

Depressive symptoms as a predictor of addiction to tile-matching games: A cross-sectional study

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Abstract

Background

Tile-matching games engage millions of players worldwide by combining cognitive challenges, immediate rewards, immersive flow experiences, and visually and auditorily appealing designs that promote mastery, escapism, and repeated play. Meanwhile, video game addiction and depression are increasingly recognised as growing concerns for youth in Sri Lanka and across the globe.

Aims

This study was carried out to assess whether individuals experiencing depressive symptoms are more likely to exhibit addiction to tile-matching games.

Methods

A cross-sectional study involving 401 Sri Lankan adolescents and young adults who play video games. Data were collected through a pre-tested questionnaire administered through the snowball sampling method.

Results

The present study identified a significant association between depressive symptoms and video game addiction. The prevalence of gaming addiction was higher among tile-matching players (45.9%) than others (39.0%). Furthermore, tile-matching players showed higher unadjusted odds of addiction (OR = 6.29) compared to players of other games (OR = 4.79) among individuals with depressive symptoms versus those without depressive symptoms. Logistic regression confirmed depressive symptoms as the most significant predictor of addiction, although the interaction term for Depressive symptoms $\times$ Game Type, was not statistically significant.

Conclusion

Depressive symptoms are a significant predictor of video game addiction, including tile matching games, highlighting the importance of addressing mental health in preventive and intervention strategies.

Keywords: addiction, depression, association, tile-matching games, Asia

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1. Introduction

Depressive disorder is a recognized mood disorder with significant morbidity. It contributes to a global point prevalence rate of self-reported depressive symptoms, which was 34% from 2001 to 2020, pooled one-year prevalence and lifetime prevalence for major depressive disorder of 8% and 19%, respectively, according to a recent systematic review (1). In relation to young populations, the point prevalence of elevated depressive symptoms among adolescents was 37% between the years 2011 and 2020. Meanwhile, female adolescents were reported to have a higher prevalence of elevated depressive symptoms than males. Regarding Sri Lanka, a recent systematic review, which comprised 33 studies,

found the pooled prevalence of depression to be 19.4% (2). According to this analysis, the highest prevalence, 39%, was reported among young people in Sri Lanka (2). Humans often seek relief and comfort during times of distress, and playing video games has become intensively popular among billions of individuals due to its easy accessibility. Video games include various genres such as role-playing games (RPGs), and puzzle games. Among these, tile-matching games which come under the genre; puzzle games have remained consistently popular even prior to the advent of smartphones (3). Tile-matching games, such as Bejewelled, Candy Crush, and Tetris, uniquely combine cognitive demands with immediate gratification, which

underlies their broad appeal and compelling psychological engagement. These games capitalize on the human preference for order and completion by presenting disorganized tiles and offering the players the opportunity to restore order, which triggers dopamine release and reinforces continued participation in the play. Furthermore, in tile matching games the players often enter a flow state, where players become deeply immersed, and losing time perception, as the game dynamically adjusts its difficulty to match the player's skill level, providing a feeling of mastery and escapism (4). Accordingly, widespread popularity of tile-matching games and appeal lies in their simplicity, straightforward mechanics, capacity for brief play sessions, visually appealing designs, engaging auditory effects, and frequent reward systems which together attract millions of players globally (5). These games also foster feelings of satisfaction, achievement, and victory to the player, making them feel self-satisfied (6).

Video games exert a dual-edged influence on youth development, providing both important cognitive benefits and significant psychological risks. Positively, certain gaming genres enhance problem-solving abilities, spatial cognition, resilience in the face of failure and challenges, and facilitate social interaction and communication, especially in multiplayer contexts (7). Conversely, excessive or problematic gaming often involving violent content, is linked to heightened aggressive thoughts and behaviours, increased risk of gaming addiction, and adverse effects on sleep quality and academic performance (8). The overall influence of video gaming on mental health is largely determined by factors such as the type of game, the duration of game playing, and the context of play (9). While concerns about the potential harms of video game play have increased over the past decades, understanding its causal effect on mental health remains uncertain since the video game exposure is complex and multifaceted, encompassing multiple factors such as genre, duration, rewards, and social interaction that influence psychological outcomes differently (9). Moreover, abstaining from gaming is itself ambiguous, making it a complex issue to unpack (9). Although some individuals experience life problems linked to gaming, formalizing a disorder like ICD-11 Gaming Disorder requires stronger evidence, careful study design, and consideration of underlying issues such as depression or anxiety (10). Many have reported a co-occurrence between video game addiction and mental health disturbances, but few studies have contextualized this relationship. For instance, a study on Core and Peripheral Criteria of Video Game Addiction in the Game Addiction Scale for Adolescents found that video game addiction is related to depression, lower academic achievement, and conduct problems among adolescents (11), and a study on Video Game Addiction,

