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The role of family intimacy in playing collaborative e-sports with a Switch device to predict the experience of flow and anxiety during COVID-19 lockdown

Jon-Chao Hong a, b, c, Hsiao-Chi Juan b, *, Wei-Chen Hung b

a Institute for Research Excellence in Learning Sciences, National Taiwan Normal University, Taipei, 106308, Taiwan
b Continuing Education Program of Creativity Development, College of Education, National Taiwan Normal University, Taipei, 106308, Taiwan
c Department of Industrial Education, National Taiwan Normal University, No. 162, Section 1, Heping East Road, Taipei, 106308, Taiwan

ABSTRACT

During the COVID-19 pandemic, most people have more time to stay at home and play games together. In particular, so as to maintain social distancing, most people play with their family members. To understand how people’s family intimacy affects their game experience and perceived value of playing, the present study applied a boating game, River Survival, played collaboratively via Switch. People with experience of playing the game with family members were targeted in this study. They were notified via Facebook and Line special interest groups and responded to the questionnaire through a website. Data of 301 respondents were validated, and were subjected to structural equation modeling. The results of this study indicated that family intimacy positively predicted flow experience, but there was no significant relation to gameplay anxiety. Flow experience positively predicted perceived value, but gameplay anxiety did not significantly predict perceived value. The implication of this study is that, without intimacy among team members, players cannot experience flow state or perceived game values.

The COVID-19 pandemic has affected the whole world, and the United Nations World Health Organization is trying to keep people indoors or at home. The demand for indoor entertainment has increased in order to relieve leisure time at home, and people have turned their attention to video games or online video games, driving up the sales of game consoles. Video games have become a way for people stuck at home to practice social distancing. The Switch gaming system is a Japanese Nintendo product, in which each player controls a character and plays in the same window. It is divided into real-time and turn-based games. During the COVID-19 lockdown period, it has also created a way to build a sense of community and interact with others without having to leave home (Takeda, 2020). A virtual sports device, Switch, has become very popular recently, and especially the game, River Survival. In 2021, there are expected to be 15.72 million downloads of this game (Ninjia, 2021). In particular, so as to maintain social distancing, most people play with their family members. To understand how people’s family intimacy affects their game experience and perceived value of playing, the present study applied a boating game, River Survival, played collaboratively via Switch. People with experience of playing the game with family members were targeted in this study. They were notified via Facebook and Line special interest groups and responded to the questionnaire through a website. Data of 301 respondents were validated, and were subjected to structural equation modeling. The results of this study indicated that family intimacy positively predicted flow experience, but there was no significant relation to gameplay anxiety. Flow experience positively predicted perceived value, but gameplay anxiety did not significantly predict perceived value. The implication of this study is that, without intimacy among team members, players cannot experience flow state or perceived value.

Some dimensions representing relationship quality affect performance in sports competition; for example, closeness is a critical function that allows team members with higher intimacy to have a higher sense of camaraderie in sports competitions (Brown et al., 2018). Intimacy and a sense of having “things in common” in higher quality father-child and mother-child relationships were both found to predict higher levels of player enjoyment, but lower stress levels (Harwood & Knight, 2015). Particularly, O’Sahbaïn and McGrath (2019) studied a distinctive family boating competition collaboratively known as the “hooker” which is actively used for recreation and leisure in the West of Ireland. To win the boating competition, an understanding of “rhythmic practices of place”

* Corresponding author. 6F.-2, No. 1, L. 113, Xiamen St, Zhongzheng Dist, Taipei City, 100037, Taiwan, ROC.
E-mail addresses: tcdahong@gmail.com (J.-C. Hong), 009a02105@gapps.ntnu.edu.tw (H.-C. Juan), weichenlovejesus@gmail.com (W.-C. Hung).

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is needed by all team members along with their intimate relationships to conquer all the challenges occurring along the river. Another study by Jang et al. (2018) found that sport consumers’ levels of happiness differed when collaboratively playing a game which relies on a level of team identification and interdependence. However, few studies have explored family members playing the virtual boating game, River Survival, using Switch to understand the antecedent role of family intimacy related to cognitive and affective states and perceived gaming values as they collaboratively engaged in virtual boating during the COVID-19 lockdown. Thus, the purposes of this study were to explore the correlates between family intimacy as an antecedent role to predict participants’ flow experience and gameplay anxiety that reflected their perceptions of gaming value.

