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Anxiety-Triggered Model for Enhancing User Engagement in Game

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Abstract: Based on previous game studies which overemphasized the negative effects of game engagement caused by negative user experience, the goal of this study is to further scholarly understanding of this phenomenon by focusing on the popular game genre and to offer a dynamic cyberpsychology model of anxiety effect to encourage game developers to improve user experience design and utilize psychological triggers to boost user engagement in games. Both qualitative and quantitative methods, such as surveys, observational experiments, focus groups, and in-depth interviews, were used to evaluate the study's concerns. The findings aim to support future game development practices with theoretical insights.

1. Introduction and Background

As the theoretical background for similar researches related to interactions in virtual social networks, cyberpsychology is a emerging interdisciplinary domain found by The British Psychological Society(BPS) [1]and developed since 2018,which centers on the examination of psychological phenomena stemming from human interaction with digital media. Mainstream cyberpsychology research programs concentrate on a variety of internet-related themes such as online relationships, personality types in cyberspace, online identity, digital gaming addiction, regressive behavior, etc. Studies have shown that the connection between user engagement and user experience in games influences a range of cognitive, affective, and behavioral[2]. The increased emphasis on user experience pushes developers to make digital media systems more engaging[3]. To explain how user experience affects user engagement in games, scholars have investigated it from the perspectives of flow theory[4], uses and gratifications theory[5], cyber-psychology and other theories. Early game researchers overly focused on the negative impacts of game engagement, but whether the negative impacts are truly negative remains controversial[6].

Drawing upon the perspective background of cyber-psychology and other relevant scholarly frameworks, this study will delve into the investigation of the user experience in gaming on the effects of anxiety.

This implies that, the purpose of study is to further explore how negative user experience(e.g. anxiety experience) influences user engagement by concentrating on what positive effects, if any, user engagement based on anxiety experience has on individual players, and provide a guideline

including a dynamic guidance model for online game mechanics design based on this phenomenon and individual game users' personality traits related to social preference. While evidence suggested that in the East Asian digital gaming market, even if a game causes people to feel stressed or nervous, instead of quitting games, some of the core users would devote more consumption including time and money to the game-inducing unpleasant experience[7]. In Western game user research, Juul similarly focuses on this phenomenon and argues that players will promote positive engagement behaviors to a certain extent in response to negative in-game feedback (e.g., failure or death in a game level) [8]. This study seeks to further scholarly understanding of this phenomenon by focusing on the popular game users.

2. Literature Review: User Engagement in Game Experience

The user experience, as defined by the international standard on ergonomics of human-system interaction(ISO9241), encompasses the perceptions and responses that users have during and after the use of a system, product, or service. Sutcliffe argues although the ISO standard does not explicitly delineate the relationship between user experience and usability, it acknowledges the overlapping nature of these concepts. Compared with usability of the product, which focuses on pragmatic aspects of task completion, user experience encompassed both pragmatic and hedonic aspects, influencing users' feelings towards the system[9].

In the realm of game design and development, the evaluation of user experience has been a focal point for designers over the past two decades Game experience, a multidimensional concept, encompasses various aspects of user engagement, satisfaction, and enjoyment when interacting with video games[10]. Researchers share varied opinions about the definition of game experience. The preview study provides insights into user experience within the context of game design, emphasizing its significance in shaping player engagement, enjoyment, and retention. Key elements such as interface design, game- play mechanics, and player feedback contribute to the overall game experience. Bernhaupt describes game experience through qualities such as flow, engagement, presence, immersion, and fun[11].

The understanding and definition of game experience hold great importance for game designers, researchers, and practitioners seeking to create immersive and meaningful gaming experiences[12]. Recognizing the role of experience in game design is integral to the development of successful games, and this understanding serves as an essential component of the game design process[13]. Simultaneously, research on game engagement is another significant factor of high frequency interest for game designers. Consensus on the precise terminology to describe the subjective experience of playing video games has yet to be reached, as noted by Wirth et al[14]. To measure game engagement, numerous valuable perspectives shed light on how concepts such as presence, flow, arousal, participation, and others contribute to or constitute engagement [15]. Considering the above conditions, this study will employ the term "game engagement" as a broad indicator of individuals' level of involvement in gaming activities, serving as a generic descriptor, including users' cognitive, affective and behavioral states[16].

