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計畫名稱：以一日經驗重建法探討遊戲玩家與遊戲設計者的心流與情緒
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中文論文題目：青少年從事網路遊戲的動機、玩興及其對活力與自尊的效果

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Abstract

The authors report their results from two studies in which they used self-determination theory (SDT) to investigate adolescent motivation and playfulness when playing online games and the effects of those factors on vitality and self-esteem. In the first study, 105 grade 6 Taiwanese students were asked to complete a questionnaire of motivation and playfulness levels while playing online games. The results of exploratory factory analysis suggest that three factors accounted for the participants' in-game (state variable) motivation: competency, autonomy, and relatedness. A correlation was found between the students' playfulness *trait* and in-game playfulness *state*. Results from a regression analysis indicate that the students' in-game motivation successfully predicts their playfulness, vitality, and self-esteem. In the second study, 363 junior high school students were asked to complete a questionnaire

designed to measure their in-game motivation, playfulness, vitality, and self-esteem. Their response also suggest that in-game motivation has positive effects on both in-game state of playfulness and self-esteem, as well as a significant impact on subjective vitality as mediated by in-game playfulness.

Keywords: Online games; motivation; playfulness; self-determination theory; vitality.

1. Introduction

Online games and online communities are among the fastest growing forms of human recreation[1], with annual revenues from video games worldwide surpassing those of the film industry[2,3]. Online game playing now represents a significant and rapidly expanding segment of daily media usage among children and adolescents[4,5]. Young adolescent boys are especially active digital game players[6], and are therefore attracting research attention on the topic of playfulness and what Webster and Martocchio[7] call "human-computer interaction." Online games per se have many features that encourage states of playfulness, such as providing rich immediate feedbacks to player actions, ease-of-use, and adjustable game levels which is able to meet individual users' dynamic skill development. Some Researchers focus on the negative effects on online games[8], but many adolescents regard online games as relaxations and the gateway to seek pleasure and satisfactions. Adults often pay attention to long term effects on online games, but players seek immediate, short term release from schoolwork. Furthermore, playfulness is a human innate disposition and online games replace the toy for adolescents to

seek joys.

Players must have fun in playing online games so that they continuously participate in this kind of activities. What causes the feeling of fun (playfulness) in playing online games? For Chung and Tan[9], they propose the most relevant antecedents of perceived playfulness are users' intrinsic motivation rather than features of the software. With respect to gaming, researchers have explored a variety of individual motives, including social interaction motive[10]; achievement, social, and immersion motive[3]; or competition, challenge, fantasy, and interest in games[11]. Researchers have also identified various motivation categories based on theory of Information and Management, such as WWW acceptance[12]. Nevertheless, little attention has been given to understand intrinsic motivation in playing games. Among rare attempts, only Hwang's[13] as well as Wan and Chou's[14] applied flow theory[15] to investigate the psychological motives of online gamers.

Jansz and Tanis[10] argue that the decision of playing games, rather than doing home works, watching TV or participating other activities, is a conscious determination. Media use, such as selecting and playing game has long been conceptualized as an active, goal oriented behavior. Following the same trend, Ryan, Rigby and Przybylski[1] have applied self-determination theory (SDT) to study the motivational "pull" of online games, and found that personal needs for autonomy, competence, and relatedness, three factors of intrinsic motivation, significantly predict enjoyment and future game play. Players enjoy a game and

decide to play that game again when they have free will to play

In line with previous studies, the authors suggest that players have both free will and self-determination. As part of this project we will examine antecedent motivation factors based on SDT.

There continues to be debate among scholars about the potential negative effects of playing computer games, including increased tendencies toward aggression[8] and lower psychological well-being[5]. The literature also contains evidence in support of the psychological benefits that can be derived from game experiences, including perceived self-efficacy (meaning the perception of power over one's environment[16]) and enhanced self-esteem[1]. The two studies described in this paper look at two potential benefits: enhanced vitality and self-esteem. The research has three parts: (a) using Deci and Ryan's[17] SDT (entailing autonomy, competence, and relatedness) to construct questionnaires for measuring motivation and playfulness, subjective vitality, and self-esteem; (b) performing a regression analysis using the three variables to determine the predictive strength of motivation; and (c) using a structural equation model to examine our online game playfulness and motivation model.

2. Related Studies

2.1 Playfulness

Lieberman[18] was among the first to define and use the concept of *playfulness* as a

characteristic of game players. Based on data collected from preschool teachers, she identified five components of playfulness: (a) physical spontaneity, referring to levels of coordination and motor activity; (b) social spontaneity, meaning the quality of interactions among children at play; (c) cognitive spontaneity, representing the quality of children's imaginations when playing and the degrees to which children assume character roles, create their own unique games, or adopt unconventional objects while playing; (d) manifest joy, meaning the degree to which children express enthusiasm, exuberance, enjoyment, lack of restraint, and vocalization while playing; and (e) sense of humor, referring to the joking, teasing, and clowning behaviors that are characteristic of children at play.

Researchers have identified two specific playfulness categories. The first, *computer playfulness*[19], refers to an individual's tendency to interact spontaneously with a computer. Hackbarth et al.[19] created this concept based on suggestions from Webster and Martocchio[7] and Woszczynski, Roth and Segars[20] that playfulness in computer interactions should be measured as both a state and a trait; the latter may be treated as a motivational characteristic. The second, *microcomputer playfulness*[7] (MCP) is a situation-specific characteristic representing a type of intellectual or cognitive playfulness. MCP refers to an individual's tendency to interact with computers in a spontaneous, creative, imaginative, and of course, playful way. Potosky[21] and Woszczynski et al.[20] have demonstrated that computer playfulness is a relatively stable trait.

