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計畫主持人：林珊如

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Exploring Online Game Adolescent Players' Flow Experiences and Positive Affect

The authors conducted two studies to explore online game adolescent players' flow experiences and positive affect. Our findings indicated that online game are capable of evoking flow experiences and positive affect, and games of violent or nonviolent type may not arouse adolescent players' aggression. The adolescent players could be placed into four flow conditions: flow, boredom, anxiety, and apathy, as determined by level of perceived challenges and skills. The majority of players were placed in the flow condition. The path analysis results suggested that violent online games may have a significant but indirect effect on positive affect via flow experience mediation.

Key word : Flow experiences, Positive Affect, Online Game, Adolescent Player

In recent years, online games are among the growing rapidly forms of human recreation (Ryan, Rigby & Przybylski, 2006) which has received an increasing amount of attention (Chang JH, Zhang H.,2008). Online game playing represents a significant and rapidly expanding segment of daily media usage among children and adolescents (Roberts, 2000). In light of the clear short-term pleasure, relaxation, and playfulness that online game players experience, a growing number of researchers are exploring positive effects (e.g., flow experiences, Wan & Chiou, 2006; intrinsic motivation, Ryan & Przybylski, 2006; positive mood, Ryan & Przybylski, 2006) emanating from online game play. However, some researchers found violent online/video game would exert negative effects (e.g., aggression, Anderson, 2004; Dill & Dill, 1998; reduced empathy, Wei, 2007) on adolescent players. Accordingly, the current research conducted two studies to examine (1) whether violent game play would evoke adolescent players' aggression and (2) adolescent players' flow experiences and positive affect aroused by online game play .

Flow Theory and Online games

According to Csikszentmihalyi (1990), the concept of flow, or optimal experiences, stands at the center of positive psychology. Flow refers to a state in which someone focuses completely on a pleasant activity, with individuals perceiving a balance between skills and challenges. He also posits a correlation between the quality of flow experiences and perceived levels of challenges and skills, with perceived balance between skills and challenges categorized into four conditions: flow, boredom, anxiety, and apathy. Asakawa (2004) defines operationally flow conditions as situations in which perceived challenges and skills are in balance and above the mean skill levels of a group; boredom conditions as situations in which skills but not challenges are above a group mean; anxiety in which challenges but not skills are above a group mean; and apathy in which both challenges and skills are below a group mean.

Csikszentmihalyi (1990) also regards flow as an autotelic experiences—that is, intrinsic rewards come from the activity itself. Characteristics of flow experiences include clear goals, immediate feedback, loss of a sense of passing time, loss of self-consciousness, an integration of self with the activity, increased concentration on the activity, and a sense of control (see also Pace, 2004; Chen, 2006).

Flow and Online games

We believe that online games have many features that encourage flow states, including the provision of rich and immediate feedback to player actions, enjoyment, playfulness, and the ability to induce high levels of player concentration. Chen (2006), Pace (2004), Pearce, et al. (2004), and other researchers are using the flow concept and experience sampling methodology or interview to explore aspects of human-online interaction. However, limitation of research fund and time, the authors preceded two studies: an experiment and survey to collect more samples rather than using the experience sampling method. Moreover, a challenge for these researchers is the potential crossover of the effects of flow experiences in online games with the impacts of online game addiction. Griffiths and Davies (2005), and

Lemmens, Valkenburg and Peter (2009) are on a long list of researchers suggesting that online games can cause some players to become addicted. Oppositely, Wan and Chiou (2006) posit a negative correlation between flow state and inclinations toward addiction, and they also report that flow state is not a significant predictor of subsequent inclinations toward addiction. Chumbley and Griffiths (2007) argue that online game addiction may exist, but only in a small percentage of players, therefore samples of addicted players are hard to establish and comparisons with non-addicted players in terms of general online game effects are hard to make. For this reason, the potential for online game addiction was not included in the current study.