From the perspective of cognitive engagement in game, which can be summa- rized as the level of dedication a player exhibits towards gaming activities [17], researchers indicate that a deeply engaged player is completely absorbed in the game and remains unaware of their surroundings, referring immersion and flow as key concepts frequently explored in research concerning game engagement. Affective engagement, or emotional engagement in game refers game narrative that trigger emotions in the player, emphasizing the significance of self- congruency with the game content[16]. Affective engagement always relates to fiction layer in game contains narrative, visual and audio designed to allow player to evoke emotional experience, and builds an emotional

connection between game characters, the game world, and players[18]. For example, Song and Fox's study demonstrated the association between consumption of romantic media and romantic beliefs. They investigated romantic video game (RVG) and Chinese young women users and found that the amount of time spent playing RVGs predicted these women's romantic beliefs indirectly[19].

Behavioral engagement in game closely related to user interaction including social connection and playful consumption experience in games[16]. Cheung revealed that the extent of monetary expenditure in online games is deter- mined by users' game behavior[20]. Previous research indicates that factors that influence user in-game consumption include but are not limited to users' game narrative preference[21], game design and the quality of games are also significant factors affecting the audiences' cost in the new media[22]. For example, Liu notes that if the media content is unavailable to benefit the user because of the competitive mechanism in the game, the user will reduce or stop playful consuming in the game[21]. Another example is micro-payments in free online games could minimize users' awareness of the actual investment made in the game and made users lost control of their spending[23].

To inquire how negative user experience affect user engagement, it is significant to analyze what is negative user experience. For example, electronic games could also increase users' negative emotions. In Reinecke's research, he found that ego depletion may increase the risk of negatively appraising the use of video games entertaining media as a form of procrastination. He concluded that guilt is negatively related to the recovery experience associated with using entertainment[24]. Another line of research paid close attention to the impact of video game violence on players' underlying psychological processes. Rothmund investigated the psychological processes underlying short- and long-term effects of video game violence on interpersonal trust with two studies. The study investigated the long-term impact of frequent exposure to video game violence and suggested that videogame violence can decrease interpersonal trust and victim sensitivity among teenagers. Rothmund also contended that interacting with physically aggressive virtual agents would decrease players' trust in subsequent interactions in the game[25].

Thus, the motivation and experience of interacting with this type of media content in digital game might be negative, and the inquiry into the potential consequences of negative experiences on the engagement levels of media users remains an area that has received limited attention and exploration. Most results support the same idea: the quality of user experience is positive related with user engagement[20]. However, Juul mentioned the paradox in the game study: "Players like to fail, but not too much" (p.5) [8]. Developers also tried to keep the balance of difficulty in the game to put users in the psychological state of flow[4]. These evidence indicate that negative user experience can also improve user engagement and bring benefit to game industry. The ideas of sportsmanship and other hypotheses are mentioned by Juul to explain why the paradox existing, but Juul did not give a firm conclusion. At the same time, Juul notes that researchers tend to acquiesce to this phenomenon in their studies without explaining the paradox of failure[8]. Therefore, the role of negative user experience in promoting user engagement remains to be further studied.

Two core research questions are formulated for this study, the first question is designed for the quantitative research method, and the second question will be explained by qualitative research methods. Hypothesis 1 examining the relationship between negative user experience and game involvement. The hypothesis for the second research question will focus on personality features.

Research questions and hypotheses will be studied as follow:

RQ1: Will users promote engagement if the game brings them anxiety-inducing game experience?

H1: User engagement is positively related to users' anxiety-inducing game experience.

RQ2: How do users promote engagement when they meet anxiety-inducing game experience?

H2: User engagement with anxiety is influenced by social preference and in-game process.

3. Methods and Study Design

3.1 Research Target and Participants

The research participants are users of multiplayer online battle arena (MOBA) as well as role-playing game (RPG). As a popular type of online game, MOBA games focus more on adversarial combat between players[26], while massive multiplayer online role-playing games (MMORPG) involve both player interaction with the fictional layer of the game world and encourage cooperative interaction between players[27].