The majority of research on playfulness as an interactive state is based on Csikszentmihalyi's [15] *flow theory*, which describes a state frequently experienced by people who are completely engaged in and/or by their favorite activities. In terms of human-computer interaction, the flow experience occurs when users become so absorbed in a situation-specific activity that they lose track of time[20]. Wan and Chiou[14] indicate that flow state is negatively correlated with addictive inclination and it was not a significant predictor for players' subsequent additive inclination.

Moon and Kim[12] regard playfulness as a new factor that reflects the user's intrinsic belief in WWW acceptance. They have identified three dimensions of perceived playfulness: concentration (the extent to which users perceive that their attention is focused), curiosity (the extent to which users are inquisitive about an interaction), and enjoyment (the extent to which users find an interaction fun or interesting). They use playfulness as an intrinsic motivation factor to investigate user's acceptance of www. The authors suggest that players' motivation is antecedent to their playfulness state. So the related studies of gaming motivation are introduced in the following section.

2.2 Gaming motivation

Jansz and Tanis[10] and Lucas and Sherry[11] list players' motivations as competition, challenge, social interaction, fantasy, and interest in a game. Bartle[22] identified four types of online game players as killers, achievers, socializers, and explorers, with each category

defined in terms of two behavioral dimensions: (a) acting on versus interacting with game elements, and (b) focusing on other players versus focusing on the virtual world. In his studies of Massively Multiplayer Online Games (MMOGs), Yee[2,3] used a factor analysis to identify three kinds of players: achievement players who focus on gaining power within a game through mastery and competition, social players who are more interested in interacting with others and developing in-game relationships, and immersion players who have a strong desire to escape into virtual worlds by engaging in role-play and becoming part of a storyline.

From the perspective of human psychology, motivation represents the inner drive of an individual and a force that compels individuals to act. Wan and Chiou[14] have demonstrated that the psychological needs of online gamers resemble a two-factor construct consisting of satisfaction and dissatisfaction dimensions. They also used two-factor theory to examine player flow states during online games. Self-determination theory[17] addresses intrinsic and extrinsic factors that either facilitate or undermine motivation. Intrinsic motivation represents engagement in an activity for its own sake, while extrinsic motivation represents engagement to obtain an outcome that is separate from the activity itself. Arguing that a true theory of motivation should not focus on behavioral classifications that can be constrained by the structures of particular games, Ryan et al.[1] applied self-determination theory to players while they made choices between gaming products as well as to players "in character" in specific gaming contexts. In their research, Jansz and Tanis[10] emphasize active roles that are largely

determined by an individual's motives. Bartle[22] takes the position that players typically play games for one of two reasons: the games are intrinsically satisfying, or the players are seeking "fun." According to the intrinsic motivation component[17] of self-determination theory, a combination of contextual factors, events, and conditions enhance an individual's sense of autonomy, competence, and relatedness. Autonomy represents a sense of volition or willingness when performing a task. Factors that enhance autonomy (and, in turn, intrinsic motivation) include provisions for choice, the use of rewards as a mechanism for informational feedback rather than behavior control, and non-controlling instructions. A specific example is computing autonomy—a composite of confidence in controlling computers and self-reliance when using them[23]. The large majority of gamers play according to their own free will. The most popular online games provide multiple means of playing and give immediate and continuous feedback in the form of game points or status promotion.

According to Deci and Ryan[17], a sense of competence entails a need for challenge in addition to feelings of what White[24] called *effectance motivation*. Bandura[16] used the term *perceived self-efficacy* when discussing individual perceptions of having control over or being able to perform certain tasks that require special abilities. More recently, Charlton[23] has developed measures of perceived control in the computing domain. Online games offer a context for players to compete with others and to show their abilities by controlling character avatars and building skills within consistent and ongoing game worlds. Rewards consist of

money, items, and experience points, which in turn give players access to scenarios in which they can further improve their skills and achieve new levels of proficiency.

Relatedness refers to a feeling of connection with others. Many online games are specifically designed so that players join groups and interact with each other in order to overcome team challenges (e.g., battles and sieges). Other players join bulletin boards or other forms of online gathering places to discuss gaming issues. Many online relationships correspond to real-world connections. When looking at this concept, Jansz and Tanis[10] used a regression analysis to show that the social interaction motive is one of the strongest predictors of time spent gaming.

Ryan et al.[1] utilized the intrinsic motivation component of SDT to study player motivation and changes in well-being, and found that it is a strong predictor of player motivation. However, they also observed that long exposures to gaming are either draining or fatiguing—in other words, extended game play exerts negative effects on vitality. Therefore, we will adopt SDT to study the connection between intrinsic motivation and playfulness of online gamers.

2.3 Vitality

Ryan and Frederick[25] believe that experiences of vitality specifically refer to energy that emanates from the self, and regard it as both subjective and a reflection of physical and psychological wellness. Subjective vitality is defined as a state of feeling alive and alert—in

other words, having energy available to the self. Ryan and Deci[26] consider vitality to be a major factor in what it means to be fully functioning and psychologically healthy. Ryan and Frederick[25] developed their own scale to assess an individual's state of subjective vitality. The concept is assumed to have a negative relationship with physical pain and a positive relationship with the amount of autonomous support found in a particular situation. We adopted their scale for the present research.

2.4 Self-esteem

The term *self-esteem* refers to a stable sense of personal worth or worthiness that is measurable via self-report testing[27]. The concept is problematic in that it is sometimes difficult to distinguish self-esteem from other constructs such as narcissism or bragging. Regarding online gaming research, Ferng[28] has found direct and negative relationships between strength of electronic game addiction and health, self-esteem, and interpersonal relationships. Tung[29] also gives evidence indicating that players who are addicted to online games are at greater risk of having low self-esteem and negative emotions. Although some scholars argue that extensive online gaming can lead to negative results such as addiction, reduced levels of psychological well-being, lower self-esteem, and impoverished personal relationships[8,28,29], we will investigate the potential for positive benefits such as increased psychological well-being and increased physical vitality.