Chumbley and Griffiths (2007) report that differences in online game content arouse different affective responses. Griffiths (1999) notes that the majority of researchers claim that the contents of most online games are violent in nature. Furthermore, Anderson (2004) and Dill and Dill (1998) suggested that violent games would arouse negative emotions. Accordingly, our goal in this research is to gather evidence supporting or refuting the idea that online game content (violent versus nonviolent) exerts negative impacts on player flow experiences and positive affect.

Summary and Study Overview

The primary purpose of our dual studies was to investigate players' flow experiences and positive affect in the period immediately following violent and nonviolent game play sessions. Our expectation was that online games would contribute to flow experiences and positive affect, and that players' aggression would not arouse after playing either violent or nonviolent online games. We also expected that participants can be categorized to different flow conditions (flow, boredom, anxiety or apathy) based on balance between skills and challenges which were perceived during game playing sessions.

Two studies were conducted to test these hypotheses. In the first we compared the effects of two games given by the authors, one violent and one nonviolent and collected data on the

participants' reported flow experiences, positive affect, and aggression following play sessions. To ensure a successful manipulation check, advanced examinations of the participants' initial emotional states and game playfulness feature appraisals were conducted. For the purpose of counter balance control of game playing order, half of the participants played the violent online game first and the second half the nonviolent game first. Game assignments were reversed later. In the second we surveyed a group of college game players regarding their flow experiences and positive affect. We categorized participants into four flow conditions according to their scores of flow scale and categorized online games reported by participants into violent and nonviolent game according to criteria by our research group. We also performed path analyses for players in terms of the flow condition, violent online games, flow experiences, and positive affect.

Study 1

Methods

Sample and Procedure. A total of 30 (11 male, 19 female) college students in Taiwan agreed to participate in this study in return for research credit in their educational psychology course. For the purpose of counter balance of game playing order, the participants were randomly divided into two halves, with the first half (16 participants) played the violent online game and the second half (14 participants) played the nonviolent game. Game assignments were reversed two weeks later. Participants were asked to complete an emotion pretest questionnaire, learn how to play the assigned game, then complete additional questionnaires (described below) after 30-minute game sessions.

The violent game used in this study was *Grand Theft Auto*. Players act as criminals in a large city, with missions assigned by underworld figureheads; missions and tasks must be completed in order to progress through a storyline. Missions and tasks include bank robberies, assassinations, taxi driving, firefighting, pimping, street racing, and learning to fly an airplane.

Many tasks and learning scenarios can be completed at any time when main missions are not being completed. The nonviolent game used in this study was *Super Mario Crazy Racing*, in which characters from the *Mario* series of video games race go-karts on a variety of tracks. Players obtain items by driving through question mark blocks. Coins can be used for defensive moves, offensive purposes, or for adding power to engines for short time periods.

Questionnaires. We used existing questionnaires (original and modified) to create instruments aimed at collecting data on emotions (Levine, Wyer & Schwarz, 1994), online game playfulness (Hackbarth, Grover & Yi, 2003), flow during game play (Chen, 2006), positive affect (Chen, 2006), and aggression (Liu, 2003).

The purpose of Levine et al.'s (1994) emotion scale is to measure an individual's emotional state in the pretest phase. Responses to the scale's 14 adjective items are given according to a 7-point checklist, with 1 indicating "strongly disagree" and 7 "strongly agree." Sample items include "happy," "excited," and "depressed" (negative emotions are reverse scored as to indicate positive emotion).

For Hackbarth et al.'s (2003) online game playfulness feature scale (7 items and a online playfulness adjective checklist), participants were asked to select adjectives to describe subjective perceptions for the game they were playing or game characteristics. Sample items include "spontaneous" and "unimaginative" (reverse scored).