Commonly, a MOBA game player will control the character in a team to compete versus another opposing team. To defeat the players on the enemy team and their primary structure, players in the same team should cooperate to improve their characters' level that contribute to a team's overall strategy[26]. As one of the most popular game types, MOBA games with significant economic growth in recent 10 years can be utilized as research subject to study the connection between user experience and user engagement. For example, Tencent 2019 third quarter results show that online games income is 28.604 billion yuan, up 11% from a year earlier, mainly because the domestic and overseas market of mobile MOBA games such as Arena of Valor. Therefore, as a popular MOBA game with a wide range of users and good market revenue, Arena of Valor and its players were used as the research subject at the beginning of the first round of prediction.

The primary goal of MMORPG's players is the development of their character. The players who focus on roleplaying will develop extended, in-depth narratives by using the setting and resources in the game world[27]. Compared with players of MOBA games, MMORPG's players will have more interaction with Non-player characters (NPC) in the game to complete tasks and missions. MMORPGs also require players to participate in teamwork to develop their char- acters' level of ability[28]. The online games that emphasizes the interaction between player and non-player resources are the appropriate subjects which can be utilized to study the virtual relationship between players under the premise of non-competition and the parasocial relationship between player and NPCs. One of the examples is Final Fantasy XIV (FFXIV). According to Imagine Games Network(IGN) , the latest version Shadowbringers was up to the sore of 92 in 2019. As one of the most critically acclaimed MMORGPs in the world, FFXIV and its players were used as research subjects in the second round of tests.

3.2 Study Design and Procedures

This study utilized a two-round pretest methodology, employing online surveys, quasi-experimental observation, and in-depth interviews as the primary methods. The online surveys and quasi-experimental design were employed in the pretest and subsequent testing phases to assess the correlation between negative user experiences, specifically anxiety-inducing encounters, and user engagement. Furthermore, the in-depth interviews were conducted to delve deeper into understanding and elucidating the specific behavioral consequences and cognitive processes associated with negative user psychological experiences, thereby exploring the underlying reasons behind these effects on user engagement.

A total of 436 web-based questionnaire data were obtained from the two rounds of pretests. The online survey consisted of items that measured the psychological wellbeing, beliefs, and behaviors of gaming. The Likert scale was employed in the design of the questionnaire, which aimed to gather data pertaining to key variables of interest. The questionnaire items primarily focused on the following core constructs: game motivation (e.g., I take the matter of playing games very seriously.),the individual's tolerance level towards pressure arising from the in-game environment (e.g. Playing games increased tolerance for negative emotions such as anxiety.), the intention to

engage in positive gameplay (e.g. I don't give up when I encounter stress, dilemma, or failure in the game, but try to do it again.), the level of flow state (e.g. During the game, my actions come naturally and without thinking.), Consumption over expectation, and the duration of online game (in-game time spent).

Data for the quasi-experiment was collected from volunteers who met the research requirements. The researcher recruited total 26 respondents for quasi-experiment and in-depth interviews. The volunteers were divided into different groups based on game modes, game difficulty, and individual gaming habits. All volunteers were asked to take the Big Five personality test questionnaire before the start of the experiment to test for personality. During the course of the observation experiment, all participants were required to fill out and submit a daily observation report form which included information such as the number of wins and losses, the mode (easy or hard) in which participants competed, in-game consumption, and a Anxiety Inventory questionnaire aimed at gauging the players' stress levels during gameplay.

The Anxiety Inventory was combine with State Anxiety Inventory (SAI) and Test Anxiety Inventory (TAI). was designed as a section of the daily observation report. As a widely employed psychometric tool designed to assess state anxiety levels[29]. Its primary application extends to clinical contexts, where it aids in diagnosing anxiety disorders and distinguishing them from depressive syndromes. The Test Anxiety Inventory (TAI) offers a means to assess an individual's anxiety level in the specific test environment. By focusing on the individual's disposition towards anxiety in general, the TAI provides a comprehensive understanding of their text environment anxiety tendencies[30]. The SAI and TAI is frequently employed in research endeavors as a reliable measure to evaluate caregiver distress[31].

