

ORIGINAL ARTICLE

Factors Correlated With Internet Gaming Disorder Among Malaysian University Students

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ABSTRACT

Introduction: Internet gaming disorder (IGD) has recently been incorporated into the Diagnostic and Statistical Manual of Mental Disorders fifth edition (DSM-5) as a disorder for future research. The primary objectives of the present study are to describe the level of IGD and to examine its correlations with sociodemographic factors and psychological comorbidities among undergraduate students in a Malaysian university. **Methods:** A total of 411 undergraduate students completed an online questionnaire. They were selected from a random sample of participating university faculties. The online questionnaire contained the Internet Gaming Disorder Scale-Short-Form and the Depression, Anxiety, Stress Scale. **Results:** The presents study reported that 52.8% of the participants had high IGH. Using hierarchical multiple regression, age ($\beta = -0.09, p < 0.05$), gender ($\beta = -0.40, p < 0.001$) and stress ($\beta = 0.23, p < 0.05$) were statistically significant predictors of IGD. Academic performance, depression and anxiety did not emerge as significant predictors. **Conclusion:** These findings highlight the risk factors (in particular, stress) of IGD. Further studies on interventions, particular that of preventative strategies, will be needed to combat this emerging public health problem.

Keywords: DSM-5, internet gaming disorder, IGD level, associated factors, behavioural addiction

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INTRODUCTION

The world wide web is fast becoming an indispensable and inseparable component of our daily lives, mirroring the rapid growth of the information technology sector in conjunction with Industrial Revolution 4.0 (2). It represents one of the most important tools for communication and information and is constantly evolving. Communicating and connecting with others have never been easier, news could be disseminated seamlessly and information could be gathered just by the click of the fingers. Also, conducting businesses and engaging in online activities (e.g., online video gaming) are aided by rapid internet connectivity.

Historically the first video game that was invented was a rudimentary version of a game that was later named Pong. However, Pac-Man, a 1980 arcade game, was the first game that revolutionizes the way video games

were perceived. It became a mainstream phenomenon overnight. Since then the gaming industry has risen exponentially and has fast becoming a multi-billion-dollar industry, surpassing even film and art industries. With the advent of online gaming, each game produced has the potential to generate millions or even billion dollars in revenue. Resulting from this, gaming companies have shifted their focus into attracting younger gamers as they potentially will have a longer gaming half-life and would bring the most revenue long term.

Aided by fast internet connectivity, online gaming has become one of the major online activities. Players could either indulge in leisurely gaming or participate in professional gaming competitions. Most gamers immersed themselves in gaming as it delivers excitement and instant gratification. Being able to obtain a sense of achievement resulting from gaming and having a chance to interact with others have also been the push factors (3). But as with all good things, online gaming may become problematic when it is used excessively and engaged in an uncontrolled manner. This often could lead to untold psychological, behavioural, and functional impairments. Interestingly in numerous

studies, psychological, behavioural, and functional impairments could predispose internet gaming disorder (IGD) itself. Age-related psychological development, disrupted family dynamics, and having poor functioning and impulsive behaviours have been identified as possible causes of IGD. A review article published in 2019 on the biopsychosocial risk factors for IGD pointed out that individuals are at-risk for IGD during the early adolescent period (4). Psychologically, age-related issue such as underdevelopment of cognitive control seems to be an important contributing factor. Various psychological comorbidities have been found in adolescents with IGD such as depression, anxiety, impulsiveness, conduct disorder, and attention-deficit/hyperactive disorder. Adolescents with IGD have been postulated to manifest maladaptive beliefs in relation to their gaming habit such as the overemphasis of valuing gaming rewards and gaming identity, forming self-esteem regulation via gaming, and gaining social acceptance from the virtual world.

Fractured family dynamics also play an important role in the development of psychiatric illnesses including IGD. Poor family function serves as a precursor for IGD resulting from the lack of healthy parental attachment and general attitude towards parenting playing. Researchers further suggested that rule settings concerning gaming in male and female adolescent gamers by parents could help to prevent IGD, something that is lacking in poor family functioning. Functional impairment is a consequent effect of IGD and is one of the criteria for IGD diagnosis. Low occupational or academic performance, poor social functioning, and bad sleep quality are the leading adverse consequences of IGD. Experiencing these consequences may create a vicious circle of perpetuating the habit itself as gamers may engage in maladaptive ways to cope with stress via gaming. Behaviourally, impulsivity has also been shown to be another possible determinant of IGD. A cognitive-behavioural model for IGD postulated that brain area activating executive function could promote cognitive and behavioural control which in turn play an important role in inhibiting the craving for online game use, and protecting the brain functions of executive function (4).

Even with evidence on the biopsychosocial aspects of IGD as mentioned above, experts are still split on how IGD should be defined (5). It has been historically conceptualized as a behavioural addiction by including addictive behaviour criterion such as salience, mood disturbance, tolerance, withdrawal symptoms, relapse after a period of stopping, and difficulty controlling the gaming habit in spite of daily problems (6). There has also been notion that IGD should be viewed as a form of impulse control disorder similar to internet addiction (4). Most recently it has been conceptualized as a prolonged, uncontrollable indulgence of online gaming that may lead to impairment in social functioning and possible psychological problems that might arise from

the internet gaming habit (7,8).

Recently the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) included IGD as a condition warranting further study. The 9 criterion proposed by the DSM-5 are: (i) preoccupation with internet gaming, (ii) loss of control, (iii) development of withdrawal symptoms, (iv) tolerance, (v) loss of interest, (vi) overuse, (vii) deceiving to conceal gaming habit, (viii) escape of adverse mood state, and (ix) loss of employment or opportunities or relationship due to excessive gaming (6, 9).

