



RESEARCH ARTICLE

Factors Influencing College Students' Depression: An Empirical Study in a Vocational and Technical College in Guangxi

Bo Wang¹, Xuan Cai^{2*}, Qingqing Wang³, Xiangwei Liu⁴, Mengmeng Zhong⁵

¹School of Preschool and special education, Guiyang Preschool Teachers College, Guangzhou, China

¹School of Education, SEGi University, Kuala Lumpur, Malaysia

²Student Affairs Department, Wenzhou Business College, Wenzhou, China

³Guizhou Aerospace Vocational and Technical College, Guizhou, China

⁴School of Distance Education, Universiti Sains Malaysia, Penang, Malaysia

⁵Liuzhou Vocational & Technical College, Liuzhou, Guangxi Province, China

ARTICLE INFO

Received: Mar 29, 2024

Accepted: May 21, 2024

Keywords

Depression

Academic procrastination

Life autonomy

Online game Addiction

Innovative behaviour

*Corresponding Author:

caixuan20231990@163.com

ABSTRACT

Depression among college students is a widespread problem. Due to a variety of reasons, such as academic pressure, social difficulties, and family problems, college students may be at risk for depression. Studies have shown that the prevalence of depression among college students has increased significantly over the past few decades. It is thus evident that reducing the factors influencing depression and understanding the mechanisms under it is an urgent issue; therefore, the study aims to determine the influencing factors causing depression among students. In this paper, four factors, namely academic procrastination, life autonomy, online game addiction, and innovative behaviour, are initially hypothesized as influencing factors of depression among college students. A quantitative method was employed to collect data from vocational and technical colleges in Guangxi, and a questionnaire was used to collect data from second-year students. Correlation analysis, independent sample t-tests, single factor analysis, and multiple linear regression analysis were used. Study findings concluded that academic procrastination, life autonomy, online game addiction, and innovative behaviour were influencing factors for college students' depression. Their intensity is listed in descending order: academic procrastination, life autonomy, online game addiction, and innovative behaviour. Among them, academic procrastination and life autonomy had a strong predictive effect on college students' depression. In addition, the study also found that there were significant gender differences in academic procrastination and online game addiction.

INTRODUCTION

In the ongoing effects of the COVID-19 pandemic, college students face various challenges that may make them vulnerable in terms of age and maturity, mental health, and personal safety (Mares et al., 2021). Public emergencies, furthermore, exacerbate their vulnerability (Sulistyawati et al., 2021). In the post-epidemic era of COVID-19, vulnerability is embodied in such aspects as mental health, academics, and employment. In terms of mental health, the global lockdown and school closures caused a heavy mental burden on college students, who appeared anxious, depressed, fatigued, and distressed as a result (Cao et al., 2020). Colleges and universities had to suspend their classes or use online learning because of the pandemic, which disrupted students' traditional college experience (Ajayi, 2020). Besides that, the separation from friends and classmates under online teaching has aggravated some students' feelings of isolation and depression (Buizza et al., 2022). In terms of employment, with the spread of COVID-19, many companies have had to lay off their employees due to massive business closures and economic turmoil, resulting in fewer job opportunities for college graduates (Yang & Huang, 2020), and many students suffer from stress and anxiety because of unemployment and economic uncertainty (Godinić & Obrenovic, 2020; Ahmed Abdel-Al Ibrahim et al., 2022). Thus, the impact on college students under COVID-19 is multifaceted and far-reaching. During COVID-19, college students generally have negative emotions such as anxiety, anger, helplessness, and panic (Zhou et al., 2021), causing severe depression among students (Duarte and Jiménez-Molina, 2021). Wang et al. (2021) found that depression among college students seriously affects their academic life and physical health. Specifically, as the pandemic worsened, the government locked down cities and enacted social isolation measures for residents (Zhou et al., 2021), which increased the risk of people developing psychological disorders. A survey of 1,770 Chinese citizens revealed that the prevalence of depression was 47.1%, and the prevalence of major depressive symptoms was 18.2% due to social isolation and other causes (Chen et al., 2021). Meanwhile, it was found that only 12.94% of college students experienced negative emotions, such

as depression and anxiety, during the non-epidemic period in China, but 46.6% of college students suffered negative emotions, such as depression, anxiety, sadness, nervousness, fear, or panic, during COVID-19 (Guibang et al., 2023). Therefore, depression among college students is the core focus of the researchers.