The flow during game play and positive affect instruments were modified from Chen's scale (2006) which is originally constructed to measure flow states and positive affect among World Wide Web users; we revised them to fit a online game context. It consisted of 14 items and sample items include "I was absorbed intensely in the game or in my game roles" and "Time went faster than I thought, and I did not sense the passing of time." Responses to scale items were given along a 7-point Likert scale. The positive affect scale consisted of 6 items and was modified into 7-point semantic differential rating: fun—not fun (reverse scored), boring-exciting, sad—enjoyable, active—passive (reverse scored),

lonely—not lonely, and tense—relaxed.

Finally, Liu's (2003) aggression scale is originally constructed to measure aggressive cognition, behaviors, and affect among World Wide Web users. It consists of 17 items and responses ranging from 1 ("strongly disagree") to 7 ("strongly agree"). We revised it to serve our purposes of determining increases in the participants' aggressive attitudes. Sample items included "I have no violent feeling from that game" and "I would hit anyone who harassed me."

The small sample size limits the use of a factor analysis to examine the validity of the scales. We therefore examined item-scale correlation (> 0.3) and item discrimination of extreme values (t-test value significant) to ensure the quality of the scales. No items were removed from the emotion scale (Cronbach Alpha coefficient = .78), one item was deleted from the game playfulness features scale (.83), three items were deleted from the flow-during-game scale (.91), one item was deleted from the positive affect scale (.84), and two items were deleted from the aggression scale (.88). The reliabilities of all instruments were acceptable.

Statistical Analyses and Results

To perform a manipulation check, participants were asked to describe their initial emotional state and to appraise the playfulness levels of the two games using the paired t-tests. In addition, the paired t-tests were also used to determine mean differences within halves (when they in switch played violent and non-violent games for counter balance of playing order) for the flow-during-game play, positive affect, and aggression scales.

Results from the paired t-test comparison of violent and nonviolent games are shown in Table 1. In both cases, the participants' mean scores on the emotion pretest were below the scale midpoint of 4.0. The participants reported lower playfulness feature appraisal of the violent game (< 4.0) and higher playfulness feature appraisal of the nonviolent games (> 4.0). They also reported scores above 4.0 for the flow experience and positive affect scales. Paired

t-test results indicated no significant differences in the participants' scores on the emotion pretest and ($t=-.58$, n.s.) and playfulness feature appraisal scales ($t=-1.26$, n.s.). These findings were used to ensure that the participants' initial emotions and playfulness feature appraisals for the two games at the same level.

Significant differences were noted between the two game types in terms of flow experiences ($t=-5.22$, $p<.001$) and positive affect ($t=-4.07$, $p<.001$). Participants reported higher flow experience and positive affect scores after playing the nonviolent game compared to the violent game ($M=5.38$ vs. 4.08 and 5.67 vs. 4.30 , respectively). Finally, participants playing two type games reported scores far below the midpoint of 4.0 on the aggression scale ($M=2.33$ for both the nonviolent and violent groups). No significant differences in aggression ($t=-.01$, n.s.) were found between the two game types.

---Insert Table 1 about here---

Discussion

The findings indicated no significant differences between the two game types in terms of the participants' initial emotions and playfulness feature appraisals. That the mean scores for flow experiences and positive affect exceeded the 4.0 midpoint after playing either violent or nonviolent games suggested a positive effect from online game play. Note also the significant differences in flow experiences and positive affect when playing the violent and nonviolent games, with higher scores reported after playing the nonviolent game. These results find support from Chumbley and Griffiths (2007), who reported that different online game contents trigger different affective responses. In short, our data indicated that nonviolent online games trigger higher positive player affect compared to violent games.

Mean aggression scores between violent ($M=2.33$) and nonviolent ($M=2.33$) games were both below the 4.0 response midpoint. No significant differences were noted in aggression scores after playing either game—in other words, the results indicate that online

games did not evoke aggression in the participants, regardless of their violent or nonviolent status.

