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Attitudes or Norms? Self-Esteem as a Moderator of Gaming Intentions and Gaming-Related Outcomes

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Abstract

Background

Online gaming has become a common leisure activity among young adults, with concerns about excessive and problematic use increasing since the COVID-19 pandemic. While problematic game use (PGU) has been extensively examined in adolescents, less is known about the variables related to PGU among college students experiencing greater autonomy and social pressure. Guided by the Theory of Planned Behavior (TPB), this study examines whether attitudes, subjective norms, and perceived behavioral control (PBC) are associated with gaming intention and whether intention is related to excessive game use (EGU) and PGU. The study further examines self-esteem as a moderator that may alter the cognitive and social mechanisms underlying intention formation.

Methods

A sample of 303 Korean undergraduates with online gaming experience participated in the survey with validated measures of TPB constructs, intention, EGU, PGU, and self-esteem. Structural equation modeling (SEM) was used to test the hypothesized model, and multi-group SEM was conducted to examine moderation by self-esteem.

Results

The overall SEM demonstrated good fit. Subjective norm ($\beta = .612$), PBC ($\beta = .378$), and attitude ($\beta = .124$) showed significant associations with intention. Intention showed a strong positive association with EGU ($\beta = .709$), which was positively associated with PGU ($\beta = .326$). PBC also influenced EGU ($\beta = .104$). Multi-group analyses revealed distinct mechanisms by self-esteem: attitude was significantly associated with intention only among high self-esteem students, whereas subjective

norms showed a substantially stronger association with intention among students with low self-esteem. Differences in ATT → INT ($\Delta\chi^2 = 4.97, p < .05$) and SUB → INT ($\Delta\chi^2 = 6.88, p < .01$) were significant.

Conclusions

The findings support the usefulness of TPB in understanding gaming intention and related gaming behaviors. Self-esteem appears to condition the cognitive and social antecedents of intention, highlighting the need for tailored interventions: autonomy- and value-based strategies for high self-esteem individuals, and norm- or peer-based approaches for low self-esteem individuals.

Keywords: Online Gaming, Excessive Game Use, Problematic Game Use, Theory of Planned Behavior, Self-Esteem

Background

The rapid expansion of digital media has made online gaming one of the most popular leisure activities among young people worldwide. The widespread adoption of smartphones and the interactive features of online games, including massively multiplayer online role-playing games (MMORPGs), have increased both accessibility and engagement [1]. This trend appears to have intensified during the COVID-19 pandemic, when school closures and social distancing increased young people's reliance on online activities for entertainment and social connection [2,3].

Despite this growth, research on problematic game use (PGU) has focused primarily on adolescents. College students, however, warrant separate attention because they typically experience greater financial and temporal autonomy, less parental supervision, and more complex academic and social demands. In Korea, online gaming is also common among college students, suggesting that the factors associated with gaming-related outcomes may differ in this developmental context from those observed in younger populations [4].

PGU refers to a maladaptive pattern of game use that persists despite negative consequences and is often accompanied by psychological and social impairment [5,6]. It includes symptoms such

as loss of control over play time, withdrawal-like experiences, and deterioration in academic or occupational functioning. Prior studies have supported that PGU is strongly linked to depression, loneliness, social anxiety, and broader difficulties in well-being and social adjustment [7,8]. These findings indicate that problematic gaming should be understood not simply as heavy use, but as a more harmful pattern of media behavior with meaningful psychological and social correlates.

In this study, the Theory of Planned Behavior (TPB) provides the main conceptual framework [9]. TPB suggests that attitudes, subjective norms, and perceived behavioral control (PBC) are associated with behavioral intention and, in turn, with behavior. Building on this framework, the present study distinguishes between excessive game use (EGU) and problematic game use (PGU) and examines whether they are associated with a pattern consistent with the proposed model based on TPB. The study also considers self-esteem as a potential moderator of intention formation, given its relevance to self-regulation, social influence, and digital media use among young adults [10,11]. By focusing on college students and differentiating stages of gaming-related outcomes, this study aims to refine the application of TPB to online gaming and to identify whether the relative importance of cognitive and social antecedents varies by self-esteem.

Excessive and Problematic Online Game Use

Excessive and problematic online gaming have drawn increasing scholarly and public health attention in recent years. Although heavy game use is not necessarily dysfunctional, prolonged overinvolvement in gaming may make maladaptive outcomes more likely. Concerns about gaming-related problems also increased during and after the COVID-19 period, when online leisure activities became more central to everyday life [2,3].