1. Theoretical background

Family Intimacy in the Gaming Context.

Intimacy reflects perceptions of self-versus-others and has an influence on one’s behaviors. Those people who are in intimate relationships tend to think more about their partner’s interests than about their own (Aron et al., 2004). Family intimacy refers to the emotional connectedness between family members (Luo et al., 2020). Family intimacy can re-balance the family decision-making power and support the autonomy of family members (Tong et al., 2019). It can reduce family conflict and psychological maladjustment, depression, and emotional disturbance at the individual level. On the other hand, enhancing family intimacy can promote members’ courage to take risks and responsibility to complete their own tasks (Maitland et al., 2017). While most games require players to take risks (Zhang & Fricker, 2021), intimacy may affect players’ mutual dependence while playing together for a long time (Brown et al., 2018).

Intimacies are something other than a direct relationship between self and other. Intimacies become a space within which self and family members can experience emotional reflexivity (Belford & Lahiri-Roy, 2019). Generally speaking, individuals who are more intimate tend to be more affected by their intimate others, which is essential for collaborative sports competitions (Ullrich-French & Smith, 2006). Specifically, this study draws on Reis and Shaver’s (1988) Intimacy Process Model (IPM), which is a well-researched model of how intimacy develops. It can be translated into mission targets which are related to intimate relational functioning (Maitland et al., 2017). In the model, intimacy is described as a dynamic, behavioral process consistent with focusing on identifying behavioral actions-in-context (Hayes et al., 2012). For family members to play Switch together as actions-in-context, how players perceived the intimacies of family members may affect their emotion in playing this River Survival. However, few studies have discussed family intimacy related to family members playing games together. This study therefore examined the role of family intimacy while playing a Switch game.

2. Flow experience

Flow is a concept related to immersion. It was defined by Csikszentmihalyi (1990) as a state of concentration in which individuals become so absorbed in an activity that they act with total involvement. It mostly focuses on changes in the player’s internal condition. In the context of video gameplay, it has been found that sensory-motor networks are important for flow (Klasen et al., 2012). If games feature can motivate players intrinsically to achieve a goal, then, their flow experience can be generated (Procci et al., 2018). For instance, the flow dimension has been examined by changing game features or the level of difficulty (Ullrich et al., 2014), and by introducing a specific event (Klasen et al., 2012). Taking playing River Survival as a special feature of playing with Switch, players have to pay attention to some inhibitors of boating, such as avoiding hitting rocks. Additionally, sport psychologists studying within a transnational state of flow have explored various directions of mobility and diverse participants (e.g., Emich et al., 2020; Roychowdhury et al., 2021), but to date the research has not focused on individual flow experiences “on the move” with Switch. Thus, flow state while playing with family members during the COVID-19 lockdown was of interest in this study.

3. Gameplay anxiety

According to Taylor et al. (2007), anxiety sensitivity is a construct that captures individual fear which arises from maladaptive interpretations related to experience of anxious arousal. The level of anxiety sensitivity is largely dependent on environmental influences such as in extremely competitive environments in which people can experience emotional anxiety if they have a conscious desire to win (Hong et al., 2020). A feeling of anxiety makes it hard to relax while engaging in a competitive game (Ju & Wallraven, 2019). Consistent with perceptions related to affective state change, Hong et al., (2020) defined that gameplay anxiety in a competitive game can be raised with time pressure. Additionally, anxiety is significantly associated with biokinetically-driven behavioral engagement (Bakhtiaie et al., 2020). This study explored when players interacted with Switch involving biokinetically-driven movement and with time pressure to avoid the risk of the boat stopping due to hitting rocks or big fish. How their perceived anxiety as family members collaboratively controlled the boat affected their gameplay anxiety during the COVID-19 lockdown was examined in this study.