Engagement and Symptoms of Stress, Depression and Anxiety showed that one aspect of video game use is a way of coping with the presence of depression, anxiety and stress (12). Furthermore, heavily engaged young gamers with deteriorating mental health and maladaptive coping styles may be highly vulnerable to developing video game addiction, including tile-matching games. Specific psychological effects of tile-matching games have not been studied widely. We could only find one relevant study which involves studying the structural characteristics of two genres of Facebook games, Tile Matching games and Simulation/RPGs, to investigate their potential to cause problematic video gameplay (13). These researchers found that recurring structural characteristics influenced user behaviour after playing the games, with simulation/RPGs causing more problems than tile-matching games. However, both genres tended to use similar features to promote player engagement. Due to the limited studies assessing the association between tile-matching game use and psychological impacts despite the popularity of this game genre we decided to assess whether individuals experiencing depressive symptoms are more likely to exhibit addiction to tile-matching games.

2. Materials and methods

2.1 Design, setting, and participants

A cross-sectional study was conducted among adolescents and young adults in Sri Lanka who engage in playing video games. Participants were selected only if they met the inclusion criteria, and the inclusion criteria were: (a) being a video game user; (b) the ability to read, comprehend, and respond in at least one of Sri Lanka's three primary languages (Sinhalese, English, or Tamil); and (c) being between the ages of 10 and 35 (inclusive), encompassing adolescence (10-18 years) and young adulthood (19-35 years). Data were collected during June-August 2021 through an online survey using the snowball sampling technique. While we acknowledge that this non-probability method introduces potential biases and limits generalizability, it was the only feasible and ethical method for accessing our target population. In reaching the potential participants, social media platforms and emails were utilised. Initially the questionnaire was distributed to a sample of 20 individuals who met the inclusion criteria. These initial participants then acted as recruiters to gather the remaining data. The study excluded the individuals who were under treatment for any psychiatric condition other than depression, those unable to read or respond in Sinhalese, English, or Tamil, and those outside the specified age range. Furthermore, any respondents providing incomplete or unreliable questionnaire data were also omitted from the final analysis.

2.2 Sampling and data collection

The required sample size was determined using the Cochran formula (14), and 384 was the minimum sample needed to ensure a low sampling error, a high confidence level (95%), and maximum variability (prevalence set at 50%). Only fully completed questionnaires were included in the final data analysis to maintain data quality.

2.3 Ethical approval

This research study was ethically approved by the Ethics Review Committee of KIU University in Sri Lanka (KIU/ERC/21/106). Informed consent was obtained from all participants prior to their involvement through an electronic agreement. Measures were taken to ensure participant confidentiality, with no personal or identifying information collected to ensure anonymity, and data were used solely for research purposes.

2.4 Instruments

The data collection tool consisted of four sections: demographic data, information on the types of games played by the participants, a translated, pre-tested and validated seven-item game addiction scale by Lemmens and Hendriks (15) and a translated, pre-tested and validated Patient Health Questionnaire (PHQ-9) scale for Sri Lanka (16). The demographic data included participants' gender, age, ethnicity, level of education, residence province, and average monthly family income level.

2.4.1 Seven-item game addiction scale

The Game Addiction Scale (GAS) was used in the current study to screen for addictive gaming behaviour. The scale's structural validity has been confirmed through confirmatory factor analysis, demonstrating a strong model fit for a second-order factor structure (e.g., the 7-item model showed CFI = .974 and RMSEA = .046). Additionally, the scale's reliability has been supported by high internal consistency, with Cronbach's alpha values of .86 and .81 reported (17).

The Game Addiction Scale (GAS) was translated into Sinhalese and Tamil in multiple steps, adhering to international translation guidelines (18). Two bilingual translators, who were native speakers, independently translated the original English version. The two translated versions were then compared and merged to create a single consensus version through a collaborative session between the translators and authors. Subsequently, a back-translation process was conducted, where two independent translators, blinded to the original English version hence unaware of the original English text and translated the provisional versions back into English. An expert panel then reviewed all provisional translated

versions to ensure semantic, idiomatic, and conceptual equivalence between the English and Sinhalese/Tamil versions. The preliminary version of the GAS was piloted with a small group of adolescents and young adults to assess clarity and comprehension. Semi-structured interviews were conducted with these individuals to gather feedback on item wording and response options. Based on this pilot study, minor modifications and adjustments were made to enhance readability and comprehension.