3. Study 1

3.1 Research Questions

3.1.1 Do players' in-game motivation successfully predict in-game playfulness? What factors of players' in-game motivation can successfully predict in-game playfulness?

3.1.2 Do players' in-game motivation and playfulness successfully predict vitality once stop playing an online game?

3.1.3 Do players' in-game motivation and playfulness successfully predict self-esteem after online gaming? What factors of players' in-game motivation and playfulness successfully predict self-esteem after online gaming?

3.2. Method

We developed a questionnaires consisting of items designed to collect demographic information, online game playing habits, and playfulness both as state[12] and trait[7]. The instruments contained scales associated with in-game intrinsic motivation, in-game playfulness (state), a game playfulness trait, subjective vitality, and self-esteem. The in-game intrinsic motivation scale consisted of three subscales: in-game competence, in-game autonomy, and in-game relatedness. Responses to all items were given along a 5-point Likert scale (1 = "strongly disagree," 5 = "strongly agree"). Specific descriptions of each scale follow.

In-Game Intrinsic Motivation. The first subscale in this section consisted of five items

designed to measure in-game competence—that is, a study participant's perception of whether the game being played provided a challenging but not overwhelmingly difficult experience[1]. Example items are "I feel very capable during the game" and "the game is challenging but not overwhelming."

The second subscale consisted of five items designed to measure in-game autonomy, meaning the degree to which participants felt free play a game according to their own wishes and perceived opportunities to take part in activities that interested them[1]. Examples include "I play online games because they interest me" and "I feel controlled and pressured when playing online games" (reverse scored).

The third subscale consisted of six items designed to measure in-game relatedness, meaning a sense of feeling connected to other players of the same game. Examples include "I find that the relationships I form in the context of a game are fulfilling," and "Because of playing with the group, I feel the game become funny."

In-Game Playfulness (state). To create this scale we relied on research conducted by Moon and Kim[12] on three characteristics of perceived playfulness: concentration, curiosity, and enjoyment. The 8 items were modified from Ahn, Ryu & Han's [30] "web users' playfulness scale" to fit the online gaming context. Sample items include "Once I start playing the game, I am often unaware of outside noise" and "Online games always capture my curiosity.

Game Playfulness Trait. This scale, consisting of 22 items and a 7-point microcomputer playfulness adjective checklist, was originally developed by Webster and Martocchio[7]. We modified their work to fit the online game. Participants were asked to select adjectives to describe subjective feelings for the game they were playing or characteristics of that game.

Subjective Vitality. The items were modified from Ryan and Frederick's[25] scale "Subjective Vitality State" to assess the participants' perceived experiences of energy and aliveness after their stop playing the online games. An example of the 6 items is "I feel energized right now."

Self-Esteem. For this part of our instrument we adopted Rosenberg's[31] 10-item Self-Esteem Scale, which was originally constructed to measure global feelings of self-worth or self-acceptance among adolescents. Our primary modification was to change the original four-point response scale to a five-point scale to maintain consistency with the other sections of the instrument. A sample item is "I am able to do things as well as most other people."

3.3 Participants and Procedure

Our participant sample consisted of 132 6th graders approaching graduation time in a northern Taiwan primary school were recruited as subjects. The all subjects had experience playing *Kart Rider*, the most popular online game among students in that age range according to surveys conducted in Taiwan at that time (http://tw.games.yahoo.com/). Game tracks are

divided into three categories: speed, item, and flag. Players can compete as individuals or as teams consisting of two or more players.

For data collection, the participants' teachers gave them permission to play *Kart Rider* for 20 minutes,and then instructed them to spend the subsequent 15 minutes completing the Web-based study questionnaire. A total of 132 questionnaires were collected. 27questionnaires were deemed unusable for reasons such as leaving too many items to answer. According to the 105 usable questionnaires, 51 of the respondents were male, 54 female. Just under half (52, or 49.5%) had 1 month of experience playing *Kart Rider*, 44 (41.9%) had between 2 and 6 months of experience, and 9 (8.6%) students had between 7 and 12 months of experience. The majority (56, 53.3%) reported spending less than 7 hours per week playing online games, 30 (28.6%) spent between 8-16 hours, and 19 (18.1%) more than 16 hours.

3.4 Exploratory Factor Analysis and Reliability Coefficients

In-game intrinsic motivation. As with all of the scales used in this research, the 16 items for this specific scale were validated by factor analysis using principal axis and varimax rotation methods. One item was deleted due to its low factor loading. Our results indicate that the 3 subscale factors (relatedness, autonomy, and competence) explained 49.91% of total variances. The reliability coefficients (Cronbach's alpha) were .82, .85 and .80 for the three factors, respectively, and .83 the entire scale.

In-game playfulness (state). Of the 8 original items, one was deleted because of its low

factor loading. Our results indicate that the single playfulness state factor explained 57.14% of total variance (Cronbach's alpha = .90 for entire scale).

Game playfulness trait. Of the 22 original items, 4 were deleted due to low factor loading. According to our results, the scale's 4 factors of game design, cognitive spontaneity, manifest joy, and sense of humor explained 49.91% of total variance. Three of the four factors: cognitive spontaneity, manifest joy, and sense of humor were named based on Lieberman's[18] work. Cronbach's alpha for the above-mentioned factors were .86, .81, .69 and .83, respectively, and .85 for the entire scale.