The first round of pretest used MOBA game Arena of Valor and their users, 10 people in total. Given that MOBA games are played in teams of five, a total of two teams comprising ten individuals were recruited. These participants were assigned two weeks of tasks: the first week entailed a relatively straightforward objective, requiring all participants to achieve seven victories in easy mode within one week. The second week posed a more challenging task, with volunteers expected to achieve three victories in hard mode daily as part of their daily routine. Aside from the prescribed tasks, participants were granted autonomy to determine whether or not they would engage in additional game- play. Nonetheless, the frequency and duration of gameplay were meticulously recorded in the daily observation report. During the data collection process, a total of three instances of invalid data were encountered due to factors such as failure to complete assigned tasks and unreliable responses in the psychological test questionnaire.

For the second-round pretest, the MMORPG FFXIV and its user base were employed. Given that FFXIV quests are undertaken by a group of 8 players, a total of 16 individuals were recruited for this stage. The participants were divided into two distinct groups: the experimental group and the control group. Both groups were tasked with completing specified trials (i.e., 8-player quests) from FFXIV's new expansion pack, "ENDWALKER", within a one-month timeframe. The experimental group was required to tackle the quests in hard mode, while the control group was assigned the easy mode. Additionally, all group members were expected to engage in team practice sessions at least once a week. Apart from the quests, no restrictions were imposed on game time or in-game expenditures. Following each gaming session, participants were required to complete a daily observation report form, similar to the one used in the initial pretest phase. This form encompassed aspects such as game-related behaviors, specific durations of gameplay, and in-game expenditures. Responses of these groups were analyzed and compared using t-tests for correlation coefficients and ANOVA. All the quantitative data collected from the survey was analyzed using statistical packages in SPSS, including both descriptive and predictive analyses.

During the in-depth interview session, an online instant messaging service was utilized to contact

interview participants, because it allowed the researcher to reach a wide geographic area and ensured the interviews were able to "take place at the respondents' convenience" (p. 252) [32]. Throughout the interview, the researcher talked about game experience with the interview participants to establish rapport with participants. Each interview was conducted in person or via Skype and lasted about one hour. The interviews covered various topics, such as how participants got involved in the game, their anxiety experiences of playing the game, their views on violence in the game, their perception of game addiction, and their justifications for spending money and time on the game. Discourse analysis was adopted to examine the thematic content and salient frames in the interview transcripts. In addition to the survey and interviews, participant observation was used as a means of understanding gamers' experiences.

4. Result and Discussion

4.1 Round 1 Test Result

Working with data collected from Round 1 pretest, the researcher conducted linear regression analysis to successfully support the hypothesis proposed: User engagement is positively related with the anxiety the users feel while playing the game over a certain range. Specifically, the linear regression analysis result showed that there was a positive correlation between the anxiety level and positive engagement behavior of the participants in the online survey questionnaire (R = 25.4%, F = 16.356, p ¡0.01), with the formula Y = 0.679 + 0.632X, where Y represents the dependent variable, i.e., the positive engagement behavior, and X represents the independent variable, i.e., the anxiety level. The result indicates that X has a significant positive influence on Y, supporting the hypothesis that user engagement is positively related with the anxiety the users feel while playing the game over a certain range. Furthermore, the researcher set the classification problem "I will not give up when I suffer from stress, difficulty, or failure in a game" in the online survey questionnaire to divide participants into two different groups: a low score group (who prefer to disagree with the description) and a high score group (who prefer to agree with the description). During the test, the participants in the high score group showed more positive reactions than the low score group in game behavior, game consumption, game attitude, and flow statement in game.

In summary, the data from the Round 1 pretest and subsequent analysis support the hypothesis that user engagement is positively related to the anxiety users feel while playing the game over a certain range. The findings also suggest that users who have a higher tolerance for negative emotions and are less likely to give up when facing stress, difficulty, or failure in a game tend to exhibit more positive engagement behavior.