PGU is generally defined as a maladaptive pattern of online gaming that produces significant impairment or distress in personal, social, academic, or occupational functioning [5,6]. Typical indicators include preoccupation with gaming, difficulty reducing play, continued use despite negative consequences, and withdrawal-like experiences when unable to play. In this respect, PGU resembles other addictive and problematic online behaviors in that the issue is not use itself, but the persistence of use despite mounting costs [12,13].

Research has repeatedly shown that problematic gaming is associated with a range of adverse outcomes, including academic difficulties, social withdrawal, family conflict, depression, loneliness, and social anxiety [7,14,15]. At the same time, the literature suggests that excessive use and problematic use should not be treated as

identical constructs. A person may spend substantial time gaming without showing severe impairment, whereas PGU involves a more disruptive pattern marked by diminished control and negative consequences [6,16]. Therefore, distinguishing EGU from PGU allows for a more nuanced account of gaming-related outcomes.

Theory of Planned Behavior (TPB) and Its Application to Gaming Behavior

The Theory of Planned Behavior (TPB) offers a useful framework for explaining online gaming because it links behavior to intention and to three core antecedents: attitude, subjective norm, and perceived behavioral control [9]. Attitude refers to the extent to which a person evaluates gaming favorably or unfavorably. Subjective norm reflects perceived social expectations from important others, and PBC refers to the extent to which individuals believe they can perform or regulate the behavior. Across a variety of digital behaviors, TPB has been widely used to explain why people intend to engage in particular forms of media or technology use [17,18].

Prior studies applying TPB to gaming have shown that favorable attitudes toward gaming, perceived social approval, and stronger perceptions of control are associated with greater intention to play online games [19,20,21,22]. In gaming environments, these constructs are especially relevant because play is shaped not only by personal

enjoyment but also by peer culture, interaction with online communities, and beliefs about one's ability to manage time and participation. Existing studies, however, have often treated gaming behavior as a relatively undifferentiated outcome or have focused on PGU without distinguishing earlier stages of heavy involvement.

To address this limitation, the present study separates EGU from PGU and examines whether TPB-based intention is associated with these outcomes in a staged manner. This approach does not assume a deterministic or developmental sequence; rather, it tests whether the observed pattern of associations is consistent with the proposed conceptual ordering. In addition, following Ajzen's account of PBC, the model allows PBC to relate not only to intention but also directly to gaming-related behavior, as perceptions of control may matter even after intentions are formed [9,23].

The Moderating Role of Self-Esteem

The current study especially focuses on whether these hypothetical relationships can be varied by a personal characteristic. Self-esteem is an individual's overall evaluation of self-worth and has been identified as an important factor in research on digital media use and maladaptive online behavior [11,24]. In the context of online gaming, self-esteem may matter because it is related to self-regulation, sensitivity to social feedback, and the ways individuals

seek competence, belonging, or psychological relief in mediated environments. These features make self-esteem a possible moderator of the pathways through which TPB variables are associated with gaming intention.

Theoretically, several perspectives suggest that the relative importance of TPB antecedents may differ by self-esteem. Individuals with lower self-esteem may be more attentive to external approval and interpersonal cues, making subjective norms particularly influential in intention formation [25,26,27,28]. They may also use gaming to compensate for stress or diminished self-worth, increasing the salience of socially reinforced motives [24,29,30]. By contrast, individuals with higher self-esteem may rely more on their own evaluations when forming intentions, which would make attitudinal considerations relatively more important.

Empirical work directly examining self-esteem as a moderator within TPB-based gaming models remains limited, especially among college students. By incorporating self-esteem into the model, this study examines whether the associations between TPB antecedents and gaming intention differ across self-esteem groups. This focus extends previous research beyond an adolescent-centered perspective and offers a more differentiated account of how cognitive and social

mechanisms may operate in college students' gaming-related outcomes.

Methods

Research Design and Hypotheses

Drawing on the Theory of Planned Behavior (TPB), the current study examines the associations among attitudes toward online gaming, subjective norms, perceived behavioral control (PBC), gaming intention, excessive game use (EGU), and problematic game use (PGU). While prior studies have often treated gaming behavior as a relatively undifferentiated outcome or have focused primarily on problematic use, the present study distinguishes between excessive and problematic game use in order to capture different levels of gaming-related involvement and maladjustment. In doing so, the study aims to provide a more differentiated understanding of gaming behavior among college students.