Subjective vitality. Of the 8 original items, 2 were deleted due to their low factor loading. Our results indicate that the scale's single factor (subjective vitality) explained 42.75% of total variance (Cronbach's alpha = .71 for the entire scale.

Self-esteem. None of the 10 original items were deleted. The scale's dual factors (positive and negative self-esteem) explained 42.68% of total variance. Cronbach's alpha for the two factors were .76 and .76, respectively, and .74 for the entire scale.

3.4 Criterion-Related Validity

The item "how much time do you spend playing *Kart Rider* per week?" was used to examine criterion-related validity for the in-game intrinsic motivation. The game playfulness trait scale[7] served as the criterion for examining the criterion-related validity of the in-game playfulness (state) scale[30]. Statistically significant correlations were noted between number of

hours playing *Kart Rider* per week and in-game intrinsic motivation (r=.204, p<.05) and between playful state and playful trait (r=.255, p<.01) (Table 1). The relationship between playful trait and number of hours playing *Kart Rider* per week was not statistically significant. Significant relationships were also noted between motivation and both playful state (r=.607, p<.01) and playful trait (r=.409, p<.01). The results indicated that the playful state could account for online games playfulness better than the playful trait in this study.

--Insert Table 1 about here--

3.5 Regression Analyses

As shown in Table2, results from a regression analysis indicate that in-game intrinsic motivation is a predictor of in-game playfulness, since it explained 36.2% of the total variance (F=60.03, p<.001).

--Insert Table 2 about here--

The three motivation factors were added to the regression using the stepwise method, with relatedness entering the regression before autonomy (Table 3); competence did not enter at all. These results concur with those reported by Jansz and Tanis[10], who found that motivation for social interaction was the strongest predictor of the amount of time spent gaming. Combined, relatedness and autonomy explained 38.8% of the total variance in predicting playfulness (F=33.997, p<.001)

--Insert Table 3 about here--

After inputting the motivation and playfulness scores, we found that both had predictive power for vitality, with motivation entering the model first (Table 4). Combined, the two factors accounted for 42.7% of the total variance (F=39.781, p<.001).

--Insert Table 4 about here--

Results from inputting playfulness and motivation into the regression show that playfulness is capable of predicting self-esteem but motivation is not (Table 5). Playfulness can predict playfulness, explaining 10% of the total variance (F=12.509, p<.01).

--Insert Table 5 about here--

Finally, results from inputting three motivation variables and the playfulness variable into the regression model show that only playfulness and competence motivation could be considered predictors of that characteristic(Table 6), explaining 12.5% of the total variance (F=8.406, p<.001) This finding agrees with Ryan et al.'s [1] data showing that in-game motivation by itself is an insufficient predictor of self-esteem. Furthermore, while our data show that the playfulness and competence can serve as predictors of self-esteem, together they explain only 10% of the total variance for that characteristic (F=12.509, p<.01). In other words, evidence showing that online games decrease player self-esteem is weak.

--Insert Table 6 about here--

The overall results from the regression analyses suggest that in-game motivation has predictive power for playfulness, vitality, and self-esteem. Building on Ryan et al.'s[1] assertion that motivation as a component of self-determination theory (SDT) can account for motivation among online players', our results suggest that SDT can be applied to player motivation, playfulness, vitality, and self-esteem.

4. Study 2

Study 1 results were incorporated into the design of the second study design. The two primary goals were: confirming the validity of the research instrument and identifying relationships among the variables. Our Study 1 results regarding playfulness factors did not agree with those reported by the original scale authors, Ahn et al.[30]. In addition, the study participants were limited in terms of game choice, and those restrictions may have affected their sense of autonomy as a motivating factor. We therefore recruited more participants for the second study to confirm the results of our factor analysis, and did not restrict their choice of online game. Also, even though our Study 1 regression analyses suggest that in-game intrinsic motivation is a predictor of both playfulness and vitality, the small number of participants (105) may have been insufficient for testing relationships among a relatively large number of complex factors. We therefore used a structural modeling approach to analyze relationships among all factors in Study 2, meaning that the variables could be depicted as a causally related network [32].

Results from the regression analysis in Study 1 were also used to establish the following hypotheses for Study 2 (Fig. 1):

H1. In-game motivation has a positive effect on in-game playfulness.

H2. In-game motivation has a positive effect on self-esteem.

H3. In-game motivation has a positive effect on subjective vitality as mediated by

in-game playfulness.

H4. In-game motivation has a positive effect on self-esteem as mediated by in-game playfulness and subjective vitality.

H5. In-game playfulness has a positive effect on subjective vitality.

H6. In-game playfulness has a positive effect on self-esteem as mediated by subjective vitality.

The hypothesis model is presented as Figure 1

--Insert Figure 1 about here--

4.1 Participants and Procedures

The Study 1 participant sample consisted of 100 6th graders from a primary school and 290 junior high school students in Taiwan. The final sample consisted of 363 students (217 male, 146 female) who handed in usable questionnaires. Of those, 59 (16.3%) stated that they had been playing online games for 1 month or less, 129 (35.5%) for between 2 and 6 months, 47 (12.9%) for between 7 and 12 months, and 128 (35.3%) for 1 year or more. In terms of hours spent playing per week, 150 (41.3%) reported 7 hours or less, 89 (24.5%) between 8 and 16 hours, 56 (15.4%) between 16 and 24 hours, and 58 (15.9%) 25 hours or more. A statistically significant difference in weekly playing time was noted between boys and girls (T=4.378, p<.001), with boys spending much more time playing than girls. These results

support Gentile and Walsh's[6] finding that early adolescent boys are especially active digital games players.