4. Perceived values

Personal values are comprised of cognitive, affective or directional aspects as individuals to judgment and choose (Lin, 2020). In line with this, a means-end chain (MEC) (Gutman, 1982) has been suggested to reveal the psychological process that players undergo to perceive the consequences associated with a game (Shen, 2021). Personal values, which are seen as the “end” in MEC theory, can be divided into either instrumental or terminal values, where instrumental values result from preferences or behavioral outcomes, whereas terminal values reveal the ultimate status of existence that consumers actually want to achieve (Lin et al., 2017). Game play values represent the concrete outcomes of using a system, while psychosocial enjoyment is evoked as users’ subjective feelings (Shen, 2021). Yuksel et al. (2021) explained that innovative digital technology can provide players with experiential value and arouse their enjoyment and control of devices with a sense of camaraderie in virtual collaborative sports games. As challenge in games has positive effects on the perceptions of utilitarian and hedonic value (Alan et al., 2022), an aim of this study was to reveal the personal psychological process when playing River Survival with Switch during the COVID-19 lockdown, and experiential value (including hedonic and utilitarian value) was adopted as the basis to examine participants’ personal values.

5. Research model and hypotheses

Research Model.

Gamer interest is dependent upon the interaction of the three factors of player characteristics (including their gaming background and preferences), game types (including their genre and design), and the platform (including their controls and affordances) (Halloran & Minaeva, 2019). MEC theory was proposed by Gutman (1982) to elicit the linkages between product or service attributes and behavioral consequences and personal values. The linkages between the attributes (As), consequences (Cs), and personal values (Vs) of a product or service construct A-C-V ladders (Lin et al., 2020). In MEC theory, the attributes of a product or service are the “means” that allow users to achieve their desired results (Lin et al., 2017). Accordingly, the attributes in the present study are considered as the features of River Survival. The
behavior consequence is related to the flow and anxiety of boating, thus achieving a sense of value in playing this game. To understand the linkage of A-C-V when participants played River Survival together by using Switch, the present study conceptualized a research model to explore the correlates between family intimacy, flow experience, gameplay anxiety, and perceived value.

6. Hypotheses

Social presence can be studied from the perspective of constructs such as immediacy (psychological distance) and intimacy (interpersonal closeness) (Sajjadi et al., 2019). Game experience can be activated through social presence. Waterworth et al. (2015) found a correlation between perceived social presence and learning motivation when there are higher levels of perceived social presence in online education. However, it is common that those who lack family intimacy can easily lose emotional control and use aggressive attitudes toward problem-solving that brings conflict with family members, particularly with parents (Jin et al., 2019). Participants who find difficulty in problem-solving that brings conflict with family members, particularly with parents (Jin et al., 2019), may experience flow state from the hypo-arousal and in optimal anxiety has been associated with the development of problematic technology use in general (Liang & Leung, 2018). On the other hand, players may experience flow state from the hypo-arousal and in optimal challenging games, leading them to consequent positive value, such as psychological relief (Larche & Dixon, 2021). In playing the Switch game, River Survival, there are four players in a boat, and they have to work collaboratively. How their experienced flow and anxiety influenced their perceptions of playing values was hypothesized as follows:

H1. Family intimacy is positively related to flow experience.
H2. Family intimacy is negatively related to gameplay anxiety.

Game-based learning can result in improvements to learning outcomes, and learning experiences can be enhanced by promoting engagement (Yaqi et al., in press). Challenge and interactivity as representatives of flow experience in games have been found to have positive effects on the perceptions of utilitarian and hedonic value (Alan et al., 2022). For example, escape room games as cooperative style games can facilitate the acquisition of key professional competencies (Anguas-Gracia et al., 2021). However, the accessibility of new devices may be problematic for some players, especially if they have frustration in the game challenge, when they may experience mood states with negative thoughts and feelings (such as depression and anxiety). That is, anxiety has been associated with the development of problematic technology use in general (Liang & Leung, 2018). On the other hand, players may experience flow state from the hypo-arousal and in optimal challenging games, leading them to consequent positive value, such as psychological relief (Larche & Dixon, 2021). In playing the Switch game, River Survival, there are four players in a boat, and they have to work collaboratively. How their experienced flow and anxiety influenced their perceptions of playing values was hypothesized as follows:

H3. Flow experience is positively related to perceived value.
H4. Gameplay anxiety is negatively related to perceived value.