Our results confirmed our principle assumption that online games would exert players' flow experiences and positive affect during game play. However, several limitations must be noted. The first is the small sample size (30 participants). Also, the gender breakdown (36.3% male and 63.3% female) is not representative of actual game player populations, which tend to be dominated to a very large degree by male players. Past research findings have suggested that women's experiences and time allocation of online gaming were less than men of a similar age (e.g., Royse et al., 2007; Williams et al., 2009). We also observed that male players also show a preference for violent online games and female players show a preference for nonviolent games. Even though significant differences were not found in terms of perceived playfulness features between the two game types in this study, we suspect that females in general may prefer nonviolent games and report higher levels of flow and positive affect after playing nonviolent games.

The second limitation concerns flow conditions. According to Csikszentmihalyi (1990), flow experience quality is associated with perceived levels of challenge and skill level. People in different flow conditions tend to report different flow experience levels. In this study, the number of participants was too small for proper categorization in terms of participant flow conditions, thus making it difficult to compare flow experiences and positive affect.

The third limitation concerns the experimental setting. Participants were assigned to different types of games, meaning that some participants were forced to play a game type that they would normally avoid. Csikszentmihalyi (1990) posits that flow experiences are more likely to emerge from preferred or favored activities. Also note that the one item deleted from the playfulness feature scale based on results from an item analysis was "autonomy," therefore we could not accurately assess the participants' perceptions of whether or not they

were involved in a preferred activity.

In view of this, extensive survey was used to examine further the participants' flow experiences and positive affect. In response to the second limitation, we further categorized the participants into the four above-described flow conditions. In response to the third limitation, the questionnaires would be according to samples' experiences of the online game that they played in the last game to response.

Furthermore, our data indicated that the mean scores for the aggression scales between the violent ($M=2.33$) and nonviolent ($M=2.33$) games were both below the scale midpoints, with no significant differences noted between the two game types. We therefore made the decision to not address the aggression issue in our second study.

Study 2

The purpose of Study 2 was to survey college online game players concerning their flow experiences and positive affect after game sessions. Participants were classified into the four flow conditions (flow, boredom, anxiety, or apathy) with games once again divided into violent or nonviolent categories. In addition, a path analysis was conducted to examine whether players are in the flow condition or whether they play violent online games have effects on their perception of flow experiences, and positive affect. We expected that both players in flow condition and violent online game play would have effects on flow experiences and positive affect.

Methods

Participants. A total of 365 college students from 4 universities in northern and central Taiwan were requested to complete the research instruments; 337 students (246 male, 91 female) returned usable surveys. Of those, 35 (10.4%) stated that they had been playing a particular type of online game for 1 month or less, 94 (27.9%) between 2 and 6 months, 31

(9.2%) between 7 and 12 months, and 177 (52%) for 1 year or more. Regarding hours spent playing per week, 173 (51.3%) reported 7 hours or less, 81 (24%) between 8 and 16 hours, 41 (12.2%) between 16 and 24 hours, 26 (7.7%) between 25 and 40 hours, and 16 (4.7%) 41 hours or more.

Materials and Instruments. The first survey item was “What is the name of the online game that you last played (today, yesterday, several hours ago)? All of the questions that follow will be about that game and your playing habits.”

The rest of the data collection instruments were designed to collect demographic information; data on online game playing habits; and perceptions of challenges, skills, and strategy (Pearce, et al., 2004), flow experiences during game play (Chen, 2006), and positive affect (Chen, 2006). The challenge/skill items focused on participant perceptions of the match between game challenges and personal playing skills for the designated game. The two items in this part of the instrument were, “How do you feel about the game’s degree of challenge?” and “Were your skills adequate for the game while you were playing it?” Responses to the two items were measured along a 9 point Likert scale and were used to categorize the participants into the four flow conditions: flow, boredom, anxiety, or apathy. The instruments used to measure flow experiences and positive affect were identical to those used in the first study but in a 9-point Likert scale.