In addition, the study considers self-esteem as a moderator that may condition the cognitive and social processes underlying intention formation. Given that gaming-related problems may vary according to individual characteristics, self-esteem is expected to differentiate the relative importance of attitudinal, normative, and control-related

factors associated with gaming intention. Based on this framework, the following hypotheses were proposed, and the hypothesized model is presented in Figure 1.

H1: Attitude toward the online game is positively associated with the intention to play online games

H2: Subjective norm is positively associated with the intention to play online games

H3: Perceived behavioral control is positively associated with the intention to play online games.

H4: Perceived behavioral control is positively associated with the excessive use of online games.

H5: Intention to play online games is positively associated with the excessive use of online games.

H6: Excessive use of online games is positively associated with the problematic use of online games.

H7 (Moderation): Self-esteem moderates the relationship between attitude and intention.

H8 (Moderation): Self-esteem moderates the relationship between subjective norm and intention.

H9 (Moderation): Self-esteem moderates the relationship between perceived behavioral control and intention.

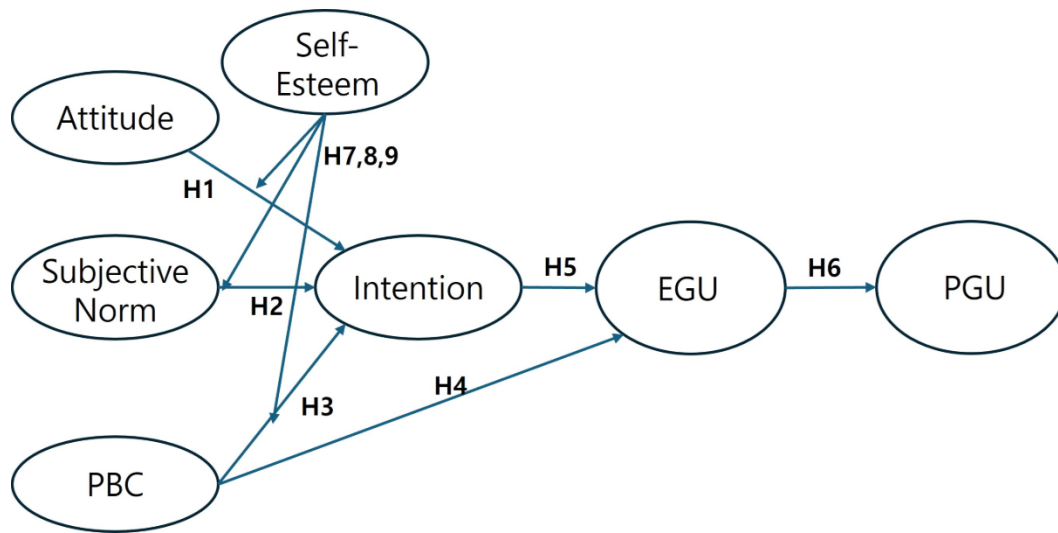


Figure 1. A Proposed Model

Participants and Procedure

The study used a cross-sectional online survey design to examine online gaming intention and gaming-related outcomes among undergraduate students enrolled at a university in Seoul, South Korea. Eligibility criteria required participants to be currently enrolled undergraduate students and to report at least some prior experience with online game play. Recruitment was conducted through invitation notices posted on the university's online community and on-campus bulletin boards. The notice briefly introduced the study, described the participation procedure, informed students of the voluntary nature of participation, explained that responses would be treated confidentially, and noted that participants could withdraw from the survey at any point before submission.

Interested students accessed the survey through a web-based URL provided in the recruitment notice. Before they could proceed to the questionnaire, respondents were presented with an electronic informed-consent page describing the study purpose, the handling and protection of personal information, the anonymous or confidential processing of responses, and the voluntary basis of participation. Only those who provided consent electronically were allowed to continue to the survey. Upon completion, participants received a coffee coupon as a modest token of appreciation.

A total of 339 responses were submitted. Of these, 36 cases were excluded from the final dataset because the respondents either indicated that they had no prior experience with online gaming or showed evidence of careless or inattentive responding. The final analytic sample thus comprised 303 undergraduate students. Of these, 194 were male (64.0%) and 109 were female (36.0%). The mean age of the sample was 21.88 years ($SD = 2.66$). With respect to academic year, 23.1% were first-year students, 33.3% were second-year students, 18.5% were third-year students, and 25.1% were fourth-year students.