Value perception, which may be either functional or psychosocial, refers to the results that users hope to achieve through certain product or service attributes (Lin et al., 2020). For players, perceived value can be either positive or negative. Positive value will be perceived if the relationship between players is intimate; on the other hand, negative consequences will be perceived when risks are incurred due to interpersonal distance (Lin et al., 2020). Briefly, in social games that require players to actively engage in social interaction, in order to facilitate effective learning, it is highly desirable to evoke good game experience and high levels of perceived family intimacy (Sajjadi et al., 2019). In light of this, to investigate whether family intimacy can affect perceived value mediated by game experience while playing the Switch game collaboratively, a hypothesis was proposed as follows:

H5. Family intimacy is positively related to perceived value mediated by game experience.

7. River Survival

7.1. Game features

Nintendo of Japan developed the Switch, a gaming console with a wide variety of games that can be played by inserting game chips. In this study, participants were asked to play the game River Survival on the Nintendo Switch Super Mario Party, and they had to play with their family members. Some features are illustrated as follows:

1. (see Fig. 1) The game mode is that the player uses the Joy-con as the controller and swings it to simulate the paddle of the game character on the screen to control the boat (see Fig. 2).
2. Breaking the level increases the voyage time by seconds (see Fig. 3).
3. Players must arrive at the end point within the set time, and if they fail to arrive, the challenge will be lost (see Fig. 4).
4. Players who successfully reach the end point will get “Party Points” (see Fig. 5 and Fig. 6).

Note: Figs. 2–6 are screenshots from Nintendo Switch “River Survival” on Super Mario Party.

8. Method

8.1. Procedure

The survey was conducted during the COVID-19 lockdown period when more people were staying at home and had more opportunities to play River Survival in the Nintendo Switch Super Mario Party with family members. The samples were purposively targeted from those who had played River Survival. First, we posted information about our study on Facebook game and Line game groups and asked respondents to complete the questionnaire by linking to SurveyCake which is a website that allows scholars to upload questionnaires. The questionnaire was opened on May 31, 2021 and closed on June 14, 2021. In terms of ethical considerations, participants were provided with information about what they were being asked to do, and were asked to provide their consent. They also had the option to withdraw from the study whenever they wished. Participants knew they were participating in an evaluation study and that the data they provided were anonymous. They also knew that the study could be published.

8.2. Participant

In this study, the participants were selected by the intentional sampling method and had played the game River Survival via Switch with their family members. A total of 565 valid questionnaires were completed after eliminating 136 incomplete responses. In terms of gender, 316 (55.9%) females and 249 (44.1%) males responded to the survey. For age, 97 (17.2%) respondents were below 22 years old, 148 (26.1%) were 24–31 years old, 241 (42.7%) were 31–40 years old, and 79 (14.0%) were over 40 years old.
Fig. 1. Research model

Fig. 2. Basic operation of playing.

Fig. 3. Achieving a level.
Fig. 4. Fail to arrival before time-up.

Fig. 5. Get “team points”.

Fig. 6. Successfully reach the end.
8.3. Questionnaire

The content of the questionnaire in this study was modified from the questionnaires of previous studies, and five domain experts checked the accuracy of the translation to ensure face validity. Then, the questionnaire was given to 10 university students to complete and to point out any confusing wording to ensure its content validity. A 5-point Likert scale was adopted, where 1 indicated strongly disagree and 5 indicated strongly agree. Because this was a confirmatory study, after data collection the reliability and validity of the questionnaire were re-analyzed.

8.4. Measurement

**Family intimacy:** A high level of intimacy involves frequent exchanges of sensitive, confidential, and complex support (Stanko et al., 2007). Accordingly, six items were designed to test participants’ perceptions of family intimacy. Example items include: *We keep each other informed about the risk coming during virtual boating. We shout “watch out” to each other frequently without pre-specified agreement during virtual boating.*

**Flow experience:** Based on flow theory (Csikszentmihalyi, 1997), flow can only occur when concentration, enjoyment, and interest in an activity are experienced at the same time. Therefore, seven items were designed for measuring participants’ flow state while they played River Survival. Example items include: *When playing the game, I have a sense of psychological relief. When I played the game, I was not aware of time passing so fast.*