Each item on the GAS is preceded by the statement "During the last six months, how often...". Scoring is done on a 5-point Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = very often). The developers of the GAS have introduced two diagnostic formats: the monothetic format, which necessitates that all items are endorsed with scores above 3 to classify an individual as addicted, and a polythetic format, which necessitates that at least half of the items to be endorsed (scoring 3 or above) (15; 17). The monothetic approach is recommended by the authors because it ensures all essential criteria including those indicative of significant pathology such as conflict, withdrawal, and related problems, are fulfilled by the addicted players (11), it provides a more accurate distinction between a habitual behaviour and a genuine addiction (17). Conversely, the polythetic format, modelled on the Diagnostic and Statistical Manual of Mental Disorder's (DSM's) method for diagnosing pathological gambling, identifies addiction based on the endorsement of a specified number of criteria, not necessarily all of them (17). In the current study, both the monothetic and polythetic criteria were used to categorise the participants as gaming addicts.

2.4.2 Patient Health Questionnaire (PHQ-9)

The validated Patient Health Questionnaire (PHQ-9) was used to quantify depressive symptoms objectively (16). Furthermore, the PHQ-9 has demonstrated high reliability (Cronbach's $\alpha = 0.90$) and strong validity, with an Area Under the Curve of 0.93 and also a cut-off score of ≥ 10 provided a sensitivity of 0.75 and a specificity of 0.97 against the SCID-IV gold standard (16). The PHQ-9 consists of 9 items rated on a four-point scale. The total score ranges from 0 to 27. The higher scores indicate higher levels of depression, while the lower scores represent lower levels. Accordingly, the participants with scores 0-4 were classified as "having no/minimal depression", 5-9 classified as "having mild depression", 10-14 classified as "moderate depression", 15-9 classified as "having moderately severe depression", and 20-27 classified as "severe depression" (16).

2.5 Data analysis

The data were analyzed using descriptive statistics, including frequencies, percentages, means, and standard

deviations, as well as inferential statistics such as Chi-square tests and binary logistic regression, using IBM SPSS Statistics version 27.

3. Results

3.1 Sample characteristics

The study included a sample of 401 individuals with a mean age of 23.71 years (± 4.69), the vast majority (90.53%) were Young Adults (19-35 years). Females (55.4%) slightly outnumbered males (44.6%). The sample was predominantly composed of individuals identifying as Sinhalese (94.3%), with the majority residing in the

Western Province (53.12%). In terms of education, over half of the participants were Undergraduates (56.9%), while a significant portion had completed their GCE A/L (22.9%). Economically, nearly half (47.4%) reported a monthly family income above 60,000 LKR, and a majority were unemployed (63.8%). Most participants were unmarried (91.0%). The sample was almost evenly split in their preference for tile-matching games (48.9%) versus other game types (51.1%). A substantial portion of participants met the criteria for gaming addiction (42.4%) and a high prevalence of depressive symptoms (43.9%) was also observed among the respondents (Table 1).

Table 1. Demographic data of the video game players

Characteristics	Frequency	Percentage (%)
Age in years (mean $\pm$ SD)	23.71 $\pm$ 4.69	
Adolescents (10-18)	38	9.47
Young Adults (19-35)	363	90.53
Gender		
Female	222	55.4
Male	179	44.6
Ethnicity		
Sinhalese	378	94.3
Tamil	4	1.0
Muslim	17	4.2
Malay	2	0.5
Province		
Western	213	53.12
Central	26	6.48
Southern	43	10.72
Northern	5	1.25
Northwestern	30	7.48
Uva	14	3.49
Sabaragamuwa	23	5.74
North Central	44	10.97
Eastern	3	0.75

(Continued)