The two scales were validated by factor analysis using principal component and varimax rotation methods. Our results indicated that the scale of flow experiences is composed of 2 factors (naming antecedent flow and flow state) which together explained 67.43% of total variances. Reliabilities for the two factors were .86 and .81, respectively, and .83 for the entire flow experience scale. The positive affect scale extracted one factor with 53.81% total variances explained and its reliability was .78.

The online games reported by the participants were coded as either violent or nonviolent. The established categorization criteria of online games (Griffiths, 1999) were

adopted to categorize violent and nonviolent games. Two college expert players were recruited as coders. One expert is an elder leader in a massively multiplayer online game (MMO) and majors in educational psychology and counseling. The other expert is an expert player of the previous target game (Grand Theft Auto) and majors in instructional technology. The scorer reliability for the two coders were .82.

Statistical Analyses

To examine perceived balances of challenges and skills, we followed the classification procedures described by Asakawa (2004). Challenge and skill level means and standard deviations were computed for the entire sample. Cutoff points were group mean minus one standard deviation, group mean, and group mean plus one standard deviation (Fig. 1). Means and standard deviations for the flow dimension and positive affect scales were computed and compared across the four flow conditions.

The four conditions in the current study included flow, boredom, anxiety, and apathy. Asakawa (2004) regarded the flow condition as situations where both perceived challenges and skills were balanced and above the group means, whereas the apathy condition was regarded as situations in which both challenges and skills were below the group average. The authors categorized the flow condition into three sub-conditions (Flow 1 to Flow 3). The flow 1 condition represented the highest balances between challenges and skills, flow 2 and flow 3 conditions represented the second best, but the apathy condition represented low balances between challenges and skills. The participants in flow 1 condition should perceived higher flow experiences and more positive affect than the flow 2, flow 3 and apathy conditions (Csikszentmihalyi, 1990; Asakawa, 2004). In order to categorize participants into the four conditions of flow (flow, boredom, anxiety, and apathy), the authors adopted Asakawa (2004)'s suggestion to the combined flow1 to flow3 into one flow condition.

The boredom condition was regarded as situations where skills, but not challenges,

were above the group average. The anxiety condition was regarded as situations where challenges, but not skills, were above the group mean. The mapping is presented in Figure 1.

In order to examine whether flow experiential regions in our data (Flow 1 to Flow 3 and Apathy) may represent a flow channel along which challenges and skills are to some extent in balance and the levels of flow experiences and positive affect gradually increase (Csikszentmihalyi, 1990; Asakawa, 2004), the authors compared the differences in flow experiences and the positive affect among participants in flow1, flow2, flow3 and apathy.

There were significant differences in flow experiences ($F=11.21, p<.001$) and positive affect ($F=4.59, p<.01$) among flow1, flow2, flow3 and apathy conditions. Post hoc analysis showed that participants in flow 1 reported higher flow experiences than participants in flow3 and apathy and more positive affect than flow2, flow3 and apathy conditions. Participants in flow 2 reported higher flow and more positive affect than participants in flow3 and apathy condition. Participants in flow 3 reported higher flow and more positive affect than participants in apathy condition. Because the flow in flow 1 and flow 2 both reported high flow experiences, they were not comparable. The results suggested that the intensity of flow gradually increased along this channel and showed adequate validity of the scale of flow experiences.

--Figure 1 about here.--

The path analysis was conducted to examine the effects among participants in the flow condition, playing violent online games, their perception of flow experiences and positive affect. The flow condition was coded as a dummy variable (1 = flow, 0 = boredom, anxiety, or apathy), as was the online game type categories (1 = violent, 0 = nonviolent).

Results

Four flow conditions based on perceived balances between challenges and skills.

The findings indicated that the study participants could be divided into four flow conditions based on perceived challenge-skill balances. Chi-square analysis yielded that significant different distributions for the four flow conditions ($\chi^2=109.48$, $p<.001$). The largest group was the flow condition, with 143 (42.4%) participants; the boredom condition contained 96 (42.4%) participants; the anxiety condition contained 70 (42.4%) participants; only 13 (3.9%) participants were placed in the apathy group.