The interview focuses on the motivations, emotions, and behaviors of players in a specific game. The data present a summary of the themes that emerged from the analysis of players' responses during the conversation. The responses were categorized into different groups based on common themes. One theme that emerged from the responses was the players' motivation to play the game. The players' reasons for playing the game included social needs, sunk costs, game content, and convenience. Another theme that emerged was the players' emotional experiences while playing the game. The emotions that players reported included somatization symptoms, feelings of aggrievement, fear, the desire to win the game, the desire to seek revenge on other players, and a sense of unfairness. The third theme that emerged was the players' behaviors in response to difficulties, dilemmas, or unpleasant experiences in the game. The players' responses were grouped into three categories: staying engaged, retaliatory behavior, and suspending the game. These findings provide insights into the motivations, emotions, and behaviors of players in this particular game, which could be useful for game developers and researchers studying player behavior.

4.2 Round 2 Test Result

Pretest Round 2 was conducted to investigate the relationship between tolerance for pressure from the in-game environment and intention of positive game engagement, as well as the relationship between intention of positive game engagement under pressure and time spent online (in-gametime), and the correlation between intention of positive game engagement under pressure and flow state level.

A linear regression analysis was performed on data collected from 436 participants, revealing that tolerance for pressure from the in-game environment had a significant positive influence on intention of positive game engagement (Y=3.214 + 0.223X, R=7.8%, F=36.540, p ρ0.01). Another linear regression analysis showed that intention of positive game engagement under pressure had a weak positive influence on time spent online (Y=2.959 + 0.005X, R=3%, F=0.720, p ρ0.05). A correlation analysis revealed that intention of positive game engagement under pressure had a positive correlation with flow state level (Pearson correlation coefficient, N=436). This study also included observational data (Figure 1) (Figure 2) in the form of State Anxiety Inventory (SAI) scores for all participants, with 8 in each of the control and experimental groups. The State Anxiety Inventory (SAI) measures anxiety levels that fluctuate over time. The control group had an average SAI score of 29 and average expenditure of 44.28, while the experimental group had an average SAI score of 36 and average expenditure of 63.43. These results suggest that the experimental group experienced higher levels of anxiety but also spent more time and money on the game compared to the control group.

Sample No.	C1	C2	C3	C4	C5	C6	C7
TAI	45	34	57	50	53	51	44
SAI	24.5	28	43.5	27.4	27.25	25.25	26.75
Expending	39	98	0	30	45	98	0
Gate	Raid 1-4	Raid 1-4	Raid 1-4	Raid 1-4	Raid 1-4	Raid 1-4	Raid 1-4
Big Five							
O	34	23	17	26	33	32	30
C	37	30	31	32	37	34	19
E	15	17	19	15	22	12	22
A	34	24	23	33	37	36	24
N	22	11	16	9	8	18	8

Figure 1: Observational Data 1

Sample No.	E1	E2	E3	E4	E5	E6	E7
TAI	49	40	50	46	42	50	49
SAI	43	44	43	36	26	40	28
Expending	45	0	128	50	98	98	25
Gate	Raid(Savage) 1-4	Raid(Savage) 1-4	Raid(Savage) 1-4	Raid(Savage) 1-4	Raid(Savage) 1-4	Raid(Savage) 1-4	Raid(Savage) 1-4
Big Five							
O	24	18	21	29	34	29	18
C	30	38	35	28	22	34	18
E	9	11	15	16	30	15	16
A	38	32	32	14	36	38	20
N	17	11	18	16	14	16	10

Figure 2: Observational Data 2

The data obtained from the interviews underwent text analysis using the gestalt personality theory as a framework for analysis. According to gestalt personality theory, researchers divide in-game stressful situations into long-term and short-term ones, and setup coordinate axes with players' personal achievement tendency and social tendency to analyze the information provided by the volunteers in the conversation.