4.2 Questionnaires

In line with our goal of giving greater autonomy to the participants, the first item of the Study 2 questionnaire was "Write the name of the online game that you usually play every day. All of the following questions will be about that game and playing habits." Items for collecting background or demographic information and the scales for in-game intrinsic motivation, in-game playfulness (state), subjective vitality, and self-esteem were the same as in the Study 1 instrument, as was the five-point Likert response range. The Playfulness Trait adjective checklist scale was deleted. Scale score statistics are presented in Table 7. They indicated a statistically significant difference between male and female participants in the category of in-game playfulness: curiosity (T=0.16, p<.001), with males reported higher scores.

--Insert Table 7 about here--

LISREL software was used to estimate model parameters, standard errors, and overall fit indices[33]. Three types of fit indices were used to assess the model's overall fit: chi-square statistic, comparative fit index (CFI), and root mean square error of approximation (RMSEA). The chi-square statistic provides an asymptotically valid significance test of model fit. The values of the CFI range from 0 to 1, with values greater than .95 indicating an acceptable

model fit. Finally, the RMSEA is an index that takes the model complexity into account. The RMSEA for the Study 2 instrument was below the critical value of .08 for describing a modestly fitting model[34].

4.3 Structural Equation Modeling

Structural equation modeling was used to examine our online game playfulness model. Latent variables were in-game motivation (Motive), in-game playfulness (Playful), and subjective vitality (Vitality). Observed variables were in-game competence (Compe), in-game autonomy (Auto), in-game relatedness (Relate), concentration (Conce), enjoyment (Enjoy), curiosity (Couri), vitality1 (Vit1), vitality2 (Vit2), self-esteem1 (Est1), and self-esteem2 (Est2). We also examined estimated coefficients for causal relationships between constructs that validated the hypothesized effects. A covariance matrix of the variables is presented in Table 8.

--Insert Table 8 about here--

LISREL software was used to estimate model parameters, standard errors, and overall fit indices[33]. Estimated coefficients and their significance in the structural model are shown in Figure 2. The chi-square statistic for the overall fit model was 19.34 (df=31, p=.000, RMSEA=0.068 < 0.08), and values for the other fit indices were within acceptable rangers (CFI=.97, NFI=.95, NNFI=.96). Standardized estimates of path coefficients for all three measurement variables (representing causal effect magnitude) ranged from 0.26 to 0.88. Total

magnitudes of causal relationships take into account the direct and indirect (mediated) effects of latent variables on one another. Interpretations of absolute values are: < 0.1, small effects; ≈ 0.30, medium effects; > 0.5, large effects[35].

The data indicate that in-game motivation had significant direct effects on both in-game playfulness (thereby supporting H1) and self-esteem (thereby supporting H2); the magnitudes of each impact were 0.88 and 0.69. In-game motivation had a significant effect on subjective vitality as mediated by in-game playfulness (thus supporting H3); impact magnitude was 0.55. In-Game Motivation was not found to have a positive effect self-esteem on mediated by In-Game Playfulness and Subjective Vitality (Hypothesis 4). No positive effect was found for in-game motivation on self-esteem as mediated by in-game playfulness and subjective vitality, therefore H4 is rejected. However, a positive effect was found for in-game playfulness on subjective vitality, meaning H5 is supported (magnitude = 0.62). No positive effect was found for in-game playfulness on self-esteem as mediated by subjective vitality, meaning H6 is rejected.

The measure's composite reliability being 0.6 or higher, calculated as

$$Composite\ reliability\ of\ flow = \frac{\left(\sum L_i\right)^2}{\left(\sum L_i\right)^2 + \sum \mathrm{Var}(E_i)}$$

Composite variables were identified as motivation (0.62), playfulness (=0.68), subjective vitality (=0.82), and self-esteem (= 0.69)—all above the 0.6 minimum.

--Insert Figure 2 about here--

5. Discussion and Conclusion

According to the study 1 results, three factors account for online gamer motivation: competence, autonomy, and relatedness. This finding agrees with the conclusion reported by Ryan et al.[1]. The microcomputer playfulness[7] was related to the in-game playful questionnaire and illustrates the criterion related validity. The relation index from our application of a "time spent playing *Kart Rider* per week" factor to examine criterion-related validity with intrinsic motivation was found to be statistically significant (r=.204, p<.01). Our results also indicate a statistically significant relationship between online game playfulness (trait) and in-game playfulness (state) (r=.255, p<.01), but no significant relationship between in-game playfulness (trait) and number of hours spent playing per week. Furthermore, statistical significance was noted between motivation and playfulness state (r=.607, p<.001) as well as between motivation and playfulness trait (r=.409, p<.001), suggesting that playfulness state exerted a stronger influence on online game playfulness.

According to the results of our regression analyses, in-game motivation was a valid predictor of in-game playfulness (r^2=.362, p<.001). In addition, of the three motivation factors that were tested, both relatedness and autonomy could be used to predict playfulness (r^2=.388, p<.001). This supports Jansz and Tanis's[10] finding that social interaction motivation is the strongest predictor of time spent gaming. Our data also indicated that in-game motivation and playfulness could predict subjective vitality (r^2=.427, p<.001), and that the

combination of playfulness and competence motivation could be used to predict self-esteem (explaining 12.5% of total variance; F=8.406, p<.001) (Table 7). These results support our contention that self-determination theory can be viewed as accounting for a large part of online players' motivation, playfulness, vitality, and self-esteem—that is, they support the findings of Ryan et al.[1].