Of the 302 game titles reported by the participants (219 by males, 83 by females), 45.4% fell into the violent game category. A significant difference ($\chi^2=35.37$, $p<.001$) shown by the chi square analysis was noted in game type involvement in terms of gender, with male players constituting the vast majority of violent game players (104, compared to 8 female players).

Path analysis: flow conditions, violent online games, flow experiences, and positive affect.

As reported in the first study, both violent and nonviolent online games were capable of triggering player flow experiences and positive affect, with nonviolent game players reporting stronger flow experiences. To determine whether violent online game play is truly capable of triggering strong flow experiences and positive affect, we performed a path analysis to examine relationships among violent online game play, flow condition, flow experiences, and positive affect. According to our findings (Fig. 2), no relationship existed between violent games and the flow condition for the participants in our study. However, violent online game play exerted a significantly positive effect ($\beta=.20$, $p<.001$) on flow experiences, but participants in the flow condition had no effect on flow experiences reported. Our data suggest that positive affect following violent online game play was mediated by flow experiences (indirect effect coefficient = .086). Flow experiences had a significantly direct effect on positive affect ($\beta=.43$, $p<.001$). No direct effect was found for flow condition on positive affect and flow experiences.

--Insert Figure 2 about here--

Discussion

The study 1 results suggest that both violent and nonviolent online game play is capable of triggering flow experiences and positive affect, with participants reporting significantly higher flow experiences and positive affect after playing a nonviolent game compared to playing a violent game. In the same manner as Chumbley and Griffiths (2007), we found that different online game content generates different affective responses. Mean aggression scores were lower than scale midpoints after playing both violent and nonviolent games. In addition, there were no significant differences in terms of aggression after playing violent versus nonviolent target games. Our findings suggest that violent online games might not be associated with aggression. Another reason is our use of college students rather than younger adolescents to address the topic of violent online games and their potential negative effect on players. Our study participants are likely better able to distinguish between game world and real world violence. Moreover, our findings may have been affected by important gender differences in game preference, with female players selecting a much higher percentage of nonviolent online games and male players mostly choosing violent games.

The study 2 findings support the idea that game players can be placed into four flow conditions based on whether players perceived the balances between challenges and skills. The majority of players were placed in the flow condition. In other words, when playing online games, adolescent players tend to perceive themselves as enjoying a balance between the challenges of the games they are playing and their playing skills—the operational definition of the flow condition given by Asakawa (2004).

In study 2, of the game involvements with the 302 participants, nonviolent game titles slightly exceeded those of violent games (54.6% vs. 45.4%). Male players showed a clear involvement for violent games, in accordance with the findings of Royse et al. (2007) and

Williams et al. (2009). Female participants were much more likely to play nonviolent games than violent games (75 vs. 8, respectively). The majority of study 1 participants were female (63.3%), and the flow experience and positive affect results reflect that imbalance. In contrast, the study 2 sample was a better reflection of real-world game play: a higher number of college male players, with all players showing a slight involvement for nonviolent online games.

According to Griffiths (1999), the majority of game researchers claim that most online games are violent in nature, even those that feature destruction (e.g., car crashes) but no deaths. They claim that violent online games usually provide participants clear targets for earning points—in other words, clear targets represent clear goals and points represent immediate feedback, which are two characteristics of flow experiences (Csikszentmihalyi, 1990). The results study 1 indicated that nonviolent online game play was more likely than violent online game play to trigger stronger flow experiences and positive affect. Csikszentmihalyi (1990) suggests that positive affect is the end result of flow experiences. However, the experimental research in our study1 was unable to examine the mediating effects of flow experiences between game categories and positive affect. Instead, flow experiences and positive affect was simultaneously regarded as the dependent variables in study 1 while in study 2 the mediating effects of flow experiences were closely examined using path analyses. It is likely that the various research approaches lead to the mixed results between study1 and study2. We assert the results of path analysis positing a more prudent and parsimonious model.