Measures

The main constructs in the study were measured using items adapted from established instruments and prior studies on the Theory

of Planned Behavior (TPB), problematic online game use, excessive media/game use, and self-esteem. In line with Ajzen's compatibility principle, the TPB-related items were formulated to correspond as closely as possible to the focal behavior of interest—online game use—so that attitude, subjective norm, perceived behavioral control, and intention referred to the same behavioral domain. Unless otherwise indicated, psychological measures were assessed on a 7-point Likert-type scale (1 = *strongly disagree*, 7 = *strongly agree*). Cronbach's alpha coefficients are reported for the reflective multi-item constructs.

Attitude toward Online Gaming was measured with three direct evaluation items adapted from TPB-based questionnaire guidelines and prior digital-media applications of the model [20,31]. The retained items captured respondents' favorable evaluation of frequent online gaming (e.g., "I think playing online games frequently is good/fun/enjoyable"). This measure showed excellent internal consistency (Cronbach's $\alpha = .958$).

Subjective Norm was assessed with three items adapted from prior norm-based studies [32,33]. The retained items captured perceived gaming-related normative pressure and the prevalence of gaming among salient others (e.g., "*Most people who are important to me play online games frequently*"). Internal consistency was

acceptable (Cronbach's $\alpha = .839$). Given prior evidence that descriptive and normative social influence may be especially consequential in younger samples and health-risk contexts, the inclusion of this construct was theoretically important for the present college-student sample.

Perceived Behavioral Control (PBC) was measured with two items adapted from TPB-based media-use research [31,33]. The retained items focused on respondents' perceived capability and control with respect to online gaming (e.g., "*I can play online games skillfully*" and "*I have the knowledge and ability needed to enjoy online games*"). Internal consistency was good (Cronbach's $\alpha = .886$). In the TPB framework, PBC is particularly relevant because it may shape both intention formation and behavior-related outcomes when individuals perceive that they possess the resources or ability needed to engage in the focal behavior.

In addition to the three TPB antecedents, the structural model included intention to use online games, excessive game use (EGU), problematic game use (PGU), and self-esteem. Intention to Use Online Games was measured with three items assessing future willingness, plans, and intention to continue engaging in online gaming (e.g., "*I will play online games frequently*," "*I intend to play online games frequently*," and "*I plan to play online games frequently*"). The

measure showed high reliability (Cronbach's $\alpha = .947$). This operationalization follows standard TPB intention measurement practice, which typically assesses expectation, intention, and planning as closely related indicators of behavioral readiness.

Excessive Game Use (EGU) was measured with three behavioral indicators: weekly gaming frequency, average weekly gaming hours, and the perceived probability of playing online games when free time was available. These indicators were informed by previous research on excessive and problematic gaming/media use [34,35]. Unlike the reflective Likert-type constructs above, EGU was operationalized as a behavioral factor composed of complementary indicators of usage intensity. Accordingly, internal consistency was not emphasized as the primary criterion for evaluating this construct. Instead, the three indicators were modeled jointly as observed indicators of a latent EGU factor in the SEM and multi-group SEM analyses.

Problematic Game Use (PGU) was assessed using five retained items from Kim and Kim's Problematic Online Game Use Scale [1]. The retained items covered key maladaptive symptoms, including negative consequences, disruption of daily functioning, priority given to gaming over other activities, and failure of self-regulation. Internal consistency was satisfactory (Cronbach's $\alpha = .863$). This distinction between EGU and PGU was maintained deliberately: EGU was treated

as a behavioral intensity construct, whereas PGU was used to capture maladaptive symptoms and functional impairment. This distinction is theoretically consistent with prior research arguing that excessive time investment and problematic usage are related but not identical constructs.

Finally, Self-Esteem, the focal moderating variable, was measured with four items adapted from prior research on excessive digital-media use [33]. The retained items assessed general positive self-evaluation (e.g., “*Overall, I am satisfied with myself*” and “*I think I have a number of good qualities*”). In the present study, the scale showed high internal consistency (Cronbach’s $\alpha = .919$). Because the study aimed to compare TPB pathways across different self-evaluative profiles, self-esteem was used as a grouping variable in the multi-group SEM, and the grouping procedure is described in detail in the Statistical Analysis subsection.