Characteristics	Frequency	Percentage (%)
Educational Level		
GCE O/L	26	6.5
GCE A/L	92	22.9
Graduates	47	11.7
Postgraduates	8	2.0
Undergraduates	228	56.9
Monthly Family Income		
Above 60000 LKR (200 USD)	190	47.4
Below 20000 LKR (67 USD)	43	10.7
Between 20000-40000 LKR (67 to 133 USD)	65	16.2
Between 40000-60000 LKR (133 to 200 USD)	103	25.7
Occupation		
Employed	145	36.2
Unemployed	256	63.8
Civil Status		
Unmarried	365	91.0
Married	36	9.0
Game Type		
Tile Matching	196	48.9
Other	205	51.1
Gaming Addiction Status		
Not Addicted	231	57.6
Addicted (Monothetic and Polythetic)	170	42.4
Depression Status		
Not Depressed	225	56.1
Depressed	176	43.9

3.2 Scale reliability

The reliability of the scales used in the study was evaluated using Cronbach's alpha coefficient. As presented in Table 2, the Gaming Addiction Scale (GAS), composed of 7 items, demonstrated a high level of reliability, with a Cronbach's alpha of .809. This

value exceeds the commonly accepted threshold of .70 for research contexts (19). Similarly, the Patient Health Questionnaire-9 (PHQ-9), a 9-item instrument for assessing depressive symptoms, exhibited excellent reliability with the calculated Cronbach's alpha .916.

3.3 Prevalence of gaming addiction among tile-matching game players and other game players who do not play tile-matching games

Among tile-matching players (N=196), 45.9% were identified as having gaming addiction, while 49.0% met the criteria for depression. In contrast, among players of

Other types of games (N=205), 39.0% were categorized as addicted and 39.0% as depressed. Accordingly, as shown in Table 3 and Figure 1, players of tile-matching games exhibited a higher prevalence of both gaming addiction and depressive symptoms compared to players who exclusively play other types of games.

Table 2. Internal consistency reliability of measurement scales

Scale	Number of items	Cronbach's alpha	Interpretation
Gaming Addiction Scale (GAS)	7	.809	Good
Patient Health Questionnaire-9 (PHQ-9)	9	.916	Excellent

Note: Interpretation based on guidelines from George and Mallery where $\alpha \geq .9$ = Excellent, $\alpha \geq .8$ = Good, $\alpha \geq .7$ = Acceptable (20).

Table 3. Comparative prevalence of gaming addiction and depressive symptoms by game

Game type	Total N	Gaming addiction (n)	Gaming addiction (%)	Depressive symptoms (n)	Depressive symptoms (%)
Tile-matching games	196	90	45.9	96	49.0
Other types of games	205	80	39.0	80	39.0
Total sample	401	170	42.4	176	43.9

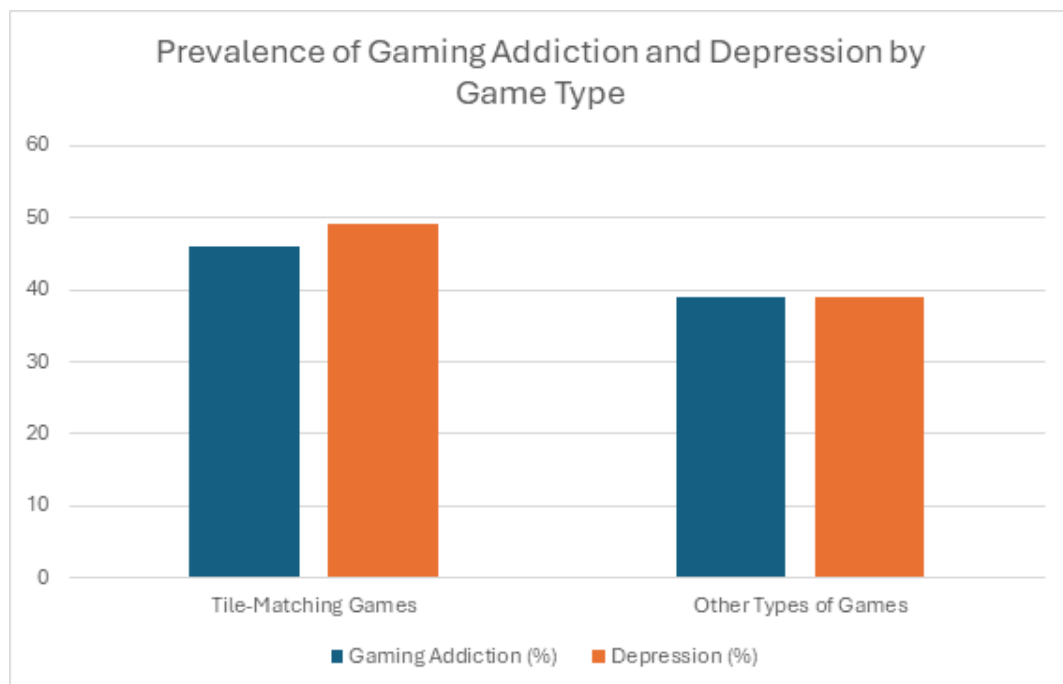


Figure 1. Prevalence of gaming addiction and depressive symptoms by game type.