As part of our second study, we utilized a structural equation model to examine correlations among motivation, playfulness, and vitality. Similar to Study 1 results, in-game motivation had significant direct effects on in-game playfulness and self-esteem. Motivation has been defined as the inner drive of an individual and a force that compels people to act. Among adolescents, intrinsic motivation to play online games is strongly connected to perceived needs for autonomy, to display competence, and to feel connected to others. Their motivation would have positive effects on adolescence players' in-game playfulness and self-esteem. In contrast, the sense if in-game playfulness (consisting of concentration, enjoy, and curiosity) among adolescent players was not found to have any effect on self-esteem in Study 2. One possible explanation is that adolescent players' in-game playfulness is possibly hard to enhance adolescence players' personal worth and self-esteem.

Among the adolescent players in the second study, in-game playfulness had a significant effect on subjective vitality (0.62 magnitude) and in-game motivation had a significant effect on subjective vitality as mediated by in-game playfulness. The results

suggest that when adolescent players have a strong sense of in-game playfulness, they either simply lose track of their fatigue or feel energized. Ryan et al.[1] concluded that prolonged exposure to online games may determine player vitality. Our data suggests that in-game playfulness may help reduce fatigue and enhances player perceptions of subjective vitality. In terms of spent playing per week, our 150 participants (41.3%) reported 7 hours or less, 89 (24.5%) between 8 and 16 hours 150 (41.3%) reported 7 hours or less, 89 (24.5%) between 8 and 16 hours, 56 (15.4%) between 16 and 24 hours, and 58 (15.9%) 25 hours or more. Most of them were not prolonged exposure to online games, and they simply lose track of their fatigue.

Previous researchers have gathered evidence showing that online games exert negative effects on individual players' self-esteem [28,29] and vitality[1]. In contrast, our data indicate that the in-game intrinsic motivation of adolescent gamers exert positive effects on in-game playfulness, subjective vitality, and self-esteem. A possible explanation it tied to Ryan et al.'s[1] suggestion that the motivation component of self-determination theory accounts a great deal for online players' motivation. Our two findings suggest self-determination theory (SDT) could be applied to investigate the positive influence on adolescence players'.

Regarding the use of SDT to investigate online game players' motivation, playfulness, vitality, and self-esteem, Bartle[22] and Yee[2] postulated that players can be categorized into four motivation types: killers, achievers, socializers, and explorers. Ryan et al[1] argue that a

true motivation theory should not focus on behavioral classifications constrained by the structures of specific games, but instead focus on (a) factors associated with enjoyment and persistence across players and genres, and (b) how games that differ in controllability, structure, and content appeal to human motivation tendencies and psychological needs. Our findings support the idea that SDT can account for a significant amount of player motivation, and that player motivation has a direct effect on playfulness and self-esteem.

Similarities exist between playfulness and Csikszentmihalyi's[15] flow theory, which has been used to explain intrinsic motivation and sense of involvement in many activities. A number of researchers are using flow theory to examine recreation and game playing. For example, Hwang[13] and Wan and Chiou[14] applied flow state to investigate the psychological motives of online games, and found the contradistinction between flow and addiction. We also expect to apply flow theory to investigate online game playfulness and motivation in future studies. Other potential topics for further research include a meta-analysis of evidence on how publication bias in terms of online game violence effect the literature[36]. Accordingly, there needs to be a stronger research focus on the positive effects of online gaming. Finally, more effort is needed to conduct longitudinal studies to provide insights into gamers' developmental stages and how adolescent game choices and play patterns evolve as they age.

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Table 1. Zero order correlations among play hours, motivation, play trait, and playful state.

	Number of Play Hours/Week	Motivation	Play State	Play Trait
Number of Play Hours/Week	-			
Motivation	.204*	-		
Play State	.269**	.607**	-	-
Play Trait	.109	.409**	.255**	.255**

*p <.05 ; **p <.01

Table 2. Regression for in-game playfulness.

Factor	R	$\triangle R^2$	F	β	t
In-Game Intrinsic Motivation	.67	.362	60.03*	.607	7.748*

*p <.001

Table 3. Regression for in-game playfulness.

Factor	R	$\triangle R^2$	F	β	t
Step 1: Relatedness	.607	.363	60.182***	.445	4.262***
Step 2: Autonomy	.632	.388	33.997***	.240	2.302*

*p<.05; *** p<.001.

Table 4. Regression for subjective vitality.

Factor	R	$\triangle R^2$	F	β	t
Step 1: Motivation	.621	.379	64.585*	.445	4.770*
Step 2: Playfulness	.662	.427	39.781*	.289	3.097**

*, $p<.001$; **, $p<.05$

Table 5. Regression for self-esteem.

Factor	R	$\triangle R^2$	F	β	t
Step 1: Playfulness	.329	.100	12.509*	.329	3.537**

*p <.01; ** p<.001.

Table 6. Regression for the self-esteem.

Factor	R	$\triangle R^2$	F	β	t
Step 1: Playfulness	.329	.100	12.509**	.329	3.537**
Step 2: Competence	.376	.125	8.406*	-.183	-1.987***

*p <.001; **p <.01; ***p<.05.

Table 7 Score statistics for Study 2 scales.

Scales	M	SD	Cronbach's Alpha	
In-Game Intrinsic Motivation[1] (Ryan et al., 2006)	3.79	0.56		
In-Game Competence	3.75	0.70	0.66	entire scale 0.74
In-Game Autonomy	3.81	0.71	0.52	
In-Game Relatedness	3.81	0.81	0.71	
In-Game Playfulness (Ahn et al.[30])	3.69	0.69		
Concentration	3.46	0.88	0.54	entire scale 0.74
Enjoyment	4.02	0.80	0.54	
Curiosity	3.70	0.85	0.63	
Player Vitality[25] (Ryan & Frederick, 1997)	3.46	0.87		entire scale 0.82
Vitality 1	3.46	0.95	0.55	
Vitality 2	3.42	1.06	0.84	
Self-Esteem[31] (Rosenberg)	3.68	0.60		entire scale 0.76
Self-Esteem 1	3.64	0.91	0.77	
Self-Esteem 2	3.62	0.71	0.75	

Table 8. Covariance matrix for the study variables.