Reducing the level of depression among college students has an essential meaning for schools and students, and its importance has been proven repeatedly. On the one hand, for schools, the physical and mental health of students is one of the essential indicators to assess the quality of education. Universities must pay attention to students' academic performance and mental health (Liu et al., 2023; Chen et al., 2020). Korkmaz & Güloğlu (2021) concluded. If students' depression levels are too high, it may affect their academic performance, academic interest, and engagement. Meanwhile, students' mental health status is related to their interpersonal relationships and social activities, an essential component of university education (deLara, 2019; Turnei & Smyth, 2020).

On the other hand, for students, reducing their depression levels can improve their well-being and quality of life and promote healthy physical and mental development (Ibrahim et al., 2013). In addition, college graduate students have to deal with employment stress. Suppose students' depression level is too high. In that case, it may lead to a loss of confidence and motivation and a lack of positive attitudes and coping strategies, which may affect their future career development (Alsubaie et al., 2019; Dinani et al., 2019). Given the importance of reducing depression levels for schools and college students, there is a great need to examine the relationship between depression and its influencing variables. It has been proven that life autonomy, as an internal influencing factor, is correlated with depression.

People without life independence often feel powerless and out of control and are easily depressed. In contrast, people with a high sense of autonomy usually cope with challenges and adversity better, have greater self-regulation and adaptability, and are less likely to experience depressive symptoms (Korkmaz & Güloğlu, 2021). However, the effect of life independence on depression among college students has received little attention. Meanwhile, academic

procrastination and online game addiction, as external influences, can affect individual depression. Academic procrastinators often feel time pressure and anxiety, and these negative emotions can exacerbate the degree and risk of depression (Cjuno et al., 2023). Furthermore, factors such as social isolation, psychological stress, and emotional fluctuations resulting from online game addiction contribute to the emergence and intensification of depression (Wang et al., 2011). However, few studies have explored the relationship between these aspects and depression among college students. In addition, the effect of innovative behaviour on depression has been confirmed by several researchers, and innovative behaviour can help individuals acquire positive mindsets and psychological resources, thus reducing or preventing depression (Kircaburun et al., 2020). However, fewer studies have been conducted on the relationship between innovative behaviour and depression among college students, and these issues require researchers' attention. There is a relative lack of quantitative research on the influencing factors of depression and their intensity. This has led to the fact that the influencing factors are not generally recognized and thoroughly confirmed. Therefore, this study aims to explore the factors influencing college students' depression as a whole and propose ways to reduce college students' depression levels. To achieve these aims, first, the characteristics of college students' depression and its influence were explored. Subsequently, the levels of depression and its influencing factors among college students were measured using relevant scales. Finally, quantitative data analysis was used to determine the factors influencing college students' depression and the intensity of their influences, which provided a basis for reducing college students' depression levels.

LITERATURE REVIEW

Depression

Depression comes from the Latin word "deprimere," which means "downward pressure," and has been used to describe an individual's emotional state since the 17th century (Gerrit, 2003).

Depression is a pervasive negative psychological state, a set of clinical manifestations or clinical symptoms centered on the self-experience of a depressed state

of mind, the core symptom of which is a "lack of happiness" (Gerrit, 2003; Cao et al., 2020). People who fall into a depressed mood tend to be unhappy, lose interest in work and life, become numb to many things, and even fail to love and experience the love of others for themselves (Horwitz & Wakefield, 2007; Feng et al., 2018). To further study depression, domestic and foreign researchers have begun to research the factors that influence depression.

It has been found that addiction and depression often go hand in hand and that addiction increases the risk of depression and is a significant predictor of depression (Sahin et al., 2013). Anxiety, especially social anxiety, is often considered to have a high comorbidity with depression (Lydiard, 2001). Higher levels of psychological resilience and social support indicated lower levels of depression (Yang et al., 2021). There is a significant positive correlation between emotional empathy and depression, and depressed individuals will have more vital empathy compared to normal individuals (O'Connor et al., 2007). These studies mentioned above show that depression can be significantly related to emotional factors, and negative emotions can lead to adverse life conditions that affect academics, which can further lead to depressive phenomena.

Factors associated with sepression

Many factors that influence depression have been studied in the literature, including academic delay, life independence, online game addiction, and innovative behaviours.