3.4 Bivariate associations with gaming addiction

Chi-square analyses revealed that most demographic factors were not significantly associated with gaming addiction, accordingly no statistically significant associations were detected between addiction and ethnicity, province, education level, income, employment status, or civil status. However, a significant association was observed between gender and addiction, $\chi^2(1, N = 401) = 5.11, p = .024, \Phi = -.11$. Furthermore, game type did not exhibit a significant association with addiction as well, $\chi^2(1, N = 401) = 1.95, p = .163$. In contrast, depression status demonstrated a significant association with addiction, $\chi^2(1, N = 401) = 64.45, p < .001, \Phi = .40$ (Table 4).

3.5 Bivariate associations with depressive symptoms

When depression status was examined as the dependent variable, similar trends emerged, as demographic factors including age group, gender, ethnicity, province, education, income, and civil status did not show statistically significant relationships with depressive symptoms (p value $> .05$). Even though employment status showed a significant association with depressive symptoms, $\chi^2(1, N = 401) = 9.95, p = .007, \Phi = .16$. Game type was also significantly related to depressive symptoms, $\chi^2(1, N = 401) = 4.03, p = .045, \Phi = .10$ (Table 5).

Stratified analyses by game type indicated that the association between gaming addiction and depressive symptoms was statistically significant in both groups $\chi^2(1, N = 401) = 64.32, p < .001$.

The Chi-square test was revealed a significant association between depressive symptoms and gaming addiction in the tile-matching game playing population, $\chi^2(1, N = 196) = 35.98, p < .001$, with a Phi coefficient of .428 (Table 6). Furthermore, a significant association between depressive symptoms and addiction to other types of games was also found, $\chi^2(1, N = 205) = 27.24, p < .001$, with a Phi coefficient of .365 (Table 6).

3.7 Comparison of gaming addiction and depressive symptoms between tile-matching and other game types

For tile-matching game players, 29.2% (31/106) of non-addicted participants and 72.2% (65/90) of addicted participants reported depressive symptoms. For other game players, among participants who were not addicted, 24.8% (31/125) reported depressive symptoms, whereas 61.3% (49/80) of addicted participants were depressed (Table 7).

The crude odds ratios indicated a stronger association between depressive symptoms and gaming addiction among tile-matching players compared with players of other game types. For tile-matching games, the odds of being addicted were 6.29 times higher among depressed individuals than among non-depressed individuals. In contrast, among players of other game types, depressed individuals had 4.79 times higher odds of addiction.

Table 4. Summary of chi-square tests for associations between addiction, and demographic factors

Variable	χ^2	df	p	Φ
Addiction $\times$ Age group	2.85	1	.092	-.08
Addiction $\times$ Gender	5.11	1	.024*	-.11
Addiction $\times$ Nationality	0.97	3	.808	.05
Addiction $\times$ Province	10.89	8	.208	.17
Addiction $\times$ Educational Qualification	4.36	4	.359	.10
Addiction $\times$ Monthly Family Income	2.73	3	.436	.08
Addiction $\times$ Employment status	3.79	2	.150	.10
Addiction $\times$ Civil Status	0.38	1	.539	.03
Addiction $\times$ Game Type	1.95	1	.163	.07
Addiction $\times$ Depression	64.32	1	.001*	.40

Note: * = significant association at $p < 0.05$.

Table 5. Summary of chi-square tests for associations between depressive symptoms and demographic factors

Variable	χ^2	df	p	Φ
Depression × Adolescents/Young Adults	0.05	1	.816	.01
Depression × Gender	0.85	1	.356	.05
Depression × Nationality	4.85	3	.183	.11
Depression × Province	6.02	8	.646	.12
Depression × Educational Qualifications	2.50	4	.645	.08
Depression × Monthly Family Income	2.80	3	.423	.08
Depression × Employment status	9.95	2	.007*	.16
Depression × Civil Status	1.27	1	.260	.06
Depression × Game Type	4.03	1	.045*	.10

Note: * = significant association at $p < 0.05$.

