				
To make online social connections	<input type="radio"/>				
Engaging in imaginative & fantasy play	<input type="radio"/>				
Video game marketing campaigns	<input type="radio"/>				

2.2 Rate the following video game genres based on your preference. (1=least favourite, ... 5=most favourite) *

	1	2	3	4	5
Massively Multiplayer Online Role-Playing Game (MMORPG)	<input type="radio"/>				
Multiplayer Online Battle Arena (MOBA)	<input type="radio"/>				
First Person Shooter (FPS)	<input type="radio"/>				
Battle Royale (BR)	<input type="radio"/>				
Fighting	<input type="radio"/>				
Family Entertainment	<input type="radio"/>				
Strategy	<input type="radio"/>				
Sports	<input type="radio"/>				
Adventure	<input type="radio"/>				
Racing	<input type="radio"/>				

2.3 Do you often experience any of the following when playing video games?
(1=Yes, ... 0=No)

Increased processing speed/reaction time *

- 1
- 0

Enhanced hand-eye coordination *

- 1
- 0

Enhanced working memory *

- 1
- 0

Improved problem-solving *

- 1
- 0

Enhanced spatial navigation *

- 1
- 0

Higher levels of logical thinking *

- 1
- 0

Enhanced concentration *

- 1
- 0

**2.4 Do you often experience any of the following when playing video games?
(1=Yes, ... 0=No)**

Enhanced emotional awareness *

- 1
- 0

Improved relationships *

- 1
- 0

Improved strategic planning *

- 1
- 0

Improved social skills *

- 1
- 0

Improved team collaboration *

1

0

Ease stress *

1

0

Ease anxiety *

1

0

2.5 Do you often experience any of the following when playing video games?
(1=Yes, ... 0=No)

Low self-esteem *

- 1
- 0

Poor sleeping habits *

- 1
- 0

Gaming addiction/disorders *

- 1
- 0

Relationship issues *

- 1
- 0

Social disconnection/withdrawal *

- 1
- 0

Lack of interest/motivation *

- 1
- 0

Poor academic performance *

- 1
- 0

**2.6 Do you often experience any of the following when playing video games?
(1=Yes, ... 0=No)**

Violent thoughts *

- 1
- 0

Irritability/Restlessness *

- 1
- 0

Elevated blood pressure *

- 1
- 0

Confrontational behaviour *

- 1
- 0

Excessively competitive thoughts *

- 1
- 0

Verbal hostility *

- 1
- 0

Destruction of property *

- 1
- 0

3.1 How much do you enjoy the following game elements when playing video games? (1=least enjoyable, ... 5=most enjoyable) *

	1	2	3	4	5
Destruction (guns, explosives, chaos, mayhem)	<input type="radio"/>				
Excitement (action, surprises, thrills)	<input type="radio"/>				
Competition (duels, matches, high on rankings)	<input type="radio"/>				
Community (online social experience, collaboration)	<input type="radio"/>				
Challenge (completing high difficulty missions)	<input type="radio"/>				
Strategy (plan ahead, make decisions)	<input type="radio"/>				
Completion (get all collectibles, complete all missions)	<input type="radio"/>				
Power (level up characters, equipment, artefacts)	<input type="radio"/>				
Fantasy (experience novel, unrealistic stimuli)	<input type="radio"/>				
Storyline (elaborate plots, character backstories)	<input type="radio"/>				
Design (customization, personalization)	<input type="radio"/>				
Discovery (explore, tinker, experiment)	<input type="radio"/>				

4.1 Rank the below game elements based on your preference. Note that each number should only be used ONCE*. (12=most favourite,..., 1=least favourite)

Destruction	Competition	Challenge	Completion	Fantasy	Design
Excitement	Community	Strategy	Power	Story	Discovery

Destruction *

Your answer _____

Excitement *

Your answer _____

Competition *

Your answer _____

Community *

Your answer

Challenge *

Your answer

Strategy *

Your answer

Completion *

Your answer

Power *

Your answer

Fantasy *

Your answer

Storyline *

Your answer

Design *

Your answer

Discovery *

Your answer

Examining the Influence of Individual Game Preferences on University Students' Behaviours in Hong Kong

5.1 How many estimated years have you been playing video games? Please enter a number. *

Your answer

5.2 Overall, do you play the video game genres in the white column MORE than those in the grey column? (1=Yes, ... 0=No)

Massively Multiplayer Online Role-Playing Game (MMORPG)	Multiplayer Online Battle Arena (MOBA)	First Person Shooter (FPS)	Battle Royale (BR)	Fighting
Family Entertainment	Strategy	Sports	Adventure	Racing

1

0

5.3 How many hours do you spend playing video games daily? Please enter a number. *

Your answer

5.4 Overall, would you consider yourself an active gamer? (1=Yes, ... 0=No) *

1

0

Appendix D (Summary of Cluster Behaviours)

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Increased processing speed/reaction time	YES	YES	YES	YES
Enhanced hand-eye coordination	YES	YES	YES	YES
Enhanced working memory	YES	YES	YES	YES
Improved problem solving	YES	YES	YES	YES
Enhanced spatial navigation	YES	YES	YES	YES
Higher levels of logical thinking	YES	YES	YES	YES
Enhanced concentration	YES	YES	YES	YES

Table 6.2.1 Positive behavioural effects: cognitive functioning

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Enhanced emotional awareness	YES	YES	NO	YES
Improved relationships	NO	NO	NO	YES
Improved strategic planning	YES	YES	YES	YES
Improved social skills	YES	YES	NO	YES
Improved team collaboration	YES	YES	YES	YES
Ease stress	YES	YES	YES	YES
Ease anxiety	YES	YES	YES	NO

Table 6.2.2 Positive behavioural effects: social & psychological functioning

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Low self-esteem	NO	NO	NO	NO
Poor sleeping habits	YES	YES	YES	NO
Gaming addiction/disorders	NO	NO	NO	NO
Relationship issues	NO	NO	NO	NO
Social disconnection/withdrawal	NO	NO	NO	NO
Lack of interest/motivation	YES	NO	NO	NO
Poor academic performance	NO	NO	NO	NO

Table 6.2.3 Negative behavioural effects: cognitive, social & psychological functioning

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Violent thoughts	NO	NO	NO	NO
Irritability/restlessness	NO	YES	NO	NO
Elevated blood pressure	NO	YES	NO	NO
Confrontational behaviour	NO	NO	NO	NO
Excessively competitive thoughts	YES/NO	NO	YES	NO
Verbal hostility	NO	YES	NO	NO
Destruction of property	NO	NO	NO	NO

Table 6.2.4 Negative behavioural effects: aggression & hostility