**Gameplay anxiety:** To measure anxiety while playing a competitive game, the Competitive State Anxiety Inventory-2 (CSAI-2), originally developed by Martens et al. (1990) and revised by Hong et al., was modified for this study. Seven items were included in the questionnaire. Example items include: *When I play the game, I worry I cannot control Switch well so that our boat will move slowly. I have been complained about by my team members when playing the game and it makes me feel nervous to control Switch.*

**Perceived value:** According to Dhar and Wertenbroch (2000), perceived experiential value represents the rational and enjoyment purpose when using a product. Their scale was revised by Hong et al. (2020). Hence, the present study designed corresponding measurement items. Example items include: *Playing River Survival with my family members reduces my conflict with my family members. Playing River Survival with my family members is fun for me.*

9. Results

Data analyses included testing the credibility of the items and constructs of the questionnaire by using SPSS 20.0, and verifying the research model by structural equation modeling with AMOS 20.0. The results are described as follows.

10. Item analysis

To test the internal validity of the questionnaire items, first, those values of factor loading (FA) less than 0.5 were deleted. Second, first-order confirmatory factor analysis (CFA) was performed to delete those items with the highest residual value in each construct until the required indexes suggested by Hair et al. (2019) were met. Table 1 presents the χ²/df, RMSEA, GFI, and AGFI of each construct. According to Dhar and Wertenbroch (2000), five items were retained for family intimacy, and the number of items was reduced from five to four for flow experience and gameplay anxiety, and from 10 to eight for perceived value (see Fig. 7).

Table 1

| Index         | Threshold | Family intimacy | Flow experience | Gameplay anxiety | Perceived value |
|---------------|-----------|-----------------|-----------------|-----------------|-----------------|
| χ²/df         | <3        | 2.89            | 2.28            | 2.32            | 2.59            |
| RMSEA         | <.08      | .07             | .08             | .06             | .06             |
| GFI           | >.8       | .99             | .99             | .99             | .97             |
| AGFI          | >.8       | .98             | .98             | .96             | .95             |
| t-value       | >10       | 12.99–14.0      | 15.38–17.63     | 13.10–15.44     | 9.61–12.27      |

Note: dotted lines indicate items with a factor loading of less than 0.5 which were deleted. The others indicate the residual value left in each construct.

In this study, external validity was verified by using the extreme group validation method, in which the top 27% of the scale scores were classified as the high group, and the bottom 27% were selected as the low group for independent sample t tests. A t-value above 10 (p*** < 0.001) is considered statistically significant (Awang, 2015). The t-value in this study was higher than 13.31*** (p < .001), indicating that all questions in this study were discriminatory, that is, all questions can be used in different situations on different samples (Green & Salkind, 2004).

11. Reliability and validity analyses

Awang (2015) indicated that when the Cronbach’s α value and composite reliability (CR) fall between 0.70 and 0.98, there is a high level of reliability. Table 2 shows that the values of Cronbach’s α are all over 0.81, indicating that those constructs had good internal consistency, and the CR values are all over 0.77, revealing that those constructs had acceptable external consistency.

To test the convergent validity of each construct, the values ofAVE and the factor loading of each construct should be above 0.5 (Hair et al., 2019). Table 2 shows that the values of FL are over 0.67, and the values of AVE are over 0.53, indicating that all constructs had good convergent validity.

The analysis of construct discriminant validity is to verify whether there is a difference between two different constructs, so the correlation coefficient between two constructs should be lower than the square root of the AVE of the construct (Awang et al., 2015). Table 3 shows that the square root of the AVE of each construct is higher than the absolute value of correlation coefficients between constructs, indicating that the questionnaire had good construct discriminative validity.

12. Model fit analysis

In this study, an overall fitness analysis was performed to verify the suitability of the hypothetical model as the validation tool for this structural equation model. The absolute fitness of this study applied the specifications suggested by Hair et al. (2019). In examining Absolute Fit Measures, the χ²/df value of this study model = 2.47, which is less than the threshold value of 3; the RMSEA = 0.06, which is less than the critical value of 0.8; the GFI = 0.99, and the AGFI = 0.98, which are greater than the threshold value of 0.9. All values meet the threshold requirement.