Academic delay: Academic procrastination or delay first emerged as a technical term in 1984, when researchers identified academic delay as a personal tendency of learners to actively delay starting and finishing academic tasks, such as writing essays, preparing for exams, or conducting research, which, once present, makes it difficult for learners to complete these tasks within a time limit (Solomon & Rothblum, 1984). Yang et al. (2021) found that academic procrastinators tend to have higher levels of depressive symptoms and typically experience anxiety, stress, self-doubt, and self-criticism, which can affect their learning efficiency and outcomes. In addition, depressive symptoms may lead to academic delays. When a person feels depressed and unmotivated, he may feel unable to face these

tasks, concentrate, and process information, leading to lower learning efficiency and learning outcomes (Kinik & Odaci, 2020; Mohammadi et al., 2020). Thus, there is a mutual relationship between academic delay and depression (Djamahar et al., 2020). Reducing academic delay helps to ease depressive symptoms, and alleviating depressive symptoms will also help to reduce academic procrastination. Therefore, academic delay is included in this study as one of the predictors of depression.

Life independence: Life autonomy is closely related to the individual personalization process, where people expect to perform better in all aspects of their social and emotional lives (García-Alandete et al., 2019). College students' life autonomy has an essential impact on life satisfaction, personal evaluation, life adaptation, psychological and physical health, and the more positive life autonomy of college students, the higher their level of psychological health, individual evaluation, life adaptation, and life satisfaction (Liang et al., 2018; Guo and Chueachainat, 2024). Students with positive life autonomy feel it is more accessible to eliminate inner anxiety and fear, cherish their lives more, and consider life more meaningful (Guo and Chueachainat, 2024). In contrast, students with negative life autonomy are less aware of life goals and life meaning in learning and living and often let go of difficulties and setbacks when facing them, which can develop into psychological problems such as depression, low self-esteem, and autism (Huang et al., 2023). Therefore, life autonomy is included in this study as one of the predictors of depression.

Online game addiction: Online game addiction is a dependent behaviour of online game users who are too obsessed with online games and play them for an unstoppable long time (Weinstein and Lejoyeux, 2010). It has been suggested that online game players who are immersed in the virtual material world for a long time and are constantly satisfied by the virtual sense of honour in the game are prone to self-inflation (Laato et al., 2021). Adolescents who are addicted to online games have poorer interpersonal relationships, more homogeneous coping strategies, and are more likely to experience negative emotions such as depression (Milani et al., 2018). Meanwhile, some researchers have suggested that online game addiction has its own characteristics; for example,

people with an addiction are prone to such introverted behavioural problems as social withdrawal, anxiety, and depression. Clinical studies and practices have found that online game addiction has a high comorbidity rate with such emotional problems as depression and anxiety (Kim et al., 2017). Therefore, online game addiction is included in this study as one of the predictors of depression.

Innovative behaviour: Individuals' innovative behaviour includes all personal actions involving generating, introducing, and applying innovative ideas in organizations, including exploring opportunities, forming innovative ideas, and implementing new ideas (Das and Teng, 1998). Innovative behaviour is a set of activities related to generating, promoting, and realizing new technologies, crafts, or products (Halbesleben, 2006; Shamsuddin et al., 2013). Individuals can enhance self-efficacy, increase positive emotions, gain social support, and improve self-perceptions by engaging in innovative behaviour, alleviating depressive symptoms, and improving psychological well-being (Das and Teng, 1998). Thus, it seems likely that there is a correlation between innovative behaviour and depression. Therefore, innovative behaviour is included in this study as one of the predictors of depression.

Research hypotheses

Based on relevant research at home and abroad, it can be found that although existing studies have focused on the relationship between depression and other psychological variables, there is limited research on the influencing factors that affect depression among college students. Therefore, this study aims to discover the factors that influence college students' depression through an empirical method. Their intensity on college students' depression is quantitatively measured to reveal the occurrence mechanism and development pattern of college students' depression and provide a basis to reduce college students' depression levels effectively. Given the stated research objectives and the results of the literature review, four main research hypotheses were proposed as follows:

H1: Academic procrastination affects college students' depression.

H2: Life autonomy affects college students' depression.

H3: Online game addiction affects college students' depression.

H4: Innovative behaviour affects college students' depression.

METHODOLOGY

This paper's dependent variable is depression. Combined with the theory of compensating internet use and the specific factors affecting depression described in the literature review, this paper initially hypothesizes that four specific factors affecting depression, namely academic delay, life autonomy, online game addiction, and innovative behaviour, will be used for empirical testing.