Table 6. Chi-square tests and phi coefficients for the association between gaming addiction and depressive symptoms by game type

Game type	Variables	χ^2	df	P	Phi
Tile-matching games	Addiction × Depression	35.98	1	< .001	.428
Other games	Addiction × Depression	27.24	1	< .001	.365
Total sample	Addiction × Depression	64.32	1	< .001	.401

* All Chi-square tests were significant at $p < 0.05$.

Table 7. Prevalence of depressive symptoms by addiction status and game type

Game type	Addiction	Depressed status	Not depressed	Total	% Depressed
Tile-matching	Not addicted	31	75	106	29.2%
Tile-matching	Addicted	65	25	90	72.2%
Other games	Not addicted	31	94	125	24.8%
Other games	Addicted	49	31	80	61.3%

3.8 Logistic regression analysis of factors predicting gaming addiction

A binary logistic regression was conducted to examine predictors of gaming addiction in the population

($N=401$). Predictor variables included age group, gender, ethnicity, province, education level, monthly family income, employment status, civil status, game type, depression status, and the interaction between depressive symptoms and game type.

Table 8. Logistic regression predicting gaming addiction

Predictor	B	SE	Wald	df	p	OR	95% CI for OR
Depression (Ref = Depressed)	1.780	0.338	27.82	1	< .001	5.93	3.06-11.49
Gender (Ref = Male)	-0.691	0.264	6.87	1	.009	0.50	0.30-0.84
Province (Ref = Western Province)	1.337	0.521	6.59	1	.010	3.81	1.37-10.57
Age group (Ref = Adolescent)	-0.918	0.581	2.50	1	.114	0.40	0.13-1.25
Game type (Ref = Tile-matching)	0.286	0.335	0.73	1	.394	1.33	0.69-2.57
Depressive symptoms × Game type interaction	0.246	0.478	0.26	1	.608	1.28	0.50-3.27
Constant	-0.549	0.522	1.11	1	.293	0.58	

Note. OR = odds ratio; CI = confidence interval; Only variables with $p < .05$ are considered significant predictors.

Among all predictors, depression status was the strongest and only consistently significant predictor of gaming addiction, 95% CI [3.06, 11.49], $p < .001$. Gender was also a significant predictor, 95% CI [0.30, 0.84], $p = .009$. Among other demographic variables, only Province of residence was statistically significant, 95% CI [1.37, 10.57], $p = .010$. No significant associations were observed for age group, ethnicity, educational qualifications, monthly family income, employment status, civil status, or game type ($p > .05$).

The Depressive symptoms × Game Type interaction term, incorporated into the current study to assess whether the impact of depressive symptoms on gaming addiction differs between tile-matching and other game types. The results showed an adjusted odds ratio above 1 ($B = 0.246$; $aOR = 1.28$, 95% CI [0.50-3.27]) but the finding was not statistically significant ($p = .608$) (Table 8).

4. Discussion

The association between depression and addictive behaviours towards tile-matching games has not been studied previously, particularly within the Sri Lankan context. The present study found that players of tile-matching games exhibited a slightly higher prevalence of both gaming addiction (45.9%) and depressive symptoms (49.0%) compared to other types of game players (39.0% for each). Complementing these findings, the unadjusted odds of addiction were notably higher among depressed players of tile-matching games compared to their non-depressed counterparts, with a

6.29-fold increase. Conversely, depressed individuals playing other game types had 4.79 times greater odds of addiction than those without depressive symptoms. Moreover, The Depressive symptoms × Game Type interaction term which utilised in the current study to assess whether the impact of depressive symptoms on gaming addiction differs between tile-matching and other game types showed an adjusted odds ratio above 1 ($B = 0.246$; $aOR = 1.28$, 95% CI [0.50-3.27]). Based on the direction of the aOR a tendency was found for depressed individuals to have higher odds of addiction when playing tile-matching games compared to other game types. Although the Wald test's p -value (.608) remained above the conventional threshold not making the finding statistically significant. Somehow, according to Vakhitova and Alston-Knox the insignificance is inconclusive since reliance on the Wald statistic for interpreting interactions in logistic regression can be problematic (21). The Wald test is known to be conservative and may fail to detect important effects, especially in models with other strong predictors as was the case with depression in the current study. This also may fail in samples with limited power, which aligns with our study which also had insufficient sample power to detect a definitive effect since the magnitude of the effect might be subtle or dependent on larger or more balanced samples (21).