Findings indicate that when confronted with a long-term dilemma, individuals with a preference for personal achievement are more inclined to express their inclination to discontinue the game, while those with a preference for social achievement are more likely to report their efforts to overcome the challenge. In contrast, when dealing with a short-term dilemma, individuals with a personal achievement tendency tend to describe their behaviors as repetitive practice and attempts to take control of the situation, while those with a social achievement tendency typically engage in social withdrawal. (Figure 3)

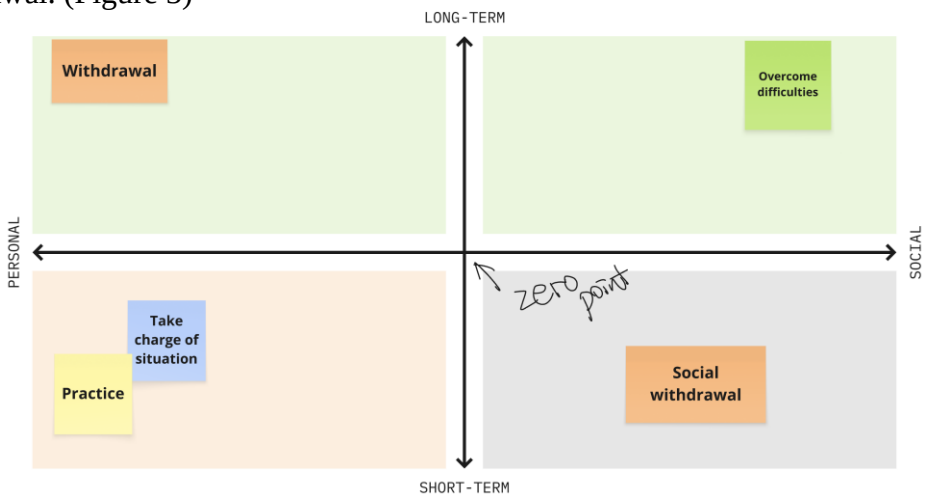

Figure 3: Discourse Analysis Result

5. Discussion and Conclusion

5.1 Psychological Concept Framework

According to the statistical and discourse analysis result section, the research question were answered as: User engagement is positively related to users' anxiety-inducing game experience, while User engagement with anxiety is influenced by social preference and in-game process. Thus, current study incorporated personality factors as variables to enhance the investigation of players' conduct within the anxiety effect, which indicated efficient.

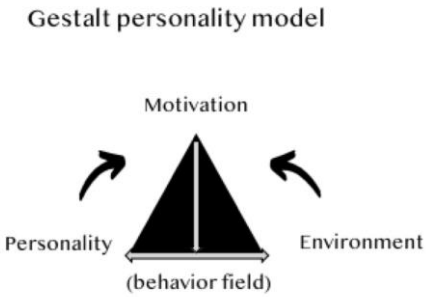

Figure 4: Gestalt Psychological Model

To conclude the dynamic relationship between user personality, game design content, and anxiety effect in one model, the Gestalt psychological model (Figure 4) encompassing personality, environment, motivation, and behavior, was employed to elucidate and analyze the performance and psychological state of game participants under stress-inducing factors.

Gestalt psychologists emphasize that organisms perceive holistic patterns or configurations

rather than isolated com- ponents, encapsulating the notion that ”the whole is more than the sum of its parts”(p.13) [33]. Within Gestalt psychology, the behavior field is perceived as a dynamic model comprising two poles: personality and environment. An imbalance in the relationship between the individual and the environment leads to tension("anxiety" in this study) and polarity. Once an individual’s goals, including motivation and needs, are fulfilled, the tension diminishes [34].

Except the tension(anxiety), the other two factors in the Gestalt personality model, environment and personality, also involve different theoretical perspectives of analysis, respectively. For the purpose of personality analysis among game users, the current study employed the Big Five personality model. Originating in the 1980s, this model, serves as a suggested classification system for personality traits, facilitating an understanding of the interplay between personality and behaviors[35]. Within this model, five distinct personality traits are included: Openness, conscientiousness, extraversion, agreeableness and neuroticism[36].