Statistical Analysis

Statistical analyses were conducted in two steps. First, the hypothesized model was tested using structural equation modeling (SEM) in SPSS Amos 30 with maximum likelihood estimation. The analysis was conducted for the full sample of 303 participants. Model fit was evaluated using multiple fit indices, including χ^2 , CFI, TLI, and RMSEA. Because the data were obtained from a one-time cross-

sectional survey, the structural paths were interpreted as associational relationships within a theoretically specified model, rather than as evidence of temporal progression or causal development, consistent with the scope of the design.

Second, to examine the moderating role of self-esteem, a multi-group SEM was conducted. Participants were divided into low and high self-esteem groups using a median split based on the composite self-esteem score. The observed distribution of self-esteem scores indicated a median value of 23 (4 items), which was used as the cut-off point for the group classification. This procedure yielded 158 respondents in the low self-esteem group (mean=18.96) and 145 respondents in the high self-esteem group (mean=25.78). Separate models were then estimated for the two groups, and the structural coefficients were compared to determine whether the effects of attitude, subjective norm, and perceived behavioral control on gaming intention differed according to self-esteem level.

Results

Structural Equation Model (SEM) Results for the Overall

Sample

As shown in Figure 2, the overall SEM showed a good fit to the data, $\chi^2(142) = 240.170$ ($p < .001$), CFI = .977, TLI = .972, RMSEA = .048. Most of the hypothesized paths were statistically significant in the overall sample [36].

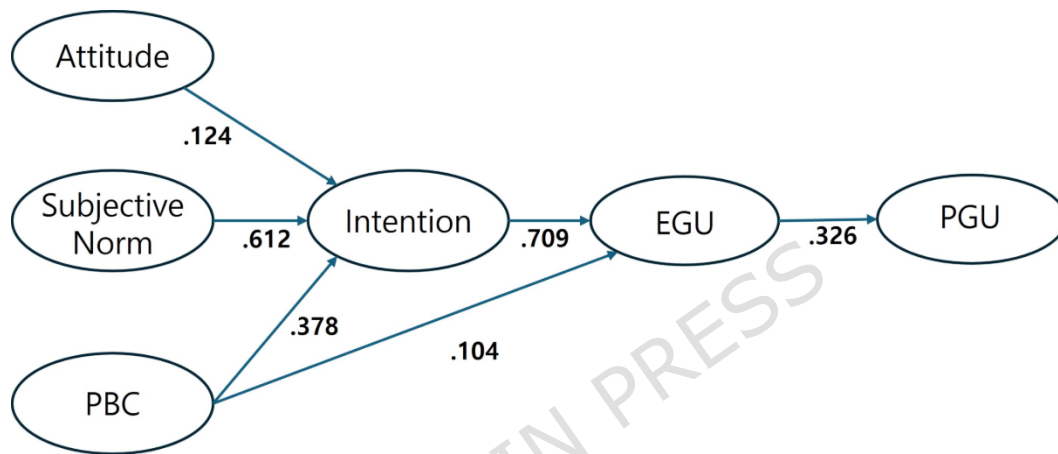


Figure 2. The Structural Equation Model

Specifically, intention to play online games was positively associated with subjective norm ($\beta = .612$, $p < .001$), perceived behavioral control ($\beta = .378$, $p < .001$), and, to a lesser extent, attitude toward online gaming ($\beta = .124$, $p < .05$). These coefficients suggest that, in the overall sample, perceived social influence and control beliefs were more strongly associated with gaming intention than personal evaluations alone. Intention was positively associated with excessive game use ($\beta = .709$, $p < .001$), and excessive game use was positively associated with problematic game use ($\beta = .326$, $p < .001$). In

addition, perceived behavioral control showed a smaller but statistically significant positive association with excessive game use ($\beta = .104, p < .05$), suggesting that PBC was linked not only to intention formation but also to higher levels of gaming engagement. Taken together, these findings support the proposed TPB-based pattern of associations in the full sample and highlight the relatively strong role of social influence and perceived control in relation to gaming intention.