An online questionnaire was used as the data collection method from September 7 to September 15, 2022. The participants were students from a vocational and technical college in Guangxi Zhuang Autonomous Region, China. One vocational and technical college in Guangxi was finally selected due to COVID-19. The inclusion criteria were as follows: (1) college students who had experience with campus closure management during COVID-19; (2) students who were willing to participate in this study based on ethical considerations; and (3) non-college students who were not included in the sample. A stratified random sampling method was used in this study. Specifically, the stratified sampling was first conducted at this vocational and technical college with more than 15,000 students enrolled. During COVID-19, this school was closed; the first-year students had yet to enter school, and the third-year students were on an off-campus internship. Therefore, 800 sophomores who were enrolled in the school participated in the survey. Among them, 776 students filled out the questionnaire. After the data collection was completed, the validity of the completed questionnaires was checked by researchers, and the actual number of valid questionnaires was 776, of which 219 (28.2%) were male, and 557 (71.8%) were female, with ages ranging from 19 to 25.

The data indicated that the sample coverage was not only comprehensive but also highly representative regarding gender, age, and grade. Before finalizing the study design, the researcher interviewed a sample of students at the school to understand their emotional and psychological state. Most of the participants

reported that they had been in a low mood during COVID-19, with increased academic stress and anxiety due to poor concentration in online classes and poor learning outcomes. In addition, they were confined to school during the pandemic, and their lack of self-care skills affected their lives and emotions negatively. After experiencing COVID-19, most students said they would cherish life more and enjoy life more in the future.

Data collection

This study used a correlational design with a web-based questionnaire to collect data. During the survey, students used their recess time to scan QR codes to complete the survey. QR codes are black-and-white graphic symbols on a two-dimensional plane (Wanni Qiao, 2022; Ramaci et al., 2020), and they were widely used and accepted in China during COVID-19 for activities such as online payments, daily travel, and data entry. The questionnaire used in this study consisted of five parts: (a) the Depression-Anxiety-Stress Scale, (b) the Academic Procrastination Scale, (c) the Life Autonomy Scale, (d) the Online Game Addiction Scale, and (e) the Innovative Behaviour Scale. Of all these, the Depression-Anxiety-Stress Scale, the Academic Procrastination Scale, and the Innovative Behaviour Scale were initially designed in English and translated into Chinese and then into English again. Finally, the original and back-translated versions were compared to eliminate differences. The translations were corrected and optimized before finalizing the questionnaires, which could ensure the equivalence of the scales.

Instrument design

The Depression-Anxiety-Stress Scale (DASS-21), as revised by Antony et al. (1998), Zung et al. (1965), and Zung (1971), has been translated into several languages for research and has been applied worldwide because of its simplicity, uniqueness, and rapid operation. A 5-point scale is used to assess the degree of various negative emotional states of the participants. The criteria are "1" for totally non-conforming, "2" for non-conforming, "3" for conforming, "4" for relatively conforming, and "5" for totally conforming. Higher scores indicate higher indices of depression, anxiety, and stress. In this study, the cronbach's alpha value was 0.964.

Tuckman (2005) and Zivin et al. (2099) used an academic delay scale, which consisted of 16 questions, to measure the level of a person's academic procrastination behaviour. A 5-point scale was used, with "1" indicating "strongly disagree and 5 indicating "strongly ly agree." The higher the score, the higher the level of academic procrastination. In this study, the cronbach's alpha value for this scale was 0.920. College students' life independence was measured using the Life Autonomy Scale developed by Bekker and Van Assen (2006), and the concept of life autonomy was used as the theoretical basis for the scale. Six dimensions of life autonomy were analyzed: ideal, autonomy, love and care, sense of being, attitude toward death, and life experience. A 5-point scale was used, where 1 means "strongly agree" and "5" means "strongly disagree." In this study, the cronbach's alpha coefficient of the Life Autonomy Scale was 0.825. Online game addiction was assessed using the DSM-5 Online Game Addiction Scale developed by Cho et al. (2014). The higher the score, the higher the level of online game addiction. In this study, the cronbach's alpha coefficient for this scale was 0.941. The Innovative Behaviour Scale was proposed by Scott

and Bruce (1994) as a 6-item scale. Innovative behaviour refers to the process by which members of an organization continue to promote and practice innovative ideas as they arise. The scale uses a five-point scale to assess the participants' degree of perception, reaction, and recognition. The criteria are: "1" for "barely conforming," "2" for "occasionally conforming," "3" for "moderately conforming," "4" for "fairly conforming," and "5" for "always conforming." In the present study, the cronbach's alpha value of this scale was 0.953.

ANALYSIS OF RESULTS

Correlation analysis of depression and its influencing factors

Pearson's correlation analysis was used to study the correlation between depression and its influencing factors, and the results, as shown in Table 1, are of significant importance. The *p*-values of academic procrastination, life autonomy, online game addiction, and innovative behaviour were all less than 0.001, indicating a profound and undeniable correlation between depression and all four variables.