The Big Five personality model has been extensively employed in previous research to analyze the behavioral and psychological aspects of game users and consumers in different environments. For instance, Chu demonstrates that the extraversion of game players amplifies the impact of perceived usefulness of virtual environments on players’ intention to use[37]. Deng and Gao investigate the influence of the Big Five personality traits on impulsive buying, as well as the potential mediating roles of self-control and sensation seeking. Their findings indicate significant correlations between all five traits and impulsive buying behaviors. Furthermore, extraversion (exerting a positive effect) and conscientiousness (exerting a negative effect) exhibit the most substantial influences on impulsive buying. Self-control and sensation seeking emerge as crucial mediators between the Big Five personality traits and impulsive buying tendencies[38]. Similarly, de Hesselle employs the motives for online gaming questionnaire and reveals that lower levels of extraversion, agreeableness, and conscientiousness, as well as higher engagement in gaming for social, escapism, and competition motives, predict increased time spent gaming when age, gender, personality traits, and gaming motives are considered as predictors in a multiple linear regression model[39].

By mapping the test variables and their statistical relationships onto the psychological framework, a final psychological picture can be drawn: player anxiety in games is jointly influenced by both game design content and individual personality traits. This anxiety-driven tension, once established, becomes a key factor in shaping player engagement.

Therefore, as a basic model that allows re- searchers to simultaneously observe players’ behavioral changes, motivations, and game design content, the Gestalt personality model can help researchers clearly establish a dynamic psychological modeling framework to describe and evaluate players’ behaviors under stressful situations, thus deepening the findings of the positive feedback of the anxiety effect on the players, and constructing a cyber-psychological perspective for game designers to design a guidance system for optimizing the difficulty of the mechanism for the user’s experience and engagement.

5.2 Anxiety Triggered Model in Game

In conclusion, based on the analysis of data from earlier pre-tests and follow-up studies, there is substantial evidence that anxiety effect, limited mechanics design, content design, and personality are all modules that significantly influence player engagement.

Using the Gestalt model’s psychological perspective as an innovative theoretical framework, this study integrates these elements into the ATEO model: the anxiety effect corresponds to tension; limited mechanics and content design correspond to the individual’s environmental polarity; and personality corresponds to personality polarity. These relationships collectively establish the

foundational structure of the Anxiety-Triggered Engagement Optimization Model (ATEO).

Within this Gestalt-based framework, the empirical findings are synthesized into a dynamic cyberpsychology model driven by anxiety. This model centers on auxiliary observation and defines the internal psychological and cognitive factors that shape the player's experience. It serves as a practical design tool for game developers.

Furthermore, under the theoretical lens of media psychology, the model provides strategic guidance by mapping how game design elements impact the player's psychological experience, thus bridging experimental insight with real-world application in design practice. (Figure 5)

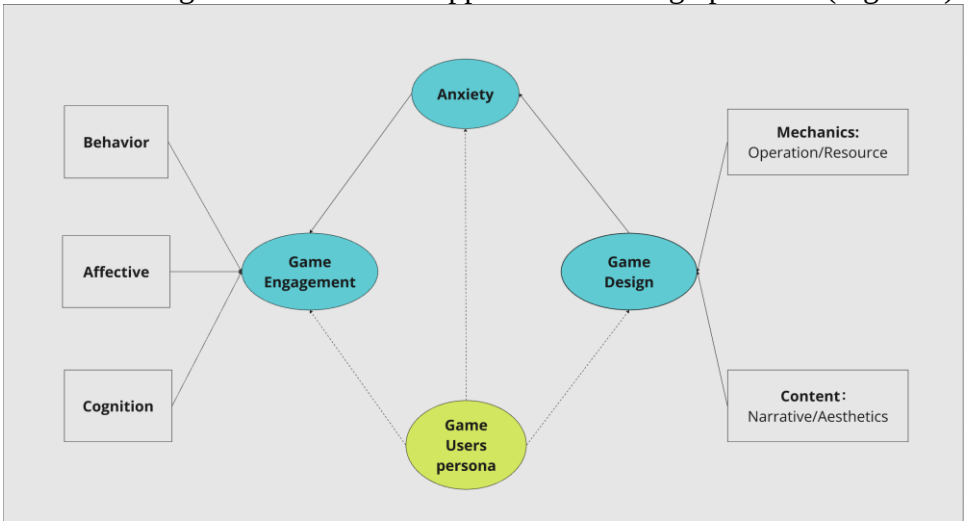

Figure 5: Anxiety Triggered Model

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