Moderating Effect of Self-Esteem: Multi-Group SEM

To examine whether self-esteem moderated the hypothesized structural relationships, a multi-group SEM was conducted for the low ($n = 158$) and high ($n = 145$) self-esteem groups, which had been formed using a median split of the composite self-esteem score. The model demonstrated acceptable fit in both groups, although the degree of fit differed somewhat across the two subsamples. For the high self-esteem group, the fit indices were $\chi^2(142) = 161.136$ ($p = .130$), CFI = .991, TLI = .989, RMSEA = .031, indicating excellent model fit according to conventional cutoff criteria [36]. The non-significant chi-square in this group should be interpreted alongside the other fit indices, particularly because chi-square is known to be sensitive to sample size [37]. The combination of very high CFI and TLI values and a low RMSEA suggests that the model fit this group well. In the low self-esteem group, the model yielded $\chi^2(142) =$

226.695 ($p < .001$), CFI = .959, TLI = .951, RMSEA = .062, suggesting acceptable, though comparatively weaker, fit. Taken together, these findings suggest that the general structure of the model was applicable in both self-esteem groups, although the pattern fit somewhat better among respondents with higher self-esteem.

Table 1. Structural Path Estimates in two groups of Self-Esteem

Path	Self-Esteem	Estimate (β)	C.R.	p -value
ATT → INT	High	0.147	2.277	<.05
ATT → INT	Low	0.053	0.843	.400
SUB → INT	High	0.444	5.276	<.001
SUB → INT	Low	0.796	7.785	<.001
PBC → INT	High	0.545	4.503	<.001
PBC → INT	Low	0.261	2.982	<.01
PBC → EGU	High	0.130	1.717	.086
PBC → EGU	Low	0.157	2.206	<.05
INT → EGU	High	0.811	9.056	<.001
INT → EGU	Low	0.621	7.764	<.001
EGU → PGU	High	0.291	3.564	<.001
EGU → PGU	Low	0.415	5.114	<.001

As shown in Table 1, the structural path estimates indicated meaningful differences between the high and low self-esteem groups, particularly in the antecedents of gaming intention. The association between attitude and intention was statistically significant only in the high self-esteem group ($\beta = .147$, $p < .05$), whereas it was not significant in the low self-esteem group ($\beta = .053$, $p = .400$). This

pattern suggests that respondents with higher self-esteem may rely more on their own evaluative judgments when forming gaming intentions. In contrast, subjective norm was more strongly associated with intention in the low self-esteem group ($\beta = .796, p < .001$) than in the high self-esteem group ($\beta = .444, p < .001$), suggesting that respondents with lower self-esteem may be more responsive to perceived social expectations when forming gaming intentions. Perceived behavioral control was positively associated with intention in both groups, with a larger coefficient in the high self-esteem group ($\beta = .545, p < .001$) than in the low self-esteem group ($\beta = .261, p < .01$). The post-intention associations—intention with excessive game use and excessive game use with problematic game use remained positive and statistically significant in both groups.

To test moderation more formally, a series of nested model comparisons were conducted by constraining each structural path to equality across groups and examining the corresponding chi-square difference values [38]. A significant change in chi-square ($\Delta\chi^2$) indicates that the relevant path coefficient differs significantly between groups.

Table 2. Differences between the path coefficients across the two groups

Path	Self-Esteem Group High (β)	Self-Esteem Group Low (β)	$\Delta\chi^2(df)$	p -value
ATT $\rightarrow$ INT	.147	.053	4.97	< .05
SUB $\rightarrow$ INT	.444	.796	6.88	< .01
PBC $\rightarrow$ INT	.545	.261	3.12	.077
PBC $\rightarrow$ EGU	.130	.157	0.55	.458
INT $\rightarrow$ EGU	.811	.621	1.04	.308
EGU $\rightarrow$ PGU	.291	.415	0.88	.348

$\Delta\chi^2$ =Chi-square difference between unconstrained and constrained path models (df =1).

As shown in Table 2, the path from attitude to intention differed significantly between groups, $\Delta\chi^2(1) = 4.97$ ($p < .05$). This result indicates that the attitude-intention association was significantly stronger in the high self-esteem group. Similarly, the path from subjective norm to intention also differed significantly across groups, $\Delta\chi^2(1) = 6.88$ ($p < .01$), indicating that the subjective norm-intention association was stronger in the low self-esteem group. The difference in the PBC $\rightarrow$ INT path did not reach conventional levels of statistical significance, $\Delta\chi^2(1) = 3.12$ ($p = .077$), although the coefficient was numerically larger in the high self-esteem group. For the remaining paths, none of the chi-square difference tests was statistically significant (all p values $> .30$), indicating that these structural associations did not differ appreciably across self-esteem groups. Taken together, these findings suggest that self-esteem primarily differentiated the antecedents of gaming intention—especially

attitude and subjective norm—whereas the associations among intention, excessive game use, and problematic game use were comparatively stable across groups.