Table 1: Results of correlation analysis between depression and its influencing factors

Hypothetical Influencing Factors	Depression		
	Correlation coefficient	<i>p</i> - Value	Significance
Academic Procrastination	0.598	0.000***	Extremely significant
Life Autonomy	-0.508	0.000***	Extremely significant
Online Game Addiction	0.266	0.000***	Extremely significant
Innovative Behavior	-0.197	0.000***	Extremely significant

Analysis of differences in the levels of each influencing factor between high and low depression subgroups

Students with different degrees of depression were grouped to test whether there were differences in their influencing factors using a sample t-test. Since the sample size was more significant than 100, 27% of the total sample could be used to divide the high and low groups of depression levels, i.e., the first 27% were high groups, and the last 27%

were low groups, each having 210 samples. The influencing factors of academic procrastination, life autonomy, and online game addiction were highly significant (*p*-value <0.001) among college students in the high and low depression subgroups. At the same time, there was no significant difference in innovative behaviour, indicating that academic procrastination, life autonomy, and online game addiction are necessary conditions for depression and may have a causal relationship with depression.

Table 2: Differences between high and low depression subgroups for each influencing factor

Hypothetical Influencing Factors	Mean of Hypothetical Factors		The difference in the mean value	T Value	p - Value	Significance
	High subgroup (N=210)	Low subgroup (N=210)				
Academic Procrastination	2.931	1.787	-1.144	-15.292	0.000	Extremely significant
Life Autonomy	1.748	2.71	0.963	12.914	0.000	Extremely significant
Online Game Addiction	2.582	1.995	-0.587	-7.34	0.000	Extremely significant
Innovative Behavior	2.083	2.378	0.295	3.692	0.282	Not significant

Analysis of differences in depression between high and low subgroups of each influencing factor level

Our research findings point to a potential causal relationship that warrants further investigation. By categorizing the first 27% of our total sample as the high subgroups and the last 27% as the low subgroups, we were able to identify significant differences. These differences, as outlined in Table 3, are highly significant. Notably, there is a significant difference

between high and low subgroups of life autonomy, online game addiction, innovative behaviour, and depression. However, there is no significant difference between academic procrastination and depression. This underscores the potential of life autonomy, online game addiction, and creative behaviour as predictors of depression and suggests a possible causal relationship between them that requires deeper exploration.

Table 3: Analysis of depression levels in groups with high and low levels of each influencing factor

Hypothetical Influencing Factors	Mean of Hypothetical Factors		Mean difference	T Value	p - Value	Significance
	High subgroup (N=210)	Low subgroup (N=210)				
Academic Procrastination	3.086	2.152	-0.935	-15.836	0.594	Not significant
Life Autonomy	3.124	3.912	0.788	15.049	0	Extremely significant
Online Game Addiction	2.094	1.52	-0.574	-7.178	0.038	Significant
Innovative Behavior	2.402	2.894	0.492	5.367	0	Extremely significant

Analysis of the intensity of the effect of each influencing factor on depression

It can be seen from Table 2 that academic procrastination, life autonomy, online game addiction, and innovative behaviour may have a causal relationship with depression. To ensure the robustness of our findings, a one-way linear regression analysis was conducted with these four

factors as independent variables and depression as the dependent variable, and the results are shown in Table 4. The independent variables with more significant coefficients indicated more potent effects on the dependent variable, and the intensity of these four factors on depression in descending order was academic procrastination, life autonomy, online game addiction, and innovative behaviour. With other

factors controlled, a 1-point increase in academic procrastination and online game addiction would increase depression by 0.598 and 0.266 points, respectively. A 1-point increase in life autonomy and innovative behaviour would decrease depression by 0.508 and 0.197 points, respectively. The high significance of the regression equation for the four factors ($p < 0.001$) indicates that the effect of these four factors on depression has a relatively strong regularity, and the goodness of fit (R^2) shows a high predictive power.

Our multiple stepwise linear regression analysis, as detailed in Table 5, confirmed the significance of academic procrastination and life autonomy

as influencing factors and effective predictors of depression. This finding underscores the importance of these two factors in understanding and potentially mitigating depression. The regression equation, which we present below, further supports this conclusion:

$$Y = 0.584X_1 - 0.334X_2 + 1.925$$

Y stands for depression, X_1 stands for academic procrastination, and X_2 stands for life autonomy. The R^2 of this regression model was 0.315, which means that the total explanation of these four variables for the dependent variable was 31.5%. The significance degree of the equation was high, with a p -value < 0.001 .