Variable	1	2	3	4	5	6	7	8	9	10
Playfulness										
1. concentration	(0.81)									
2. Enjoyment	0.25	(0.65)								
3. Curiosity	0.30	0.33	(0.72)							
4. Vitality 1	0.26	0.29	0.26	(0.90)						
5. Vitality 2	0.21	0.33	0.34	0.70	(1.13)					
6. Self-esteem1	-0.13	0.18	0.04	0.08	0.11	(0.82)				
7. Self-esteem 2	0.17	0.25	0.21	0.21	0.28	0.15	(0.05)			
Motivation										
8. Competence	0.26	0.19	0.24	0.22	0.26	0.07	0.26	(0.48)		
9. Autonomy	0.13	0.19	0.23	0.17	0.18	0.09	0.13	0.14	(0.51)	
10. Relatedness	0.23	0.28	0.31	0.17	0.20	0.08	0.23	0.20	0.21	(0.66)

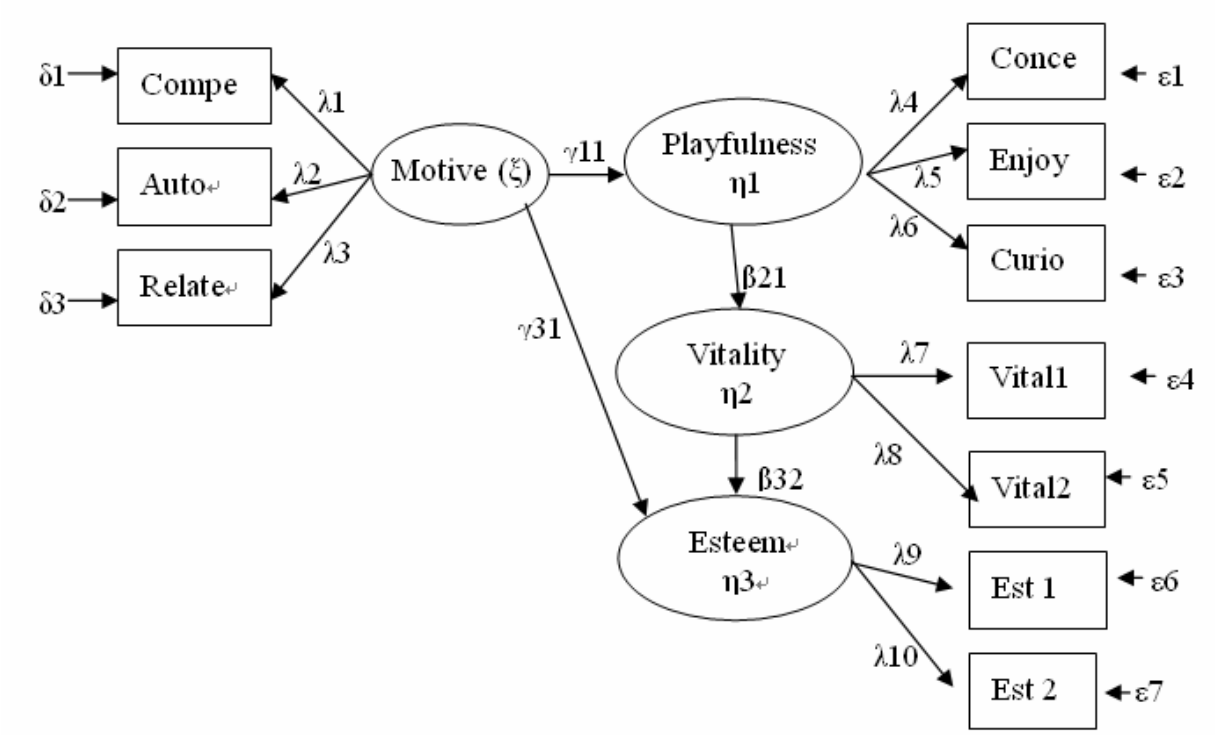

Figure1. The hypotheses model

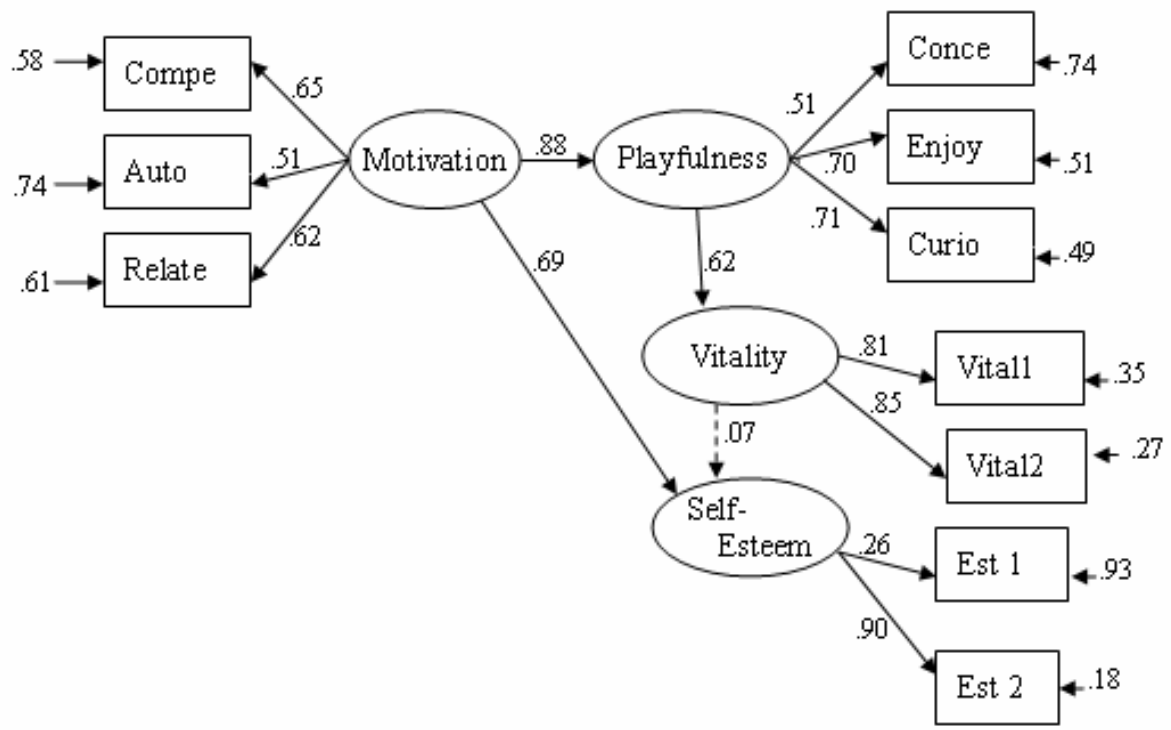

Figure 2. Structural model showing relationships among motivation, playfulness, vitality, and self-esteem. Solid lines indicate statistically significant standardized path coefficients; dashed lines indicate lack of statistical significance.

Note: Model goodness-of-fit: x^2 =82.93 (d.f. = 31), RMSEA=.068, NFI = 0.95, NNFI = 0.96, CFI = 0.97.

數位遊戲特質與環境對學習歷程影響的整合研究-子計畫一:

以一日經驗重建法探討遊戲玩家與遊戲設計者的心流與情緒

Using day reconstruction method to study flow experience, emotion, and behaviors of game designers and players

APA Convention 2007 出國心得報告

2007/08/17-2007/08/20

主持人：林珊如

交通大學教育研究所

博士生：江羽慈

碩士生：葉妤貞、鄭朝陽、周婉頤

專任助理：林淑卿

壹、主辦單位: American Psychological Association

貳、參與會議流程

1. Creativity Issues in Adolescents and Young Adults
   Session Type: Paper Session
   Division(s) 10, 7, 42, 47, 50, APA Committee on Early Career Psychologists, Psi Beta
   Building: Boston Convention and Exhibition Center:
   Room Description: Meeting Room 155
   Room Location: Meeting Level 1
   Date: 08/17/2008
   Time: 11:00AM - 11:50AM

2. Advances in Motivation Research
   Session Type: Paper Session
   Division(s) 15, 16, 17, 42, 50, APA Committee on Early Career Psychologists, Psi Beta
   Building: Boston Convention and Exhibition Center:
   Room Description: Meeting Room 259B