Moreover, the consistent direction of the effect of both the unadjusted odds ratio and the adjusted odds ratio being greater than 1 suggests that depressive symptoms may still contribute to heightened vulnerability to gaming

addiction when engaging with tile-matching games. These findings may reflect structural features of tile-matching games, such as ease of access, short session duration, minimal cost, and frequent reward loops which can encourage habitual play (22). These features align with reinforcement mechanisms known to sustain repetitive behaviour without necessarily involving social competition or narrative immersion.

As mentioned above, logistic regression analysis revealed that depressive symptoms were the most consistent and significant predictor of being classified as addicted (aOR = 5.93, 95% CI [3.06-11.49], $p < .001$). Gender was also a significant predictor, with males being more likely to exhibit addictive behaviours than females (aOR = 0.50, $p = .009$), consistent with global findings that males generally engage more intensively with digital games (23-24). The provincial difference, where participants from the Western Province showed higher odds of addiction, may reflect greater urban access to devices, higher internet penetration, and increased exposure to competitive gaming environments rather than inherent regional susceptibility. Meanwhile, the other sociodemographic variables including education level and income did not reach statistical significance. Accordingly, the individual psychological factors appeared to have a stronger influence on excessive gaming patterns than demographic characteristics or game type alone. Stratified analyses also further demonstrated significant associations between depressive symptoms and gaming addiction within both game-type groups, and as mentioned above presence of depressive symptoms is the most consistent and strongest predictor of gaming addiction as per the logistic regression test results, though this association does not necessarily imply causation.

The observed link between depression and gaming addiction can be understood through the Compensatory Internet Use (CIU) Model, which suggests that depressed individuals, experiencing deficits in real-life fulfilment, social connection, and mood regulation, may turn to gaming as a coping mechanism to escape negative emotions or to compensate for unmet psychological needs (25). This is further illuminated by the lens of Self-Determination Theory (SDT), which posits that gaming addiction often develops when the virtual environment successfully satisfies the fundamental psychological needs for autonomy (feeling in control), competence (feeling effective), and relatedness (feeling connected to others), which are otherwise thwarted in the depressed person's offline life (26).

Prior research suggests that emotional distress is an important vulnerability factor for problematic gaming across different developmental stages (23-24). According to a study examining the relationship between mobile game addiction and social anxiety, depression, and

loneliness among adolescents, the adolescents with mobile game addiction had higher self-reported depression, social anxiety, and loneliness (27), which can be further supported by the study conducted by a cross-sectional study which revealed that gaming addiction is a challenging problem among Saudi adolescents who also suffer from high levels of stress (28). Contrary to these prior studies the present research found that age groups did not significantly predict gaming addiction, possibly due to the small proportion of adolescents (9.5%) compared to young adults. The widespread use of video games among adolescents has raised concerns about their impact on psychological and social development, and they revealed that balanced parental involvement and the development of adolescents' social skills are necessary to mitigate the risks of problematic online gaming (29). However, in Sri Lanka, adolescents' attitudes towards mobile phones and gaming addiction are both positive and negative (30). According to a Sri Lankan study some participants were aware of the negative impacts of addiction. In contrast, others perceived playing mobile games as a significant need in a person's life. The study argued for its advantages, such as providing entertainment, reducing loneliness, helping to cope with feelings of sorrow, and enhancing self-identity (30). This duality in perception underscores the complexity of gaming addiction.

Gaming serves as a source of joy and social connection; on the other hand, it can lead to social isolation and mental health issues. Research examining the social and psychological impact of the Internet supports this notion, indicating that increased time spent gaming can correlate with feelings of loneliness and depression (31). Literature has consistently shown that video game addicts reported more anxiety, depression, lower positive affect, and psychological well-being. In contrast, studies have shown that video games are psychologically nutritious but less nutritious than need-satisfying real-world experiences (32). For example, video games can provide a temporary escape and relief during stressful situations such as pandemics or academic pressures. They can serve as a source of entertainment and social interaction, helping individuals cope with feelings of loneliness and sadness.

With the emergence of COVID-19 in December 2019, unprecedented changes took place in people's lives. Social distancing, quarantining, and stay-at-home orders impacted people's daily lives, and resulted in increased physical inactivity, characterised by reduced exercise, increased sitting time, and heightened screen time among the Sri Lankan population (33). The physical mode of education and employment was converted to online. According to an Italian study among children and adolescents, the average time per day of smartphone use during the pandemic was higher (in 04 hrs) than before (34). Moreover, problematic smartphone usage

for different applications, including video games, has increased rapidly in recent decades, and it has become inseparable during the COVID-19 pandemic, especially among students (35).