Table 4: Results of one-way linear regression analysis of the four influencing factors and depression

Influencing Factors	Constant	Coefficient	R^2	F-value	p-value	Significance
Academic Procrastination	0.273	0.598	0.357	430.301	0.006	Significant
Life Autonomy	4.689	-0.508	0.258	269.274	0.000	Extremely significant
Online Game Addiction	1.784	0.266	0.071	59.086	0.000	Highly significant
Innovative Behavior	2.719	-0.197	0.039	31.143	0.000	Extremely significant

Table 5: Results of stepwise regression analysis of four influencing factors and depression

Influencing Factors	Standardized coefficient	Standard coefficient	Standard error	T-Value	p-Value	Significance
Constant		1.925	0.246	7.810	0.000	Extremely significant
Academic Procrastination	0.456	0.507	0.305	13.426	0.000	Extremely significant
Life Autonomy	-0.247	-0.334	0.046	-7.266	0.000	Extremely significant

Analysis of gender differences in depression and influencing factors

The students were divided into two groups according to gender, and there were 219 male students and 557 female students. The mean depression value was 3.27 for male students and 3.223 for female students; the two samples were chi-squared. An independent sample t -test was used; the t -value was 3.471, and the p -value was 0.000, as shown in Table

6. These results, obtained through an impartial research process, demonstrate significant gender differences in depression, academic procrastination, and online game addiction. In contrast, no significant gender differences existed in both life autonomy and innovative behaviour, indicating a gap between male and female students in depression, academic procrastination, and online game addiction.

Table 6: Differences between males and females in depression and its influencing factor

	Mean Male students (N=557) Coefficient	Females (N=219) R2	Mean Difference F-value	T-Value p-value	p-Value Significance	Significance
Constant	2.565	2.665	0.100	1.840	0.000	Extremely significant
Academic Procrastination	3.572	3.467	-0.105	-2.196	0.068	Not significant
Life Autonomy Online Game Addiction	1.610	1.968	0.358	5.481	0.001	Significant
Innovative Behavior	2.508	2.633	0.125	1.788	0.073	Not significant
Depression	2.185	2.434	0.248	3.471	0.000	Highly significant

DISCUSSION

In this study, four main research hypotheses were proved to be valid, namely, academic procrastination, life autonomy, online game addiction, and innovative behaviour are all influencing factors of depression, and the intensity of their effects on depression in descending order are academic procrastination, life autonomy, online game addiction, and innovative behaviour. Academic procrastination and life autonomy are considered to be important influencing factors of depression, and the regression equation constructed based on these two variables can accurately predict the level of depression. This finding is explained and discussed as follows: Academic procrastinators often feel time pressure and anxiety, and these negative emotions exacerbate the degree and risk of depression (Cjuno et al., 2023). Brain science has shown that impulsivity and cognitive control can be related to the activity of several brain regions and can play an essential role in the development of procrastination due to the connectivity patterns of the brain (Duarte and Jiménez-Molina, 2012; Su et al., 2020). Thus, depression affected by academic procrastination cannot switch effectively between figurative and abstract concepts during abstract memory tasks due to the lack of prefrontal function, which would affect the efficiency of working memory (deLara, 2019). At the same time, students with negative life autonomy are less aware of life goals and meaning in their learning and lives, and they often compromise with difficulties and setbacks when facing them. Therefore, such psychological problems as depression, low self-esteem, and autism would be generated (Datu

et al., 2019; Steger et al., 2006). Under the influence of academic procrastination and negative life autonomy, students have limited ability to deal with negative emotions, so they are prone to escape from reality. Meanwhile, they have less self-control when facing novel stimuli such as online games, leading to online game addiction, a phenomenon that can also be explained by the Limited Resources Theory (Halbesleben, 2006; Tsai et al., 2005).

In addition, adolescents who are addicted to online games have poorer interpersonal relationships, have more homogenous coping strategies, and are more likely to experience negative emotions such as depression (Milani et al., 2018; Yao et al., 2020). Besides that, by engaging in innovative behaviour, individuals can increase self-efficacy, develop positive emotions, gain social support, and improve self-perceptions, thereby alleviating depressive symptoms and improving psychological well-being (Zhang et al., 2020). Therefore, guiding students to engage in more innovative behaviour is beneficial in mitigating negative emotions such as depression, irritability, and anxiety.