The results of path analysis showed that there was no relationship between violent online games and participants in the flow condition. Participants in the flow condition possibly played different online games, and all kinds of online games could let players perceive balance between challenges and skills. However, as we reported in the previous findings, violent games provide some characters are partly consistent with flow characters

(Csikszentmihalyi, 1990). Accordingly, the path analysis indicated that violent online games exerted a significantly positive effect on flow experiences.

In addition, participants in the flow condition had no effect on flow experiences. It is likely that the participants in the flow condition perceived a balance between game challenges and their own skills, thus triggering a sense of stress and overstrains to undermine the access to flow experiences. The authors suggested that participants in the flow condition showing slight variations were too similar to show statistical effects on flow experiences. In addition, we found even though participants in the flow condition perceived a balance between challenges and skills, that balance did not necessarily trigger positive affect. This evidence finds support in Csikszentmihalyi's (1990) argument that perceived balance between challenges and skills is the sufficient condition for experiencing flow, but it does not necessarily result in flow experiences or positive affect.

The results fail to yield direct relationship between violent games and participants' positive affect. Previously, researchers argued that violent online game play triggers negative affects (Anderson, 2004; Dill & Dill, 1998) while few examinations were conducted on its effect of positive affects. Our finding adding to the literature that positive affect does not occur following violent online game play.

A significant relationship was found between flow experiences and positive affect, indicating an increase in positive affect when participants achieved flow experiences from game play. Our path analysis results also indicated that positive affect following violent online game play is mediated by flow experiences (indirect effect coefficient = .086), suggesting that positive affect can be evoked through flow experience mediation. In other words, flow experiences appear to be capable of mitigating the positive effects of violent online game play, leading to higher levels of positive affect among violent online game players.

In conclusion, our findings from the two studies suggest that both violent and nonviolent online games are capable of triggering player flow experiences and positive affect, and that neither violent nor nonviolent online games by themselves are capable of triggering aggression following game sessions. Furthermore, results from our path analysis indicated that violent game play per se does not produce positive effect; while flow experiences during violent game play can exert significantly positive impacts on positive affect.

Limitations

Csikszentmihalyi (1990) suggests that researchers should use experience sampling methods to study human flow experiences. Our use of an experiment and a survey of players' retrospect flow experiences from online games did not allow for immediate observations or measures of momentum flow experiences.

Since flow experiences tend to result from favored activities, these gender-based differences must be taken into consideration when making implications from the data. Furthermore, game addiction was not taken into account in either of the two studies—a potentially important oversight in terms of differences in how addicted players perceive short-term positive affect from game play.

Finally, future research also needs to take into consideration improved sampling methodology as well as construct validity and instrument reliability when designing attempts to replicate these studies and results.