In this study, the Incremental Fit Measures were based on the suggestion of Hair et al. (2019). The NFI = 0.99, NNFI = 0.98, CFI = 0.99, IFI = 0.99 and RFI = 0.98, which are all larger than the threshold value of 0.8. All values are in line with the suggestion of Hair et al. (2019). In the present study, the Parsimonious Adjusted Measures were also adopted from Hair et al.’s (2019) suggestion. The PNFI = 0.66 and the PGFI = 0.69, which are greater than the threshold value of 0.5. All values met the recommended thresholds.

Table 2

| Index         | Threshold | Family intimacy | Flow experience | Gameplay anxiety | Perceived value |
|---------------|-----------|-----------------|-----------------|-----------------|-----------------|
| χ²/df         | <3        | 2.89            | 2.28            | 2.32            | 2.59            |
| RMSEA         | <.08      | .07             | .08             | .06             | .06             |
| GFI           | >.8       | .99             | .99             | .99             | .97             |
| AGFI          | >.8       | .98             | .98             | .96             | .95             |
| t-value       | >10       | 12.99–14.0      | 15.38–17.63     | 13.10–15.44     | 9.61–12.27      |
13. Path analysis

The results of the path analysis are summarized in Fig. 8, which examines the direct relationships among the research constructs and verifies the hypotheses. Table 5 shows that H1: Family intimacy is positively related to Flow experience ($\beta = 0.74$, $t = 12.59$, $p < .001$); H2: Family intimacy is not significantly related to gameplay anxiety ($\beta = 0.18$, $t = -3.69$, $p > .05$); H3: Flow experience is positively related to perceived value ($\beta = 0.66$, $t = 10.4$, $p < .001$); and H4: gameplay anxiety is not significantly related to perceived value ($\beta = -0.05$, $t = -1.32$, $p > .05$).

Structural equation modeling is a multivariate statistical method based on regression, and the explanatory power is measured by the coefficient of determination ($R^2$) (Colombo et al., 2017). Additionally, Cohen’s $f^2$ value of 0.02 represents a small effect, 0.15 a medium effect, and 0.35 a large effect (Schafe & Schwarz, 2019). The explanatory power of family intimacy on flow experience was 54% ($R^2 = 0.54$) with a large effect size of 0.52. The explanatory power of family intimacy on gameplay anxiety was 3% ($R^2 = 0.03$) with a small effect size of 0.08. The explanatory power of flow experience and gameplay anxiety on perceived value was 45% ($R^2 = 0.45$) with a medium effect size.

14. Indirect effect analysis

For the indirect effects, the results of the bootstrapping method indicated that the indirect effect of family intimacy on flow experience and gameplay anxiety reflecting perceived value was 0.26 with a 95% confidence interval: [0.32-0.61]; the 95% confidence interval did not include zero, which revealed that there was a mediator effect for flow experience and gameplay in the relationship between family intimacy and perceived value. Table 4 shows H5: Family intimacy is positively related to perceived value ($\beta = 0.26$, $p < .001$), representing a significant indirect association between the two constructs.

15. Discussion

Gamer interest is dependent on the interaction of the three factors of player characteristics, the genre and design of games, and the platform (Halloran & Minaeva, 2019). Moreover, MEC theory severs the linkages between a product’s attributes, consequences, and personal values (Lin et al., 2020). According to MEC, the attributes of Switch are the “means” by which players achieve their desired goal of arriving at the end point. To understand the cognitive and emotional effect when participants played River Survival together using Switch during the COVID-19 lockdown, the present study verified those hypotheses related to the direct effect and indirect effect between family intimacy, flow experience, gameplay anxiety, and perceived value.

Playing virtual sports is significantly associated with biokinetically-driven behavioral engagement (Bakhshaie et al.,...
When playing River Survival, one of the features is to avoid the risk of the boat stopping by hitting rocks or big fish with time pressure by using Switch. In addition, the game requires team members to collaboratively control the boat, which makes occurrence dependencies explicit in activity process models (Adamo et al., 2021), and the effects of the interdependencies affect their game experience (Diehlmann et al., 2021). Game experience can be activated by family intimacy which can affect emotion control if there is conflict with family members, particularly with parents (Jin et al., 2019). Participants found that difficulty in adjustment will have a more distressing experience in sport exercise, and they need to ask for support. If the supports are provided by intimate others, they will feel enabled to complete the task more effectively (Brown et al., 2018). Moreover, Sajjadi et al. (2019) revealed that family intimacy can be considered as having a positive association with flow experience, but it may have a negative association with gameplay anxiety. In examining the effect of playing a boating game with family members, the results of this study indicated that family intimacy can positively predict flow experience, but it was not significantly related to gameplay anxiety; that is, drawing on MEC, the game features only by game experience.