Discussion

The present study applied the Theory of Planned Behavior (TPB) to online gaming among college students while distinguishing between excessive game use (EGU) and problematic game use (PGU) and examining self-esteem as a moderator of intention formation. In the overall sample, attitude, subjective norm, and perceived behavioral control (PBC) were all positively associated with gaming intention, with subjective norm showing the strongest association among the three antecedents. Intention was positively associated with EGU, and EGU was positively associated with PGU, while PBC also showed a smaller direct association with EGU. Taken together, these findings suggest that a TPB-based framework remains useful for explaining variation in gaming intention and gaming-related outcomes in a college-student sample, while also indicating that social influence may be particularly salient in this domain. This latter point is broadly consistent with prior TPB-related evidence showing that normative influences can be especially important in younger populations and in risk-related behavioral contexts.

One important theoretical contribution of the study lies in its differentiation between EGU and PGU. Much research on gaming and other digital behaviors has tended either to focus on problematic use alone or to treat heavy use and problematic use as if they were interchangeable. The present findings support a more differentiated view. By modeling EGU and PGU as separate but related constructs, the study suggests that gaming intensity and maladaptive symptoms should not be collapsed into a single outcome. This interpretation is compatible with prior work arguing that time spent using a medium and problematic symptoms are related but not overlapping constructs, and that excessive engagement should be evaluated together with, but not reduced to, maladaptive consequences. In this sense, the present study contributes to the literature by showing that distinguishing between engagement-related and impairment-related outcomes can yield a more precise account of gaming-related behavior.

A second contribution concerns the role of self-esteem. By incorporating self-esteem into the TPB framework, the study moves beyond the assumption that the antecedents of intention operate uniformly across individuals. The multi-group results indicate that the relative importance of the TPB antecedents differed across self-esteem profiles. Among respondents with higher self-esteem, attitude showed a significant association with gaming intention, suggesting a

stronger role for personal evaluation in intention formation. Among respondents with lower self-esteem, subjective norm was more strongly associated with intention, suggesting greater responsiveness to perceived social expectations. These findings imply that the intention to play online games is not formed through an identical psychological weighting process for all users. Rather, self-esteem appears to shape whether gaming intention is grounded more strongly in internal evaluation or in the perceived behavior and expectations of others.

This pattern strengthens the study's contribution to TPB-based gaming research by clarifying when and for whom subjective norm may become especially important. Although the normative component is often weaker than attitude or perceived behavioral control in the general TPB literature, previous evidence indicates that social influence may become more salient in younger populations and in health-risk or socially sensitive behavioral domains [39,40,41]. The present findings align with that broader pattern. Among college students—who often remain sensitive to peer comparison, social belonging, and identity-related concerns—normative influence appears particularly consequential for intention formation, especially among those with lower self-esteem. Accordingly, the study extends TPB-based gaming research not merely by applying the model to

online gaming, but by showing that the relative contribution of its antecedents depends in part on individual psychological context.

The findings also speak to broader research on problematic digital-media use. Prior work on excessive and addictive social network site use found that self-esteem may function differently across groups and contexts, and that the antecedents of excessive engagement are not necessarily identical to the antecedents of more problematic or addictive use. In a similar way, the present study suggests that online gaming should not be understood solely as a function of favorable attitudes or strong intentions. Instead, gaming-related outcomes appear to reflect the joint operation of personal evaluation, perceived control, social context, and individual differences in self-esteem. This broader framing may help position problematic gaming not as a unitary syndrome with a single pathway, but as a differentiated behavioral domain in which intention formation and downstream outcomes may be shaped by partially distinct processes.

From a practical perspective, the findings suggest that prevention and intervention strategies for problematic gaming may benefit from greater psychological tailoring. For students with lower self-esteem, interventions that address peer influence, perceived norms, and socially reinforced gaming environments may be especially relevant.

This implication is consistent with the broader literature suggesting that the behavior of important others provides informational and motivational cues that can shape intentions, particularly among younger individuals. In applied settings, this could mean that peer-centered counseling, group-based norm correction, or interventions that target perceived social expectations may be more effective than exclusively intrapersonal approaches for some students [42].