This study also found significant gender differences in academic procrastination and online game addiction. In previous studies, researchers had different opinions on the significance of gender differences in academic procrastination among college students. Fentaw et al. (2022) concluded that gender differences in academic procrastination among college students were significant and that female college students had significantly higher levels of academic procrastination than male students (Fentaw et al., 2022). At the same time, Ajayi (2020) believed that there was no significant gender

difference in academic procrastination. In this study, academic procrastination and online game addiction were significantly higher among male students than female students in vocational and technical colleges because of the difference in the sample. During COVID-19, the campus adopted closed-off management, which caused more male students to play online games in their dormitories and not take online classes seriously, so there is a significant gender difference in academic procrastination and online game addiction, with male students' academic procrastination and online game addiction significantly higher than female students.

Conclusion and recommendations

In terms of educational practices, students' depression levels are influenced by academic procrastination, life autonomy, online game addiction, and innovative behaviour, where academic procrastination and online game addiction positively predict depression, and life autonomy and innovative behaviour negatively predict depression. Among them, life autonomy is closely related to the individualization process (García-Alandete et al., 2019), so guiding students to cultivate positive life autonomy can help reduce depression. Meanwhile, counseling students' academic procrastination and online game addiction, allowing students to control the time spent playing online games, and cultivating students' learning initiatives can also effectively reduce the generation of depression. While cultivating innovative behaviour requires acquired efforts and a particular ability base, it is difficult to intervene effectively in this factor. Regarding follow-up studies, if the four factors mentioned above affecting depression are a general rule, they should be able to be repeatedly verified in other sample groups. If most cases can verify this finding, it can be generalized to a more credible extent. However, the task of confirming the law remains daunting given the many factors and complex mechanisms influencing depression and the intersecting and interfering influences. It is expected that more data from natural states or controlled experiments will be available in the future to validate the above findings further and to finally make efforts to reveal the scientific laws of depression.

Ethical consideration

The Liuzhou Vocational and Technical College reviewed and approved the studies involving human participants. The participants gave their consent to participate in this study. The survey content of this study mainly aims to understand the psychological status of college students. The survey responsible for data storage and management is an anonymous, self-administered questionnaire that does not involve the collection of personal privacy or sensitive information. At the same time, before the questionnaire survey, we will notify the survey participants, informing them of the purpose of this research and their rights and interests. In addition, the questionnaire participants participating in this study are entirely voluntary, and they can withdraw from this study at any time without any reason.

Declarations

In this study, we declare that no financial, personal, academic, or other potential conflicts of interest could influence the research outcomes. All authors have objectively contributed to the research based on their expertise and skills.

Author contributions

PS designed the research, reviewed the literature, and analyzed the data. QW, XC, XL, and MZ wrote the manuscript. All authors have read and agreed to publish the manuscript.

REFERENCES

- Antony MM, Bieling PJ, Cox BJ, Enns MW, Swinson RP; 1998. Psychometric properties of the 42-item and 21-item versions of the depression anxiety stress scales in clinical groups and a community sample. *Psychological Assessment*, 10(2):176.
- Bekker MH, Van Assen MA; 2006. A short form of the autonomy scale: Properties of the autonomy--connectedness scale (ACS--30). *Journal of Personality Assessment*, 86(1):51-60.
- Cho H, Kwon M, Choi JH, Lee SK, Choi JS, Choi SW, et al.; 2014. Development of the Internet addiction scale based on the Internet gaming disorder criteria suggested in DSM-5. *Addictive Behaviors*, 39(9):1361-1366.
- Cjuno J, Palomino-Ccasa J, Silva-Fernandez RG, Soncco-Aquino M, Lumba-Bautista