   Room Location: Meeting Level 2 Date: 08/17/2008

3. Time: 10:00AM - 10:50AM
3.Who Is the Self in Self-Determination?
Session Type: Symposium
Division(s) 33, 10, 42
Building: Boston Convention and Exhibition Center:
Room Description: Meeting Room 253B
Room Location: Meeting Level 2
Date: 08/17/2008
Time: 10:00AM - 10:50AM

4. Game Theory---Lost in New York
Session Type: Film Program
Division(s) FILM
Building: Boston Convention and Exhibition Center:
Room Description: Meeting Room 210C
Room Location: Meeting Level 2
Date: 08/17/2008
Time: 8:55AM - 9:35AM

5. Address given by Robert J. Sternberg
Session Type: Invited Address
Division(s) 15
Building: Boston Convention and Exhibition Center:
Room Description: Meeting Room 104C
Room Location: Meeting Level 1
Date: 08/16/2008
Time: 1:00PM - 1:50PM

6. What Do Children Learn When Playing Video Games?
Session Type: Symposium
Division(s) 46, 32
Building: Boston Convention and Exhibition Center:
Room Description: Meeting Room 207
Room Location: Meeting Level 2
Date: 08/17/2008
Time: 9:00AM - 10:50AM
7. Influences on Cognition and Creativity
Session Type: Paper Session

Division(s) 10, 3, 6, 42, 47, 50, Psi Beta
Building: Boston Convention and Exhibition Center:
Room Description: Meeting Room 155
Room Location: Meeting Level 1
Date: 08/17/2008
Time: 1:00PM - 1:50PM

叁、報告論文

Poster Session
Session Type: Poster Session
Division(s) 2
Building: Moscone Center:
Room Description: Halls ABC
Room Location: Exhibit Level-South Building
Date: 08/18/2007
Time: 2:00PM - 2:50PM
Title: The relations of creative organizational climate of school, teachers' intrinsic/extrinsic motivation and creative teaching : An investigation study in Taiwan

肆、會議內容與心得報告

此次赴美舊金山參加 2007 年年會，目的有二:發表論文與參與各項演講與展覽，參與的 division 包括動機、自我決定理論、創造力、電玩與遊戲之理論。與會學者中有幾位研究者研究數位遊戲玩家之遊戲動機，本人與學生與之交換心得討論之後發現，以往研究者之關注電玩之負面效果，目前研究轉變爲研究線上遊戲帶給玩家之最佳經驗—心流狀態，而如何將電玩之遊戲心流經驗，帶入教學與學習中，亦爲研究之潮流趨勢。另一方面，研究者與學生報告「創意教學」論文，有許多研究者參與討論，頗受好評。

伍、相片剪影

向與會來賓介紹論文

研討會標誌前合影

研討會報告海報前合影