**p < 0.01, ***p < 0.001.

![Fig. 8. Verification of the research model.](image-url)

**Table 4**
Indirect effect analysis.

| Constructs | Family intimacy | β   | CI       |
|------------|-----------------|-----|----------|
| Perceived value | .26*** | [.32-.61] |

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

**Table 5**
The hypothesis verification.

| Hypothesis | Results         |
|------------|----------------|
| H1: Family intimacy is positively related to flow experience. | Supported |
| H2: Family intimacy is negatively related to gameplay anxiety. | Supported |
| H3: Flow experience is positively related to perceived value. | Supported |
| H4: Gameplay anxiety is negatively related to perceived value. | Unsupported |
| H5: Family intimacy is positively related to perceived value mediated by game experience. | Supported |

**16. Conclusion**

During the COVID-19 pandemic, most people have more time to stay at home and play games together. In particular, in order to maintain social distance, most people play with their family members. That is, to avoid being infected by COVID-19, most people increase their interaction time with family members, but an increase in interaction time does not always mean an increase in a sense of interdependence if the family members lack intimacy. To understand the role of intimacy among
family members and how it affects game experience, drawing on MEC theory, this study explored how players’ flow and anxiety were affected when they played River Survival with their family members. Conclusively, the present study verified the research model and found that there was an antecedent role of family intimacy that affected participants’ flow state and perceived experiential value in playing River Survival.

17. Contribution
Switch provides players’ doing bodying exercise by seeing and responding situation that suddenly appearing on the screen, which requires players to pay attention and responding action from more than one person’s action. In line with this playing, players’ family intimacy may trigger players cognition and emotion varied during teamwork to play, however, to study the correlates between those factors of cognition and emotion, the results of this study revealed that to align with the boating goals, so that it inherently stimulates social interaction to promote family interaction. Therefore, it is suggested that family members can enjoy playing River Survival at home.

18. Implication
A practical implication of this study is including family intimacy as an antecedent in the relation to flow experience and experiential value in collaborative playing of the game, River Survival, with a new technological device, Switch. That is, family intimacy played a key role of interdependence as a pre-factor of succeeding in virtual boating in this study. Moreover, the results indicated that the higher the level of family intimacy before playing this game, the higher the level of flow experience players would have, and consequently, they would have greater perceived value of collaboratively playing River Survival. Therefore, if people want to collaboratively play virtual sports games during the COVID-19 pandemic or on other occasions, they can organize team members with high levels of intimacy.

A particular feature embedded in the Switch system provides remote competition, meaning that players can organize their teams to compete with other teams while playing River Survival. Such a playing mechanism may result in other practical implications suggested by this study. That is, people in countries which are still encountering the COVID-19 pandemic can spend more time with the same team members to build up a sense of camaraderie. Moreover, as they become more familiar with the operability of the Switch device and know the locations of the rocks or where fish will appear, then they can easily reach the end point.

19. Limitations and future study
Besides “River Survival,” there are many other virtual sports games on the market which need players to play collaboratively. Every game has different design features based on the A-C-V model, which may have different results using the same research framework. Thus, future studies can implement other collaborative sports virtual games to study the mental and emotional factors mentioned in this study and to compare the differential power between different games.

The participants in this study included different age groups; however, perceptions of family intimacy from parents’ points of view may differ from children’s points of view. This perspective was not studied in this research. Future studies may compare the different points of view of parents and children to see how the differences in their perceptions of game experience affect family intimacy.

Credit author statement
Jon-Chao Hong: Conceptualization, Methodology, Supervision, Writing – original draft, Writing – review & editing. Formal analysis. Hsiao-Chi Juan: Visualization, Investigation, Data curation, Conceptualization, Writing – original draft. Wei-Chen Hung: Data curation, Formal analysis.

Declaration of competing interest
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