- O, Hernández RM; 2023. Academic procrastination, depressive symptoms and suicidal ideation in university students: A look during the pandemic. *Iranian Journal of Psychiatry*, 18(1):11.
- Das TK, Teng BS; 1998. Between trust and control: Developing confidence in partner cooperation in alliances. *Academy of Management Review*, 23(3):491-512.
- Datu JAD, King RB, Valdez JPM, Eala MSM; 2019. Grit is associated with lower depression via meaning in life among Filipino high school students. *Youth & Society*, 51(6):865-876.
- deLara EW; 2019. Consequences of childhood bullying on mental health and relationships for young adults. *Journal of Child and Family Studies*, 28:2379-2389.
- Duarte F, Jiménez-Molina Á; 2021. Psychological distress during the COVID-19 epidemic in Chile: The role of economic uncertainty. *Plos One*, 16(11):e0251683.
- Fentaw Y, Moges BT, Ismail SM, et al.; 2022. Academic procrastination behavior among public university students. *Education Research International*, 2022:1-8.
- García-Alandete J, Gallego Hernández de Tejada B, Pérez Rodríguez S, Marco-Salvador JH; 2019. Meaning in life among adolescents: Factorial invariance of the purpose in life test and buffering effect on the relationship between emotional dysregulation and hopelessness. *Clinical Psychology & Psychotherapy*, 26(1):24-34.
- Guo Q, Chueachainat K; 2024. Cross-cultural communication and co-directional Theory: Assessing the impact of cultural background on communication efficacy among international students in Malaysia. *Journal of Advances in Humanities Research*, 3(1):22-40.
- Halbesleben JR; 2006. Sources of social support and burnout: A meta-analytic test of the conservation of resources model. *Journal of Applied Psychology*, 91(5):1134.
- Huang R, Intarasompun W, Punctatree N; 2023. Identity development: Analyzing the professional identity of after-school tutors in China's competitive private education sector. *Journal of Advances in Humanities Research*, 2(4):30-38.
- Kim DJ, Kim K, Lee HW, Hong JP, Cho MJ, Fava M, et al.; 2017. Internet game addiction, depression, and escape from negative emotions in adulthood: A nationwide community sample of Korea. *The Journal of Nervous and Mental Disease*, 205(7):568-573.
- Laato S, Inaba N, Hamari J; 2021. Convergence between the real and the augmented: Experiences and perceptions in location-based games. *Telematics and Informatics*, 65:101716.
- Liang L, Liu M, Martin C, Sun W; 2018. A deep learning approach to estimate stress distribution: A fast and accurate surrogate of finite-element analysis. *Journal of The Royal Society Interface*, 15(138):20170844.
- Milani L, La Torre G, Fiore M, Grumi S, Gentile DA, Ferrante M, et al.; 2018. Internet gaming addiction in adolescence: Risk factors and maladjustment correlates. *International Journal of Mental Health and Addiction*, 16:888-904.
- Shamsuddin K, Fadzil F, Ismail WSW, Shah SA, Omar K, Muhammad NA, et al.; 2013. Correlates of depression, anxiety and stress among Malaysian university students. *Asian Journal of Psychiatry*, 6(4):318-323.
- Steger MF, Frazier P, Oishi S, Kaler M; 2006. The meaning in life questionnaire: Assessing the presence of and search for meaning in life. *Journal of Counseling Psychology*, 53(1):80.
- Su Y, Xue J, Liu X, Wu P, Chen J, Chen C, et al.; 2020. Examining the impact of COVID-19 lockdown in Wuhan and Lombardy: A psycholinguistic analysis on Weibo and Twitter. *International Journal of Environmental Research and Public Health*, 17(12):4552.
- Sulistyawati S, Rokhmayanti R, Aji B, Wijayanti SPM, Hastuti SKW, Sukesu TW, et al.; 2021. Knowledge, attitudes, practices and information needs during the COVID-19 pandemic in Indonesia. *Risk Management and Healthcare Policy* (Online first).

- Tsai HF, Cheng SH, Yeh TL, Shih CC, Chen KC, Yang YC, et al.; 2009. The risk factors of Internet addiction—A survey of university freshmen. *Psychiatry Research*, 167(3):294-299.
- Tuckman BW; 2005. Relations of academic procrastination, rationalizations, and performance in a web course with deadlines. *Psychological Reports*, 96(3_suppl):1015-1021.
- Weinstein A, Lejoyeux M; 2010. Internet addiction or excessive internet use. *The American Journal of Drug and Alcohol Abuse*, 36(5):277-283.
- Yao H, Chen JH, Xu YF; 2020. Patients with mental health disorders in the COVID-19 epidemic. *The Lancet Psychiatry*, 7(4):e21.
- Zhang SX, Wang Y, Rauch A, Wei F; 2020. Unprecedented disruption of lives and work: Health, distress and life satisfaction of working adults in China one month into the COVID-19 outbreak. *Psychiatry Research*, 288:112958.
- Zivin K, Eisenberg D, Gollust SE, Golberstein E; 2009. Persistence of mental health problems and needs in a college student population. *Journal of Affective Disorders*, 117(3):180-185.
- Zung WW; 1971. A rating instrument for anxiety disorders. *Psychosomatics: Journal of Consultation and Liaison Psychiatry*, 12(6):371-379.
- Zung WW, Richards CB, Short MJ; 1965. Self-rating depression scale in an outpatient clinic: Further validation of the SDS. *Archives of General Psychiatry*, 13(6):508-515.