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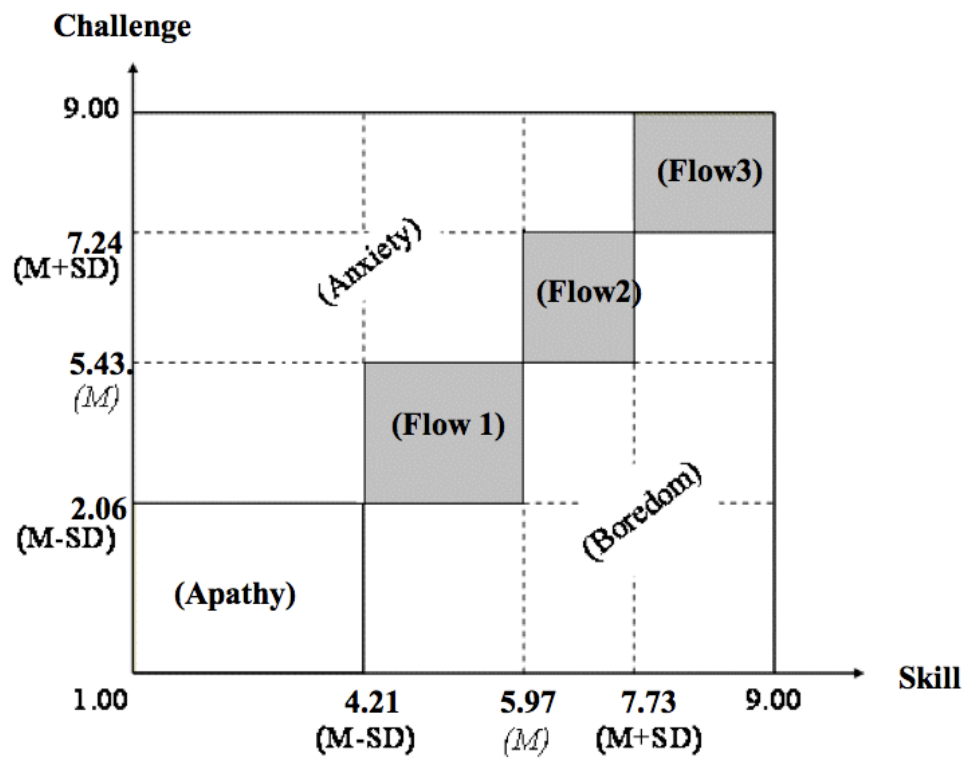
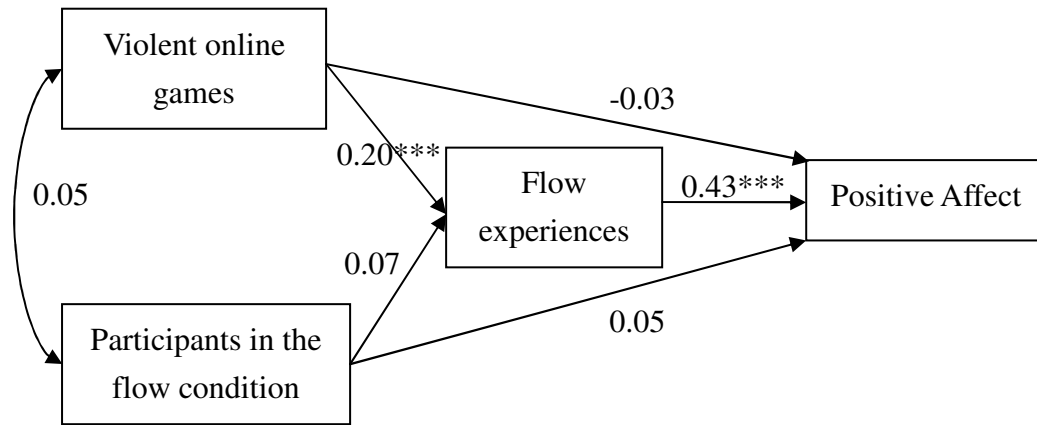


Figure 1. Four conditions of flow in a flow channel defined by perceived challenges and skills. Min =1, Max =9, M=5.43 SD=1.81; skills: Min=1, Max =9.00, M =5.97, SD =1.76. (Flow included three regions: flow1, flow2, and flow3)



* $p < .05$, ** $p < .01$, *** $p < .001$

Figure 2. Path diagram: participants in the flow condition, violent online games, flow experiences, and positive affect.

Table 1. Results from paired t-tests, violent versus nonviolent game players (N=30).

	Violent Games		Nonviolent Games		Paired t
	M	SD	M	SD	
Emotion Pretest	3.12	0.82	3.20	0.82	-0.58
Game Playfulness Feature	3.98	1.47	4.38	1.02	-1.26
Flow Experiences	4.08	1.28	5.38	1.11	-5.22***
Positive Affect	4.30	1.45	5.67	1.08	-4.07***
Aggression	2.33	0.95	2.33	0.95	-0.01

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