It is also important to consider the Sri Lankan cultural context as in Sri Lanka, the pervasive social stigma surrounding mental health acts as a critical cultural factor, influencing how psychological distress is reported and managed. Cultural norms often lead to the denial of mental illness and a significant fear of social repercussions, resulting in delayed help-seeking behaviours (36). Consequently, individuals may channel their need for emotional regulation and escape into more socially acceptable or accessible activities. This is reflected in studies on Sri Lankan students, which consistently identify escape and fantasy motives as strong correlates of Internet Gaming Disorder (IGD) (37), suggesting that the gaming environment functions as a less-stigmatised, compensatory space to flee from negative real-life experiences or internal depressive symptoms.

The question of whether Video Gaming Addiction is a genuine clinical disorder has valid arguments on both sides. Proponents argue for its disorder status, pointing to its official inclusion as Gaming Disorder (GD) in the World Health Organisation's (WHO) ICD-11, indicating recognised patterns of persistent, recurrent behaviour leading to significant impairment in personal, family, social, educational, or occupational functioning. Conversely, critics contend that pathologising this behaviour is premature, suggesting that excessive gaming may often be a symptom of underlying mental health issues like anxiety or depression, rather than a primary disorder, and that broad diagnostic criteria risk pathologising non-problematic intense engagement, especially since the stability and clinical necessity of the construct are still under debate (38, 39).

However, the increased use of smartphones has highlighted the importance of categorising addiction to identify the severity of the addiction through pathological and excessive gaming behaviour. To achieve this, the current study used the seven-item game scale to identify the population's monothetic (pathological gaming) and polythetic (excessive gaming) gaming behaviours. The main difference between excessive and pathological gaming is that excessive gaming reflects behaviour that is disproportionate but not necessarily problematic. In contrast, pathological gaming is defined as the persistent inability to control extreme gaming habits despite the associated social or emotional problems, such as preoccupation, withdrawal, loss of control, and interpersonal or intrapersonal conflicts (40, 42, 43).

A video game addiction is not a spontaneous occurrence. Four main features attract people to video games. First, the original game design: the soundtrack, frames,

background story, and the complexity of the gaming elements. Secondly, the role-playing achievements. Thirdly, the online social interactions, and fourthly, the psychological needs and motivations (41). When comparatively considering these four attractions in games, it is evident that some games possess simplicity while some are complex, and on the other hand, different games provide different motives. In a study done regarding game genres, popularity, and addiction, puzzle and action were both popular genres but weakly related to addiction, whereas RPGs were not very popular but strongly related to addiction (15). Thus, it is assumed that popularity and addiction are not two related factors. For tile-matching games, their popularity is attributed to their simplicity, frequent reward system, and other features.

5. Conclusion

This study confirms a strong and significant association between depressive symptoms and gaming addiction among Sri Lankan youth, establishing depression as the most powerful predictor in our model. While male gender also showed a notable association. The consistently elevated odds of addiction observed among players of tile-matching games points to a potential genre-specific vulnerability. Even though the current study did not meet the conventional statistical significance for the depression $\times$ game type interaction, the persistent trend indicates that the psychological interplay between depression and addiction to tile-matching games is likely more complex than a simple main effect, warranting further exploration.

6. Future recommendations

Future investigations should prioritise longitudinal studies to investigate the direction of causality and clarify how specific game genres, like tile-matching games, influence mental health trajectories over time. Furthermore, methodological enhancements to include more diverse and representative samples across Sri Lanka to improve generalizability. Finally, the incorporation of clinically validated diagnostic tools alongside self-report measures would strengthen the validity of future findings.

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Statement of contribution

V.A.S. contributed to conceptualization, methodology, statistical analysis, and drafting of the manuscript. S.A.P. and H.M.D.S.T. contributed to methodology, statistical analysis, and drafting of the manuscript. K.T.G.K. and M.C. contributed to supervision of the study and critical

revision and editing of the manuscript. All authors reviewed and approved the final version of the manuscript.

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Ethical approval and informed consent statements

This study was ethically approved by the Ethics Review Committee of KIU University in Sri Lanka (KIU/ERC/21/106). Informed consent was obtained from all participants through an electronic agreement. Participant confidentiality was maintained, and data were used solely for research purposes. No identifying or personal information was collected to ensure anonymity.

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