For students with higher self-esteem, the findings suggest a somewhat different emphasis. Because attitude was more strongly associated with intention in this group, interventions may be more effective when they engage students' own evaluative standards, priorities, and goals. In practice, this means that value-based reflection, self-regulation training, and decision-making strategies that highlight opportunity cost and long-term academic or well-being goals may be particularly useful. The direct association between PBC and EGU also suggests that gaming-related self-regulation cannot be reduced to a simple matter of liking games or yielding to peer pressure. Programs that strengthen reflective control over time use, scheduling, and competing commitments may be beneficial across self-esteem groups, especially in university settings where students often manage high autonomy with limited external monitoring.

The present findings may also be useful for campus mental-health and student-support services. University counseling centers often encounter students whose gaming is embedded in broader struggles involving loneliness, belonging, stress, or academic disorganization. The current results suggest that screening and intervention may be improved by paying attention not only to how much students play, but also to why they intend to play and which antecedents appear most salient. For some students, gaming intention may be tied more strongly to peer context and social comparison; for others, it may be linked more to personal evaluation and self-directed preference. This distinction can guide more tailored prevention messaging, psychoeducation, and counseling strategies.

Several limitations should be acknowledged. First, all variables were measured through a one-time self-report survey. As a result, the present study cannot establish temporal ordering, behavioral progression, or causal escalation from intention to excessive or problematic game use. Although the model was specified in a theoretically ordered manner, the findings should be understood as evidence of structured cross-sectional associations rather than demonstrated developmental processes. This limitation is especially important because questions about behavioral change, escalation, or transition are often better addressed through longitudinal, repeated-measures, or behavioral-log designs than through a one-shot survey.

Second, the sample was restricted to undergraduate students from a single university context in South Korea, which may limit the generalizability of the findings to other age groups, institutions, and cultural contexts. Third, self-esteem was operationalized through a median split for the multi-group SEM, which is useful for group comparison but necessarily simplifies what is fundamentally a continuous psychological characteristic.

Future research should therefore pursue three directions. First, longitudinal and repeated-measures studies are needed to determine whether the observed associations among intention, EGU, and PGU remain stable over time and whether temporal ordering can be established more directly. Second, future research should examine whether similar moderation patterns emerge in more diverse populations, including non-student adult samples and cross-cultural settings. Third, future studies may benefit from combining self-report measures with behavioral indicators or digital trace data to strengthen inference about gaming engagement and problematic usage. Such approaches would make it possible to test more rigorously whether the distinctions observed here at the cross-sectional level are also meaningful over time and across contexts.

In sum, this study supports the usefulness of TPB for explaining online gaming intention in a college-student sample and suggests that

self-esteem is an important individual-difference variable shaping how gaming intentions are formed. By distinguishing EGU from PGU and by identifying differences in the antecedents of gaming intention across self-esteem groups, the study contributes to a more nuanced account of gaming-related outcomes. At the same time, the findings are best interpreted as evidence of structured associations within a cross-sectional design. Within those bounds, the study offers both a more differentiated theoretical perspective on problematic gaming and a practical basis for tailoring prevention and intervention strategies to students' psychological profiles.

Declarations

Ethics approval and consent to participate

The study protocol was submitted to and approved **by The Institutional Review Board of Chung-Ang University** (IRB approval no.: 1041078-201804-HRSB-081-01). All procedures performed in this study were conducted in accordance with the ethical standards for research involving human participants. Participation was voluntary, and informed consent was obtained electronically from all respondents prior to data collection. The study involved minimal risk, and confidentiality and anonymity were ensured throughout.

Consent for publication

Not applicable. All data were collected anonymously, and no identifying information is included in the manuscript and the original data.

Availability of data and materials

The datasets generated and analyzed during the present study are publicly available in the *Figshare* repository at the following DOI:
<https://doi.org/10.6084/m9.figshare.30018790.v1>.

Competing interests

The authors declare that they have no competing interests, financial or otherwise, related to this research.

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Authors' contributions

All authors contributed to the study's conception, design, analysis, and manuscript preparation. The first author led the study design, data collection, and initial manuscript drafting. The second author contributed to data analysis, interpretation, and manuscript revision. All authors reviewed and approved the final manuscript.

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