As a result of the ever-increasing awareness of IGD, numerous studies have been conducted to identify the prevalence of IGD (10). A South Korean study involving 2024 students found that 5.9% of the sample fit the DSM-5 criteria for IGD (11). The prevalence rates of IGD were 17.7% in a Singaporean sample and 1.16% in German gamers of IGD (12,13). Cross-cultural data are scarce, probably due to the lack of standardization of diagnostic criteria.

Previous studies have found that IGD has a direct link with other psychological comorbidities (14,15), such as stress, anxiety, and depression (16,17). Both IGD and gambling disorder are listed in the DSM-5 as a condition for behavioural addiction. Of note, gambling disorder was found to have higher psychological comorbidities such as depression, anxiety, and social phobia as compared with IGD (18). As IGD and gambling disorder may share similar psychopathological characteristics and neuro pathway, proper regulations on gaming companies are needed as these companies have now incorporated gambling elements in some of their newer video games. The practice of 'Loot Boxes' is a prime example in which gamers pay monies to receive variable surprise rewards in-game.

One of the most important perpetuating factors for IGD is negative escapism. Negative escapism is a psychological defence mechanism used in individuals with maladaptive coping. It has been suggested that addictive behaviours are reinforced and made stronger as it relieves anxiety and adverse effects from stress when engaged. Negative escapism was identified in 77.8% of the participants in a prior study examining the association between IGD and stress (19).

Psychodynamic theory of addiction and by extension IGD postulated that addictive behaviours are brought on by past adverse life experiences (20). Addictive behaviours could be attributed to difficult family dynamics or deprived parenting in one's earlier life. In a study involving teenagers with addictions, the participants identified the primary reason of substance abuse was in part due to being able to feel good and experiencing momentary escapism from difficult family environment. Most of the subjects reported low self-

esteem as they were not able to utilize mentalization skills resulting from poor family attachment. IGD has also been linked with low or absent familial support, high school related conduct difficulties, and aggressive tendencies (17,21).

Historically, males are often associated with video gaming and by extension are more vulnerable to develop addiction to gaming compared to females. In a relevant study examining the neuroanatomical differences between male and female gamers, the researchers performed functional magnetic resonance imaging (fMRI) on both genders (22). Male subjects exhibited greater thalamic activations in the post-pre fMRI assessment in comparison to female subjects.

There have not been many studies examining the pathological association between age and IGD. Age seems to be an important predictor of IGD, more specifically the age of gaming initiation. The age of gaming initiation has a direct link to the development of IGD. There was a positive correlation between age of gaming initiation and IGD development (23). The modulation of self-esteem modulation in children appears to be an important pathology in development of IGD. Having low global self-worth was shown to bring a poor prognosis as opposed to those having a good global self-worth. The age of gaming initiation is getting younger in that gaming companies are increasingly targeting the younger age groups so many games that are age appropriate become available.

The objectives of the present study were to describe the level of IGD and to examine its correlations with socio-demographic factors (gender, age, and academic performance) as well as psychological distress (depression, stress, and anxiety) using a sample of undergraduate students in a Malaysian university.

MATERIALS AND METHODS

A total of 441 undergraduate students from a Malaysian university with three campuses (i.e., Bangi, Cheras, and Kuala Lumpur) were recruited. The inclusion criteria were undergraduate students who aged between 19-25 years old. Post-graduate students and students who did not have smart devices were excluded. The year of the study and the courses were randomly selected by using multistage cluster sampling. To promote heterogeneity in the present study, undergraduates were selected from Years 2 and 4 at the Faculties of Medicine, Pharmacy, Engineering and from Years 1 and 3 at the Faculty of Science and Technology. Approval from the university ethics committee was obtained prior to data collection (JEP-2019-413). Following the ethical approval, online Google questionnaire forms were distributed to the student representatives. A description of the study was given to the representatives. The respondents who met all the criteria and those who had voluntarily agree to

participate in the study were given the online consent form. All responses were kept anonymous, and no monetary rewards were given. Data collection online was over a 3-month period spanning from January 2019 to March 2019.

Sample size calculation

The sample size was calculated based on the IGD prevalence of 38% as reported in a Korean study (11). The power of the study was 90% and p-value was set at 0.05. By using manual calculation formula (Kish L. 1965), the minimum sample size calculated was 362. Considering a non-response rate of 20%, the final calculated sample size was 434.

Socio-Demographics

Socio-demographics such as age, gender, and cumulative grade point average (CGPA) of recent semester were obtained.

Weekly Game Play

The information on the weekly duration of gaming time on consoles, personal computers and mobile phones was obtained. It was further categorized into several playing categories according to hours spent: less than 7 hours a week, between 8 and 14 hours a week, between 15 and 20 hours a week, between 21 and 30 hours a week, between 31 and 40 hours a week, and more than 40 hours a week.

Internet Gaming Disorder (IGD)

The IGDS-SF9 is a 9-item instrument designed to screen IGD. It is based on the DSM-5 diagnostic criteria for IGD such as developing preoccupation to online gaming habit and having symptoms of withdrawal or tolerance. Other features include failed attempts to control, neglecting other interests, continuous use despite resulting psychosocial problems, desire to escape adverse life events, deceitful behaviour regarding gaming habit, and resulting psychosocial impairments (3). Participants rated the items based on a Likert scale ranging from 1 (never) to 5 (very frequent). Possible IGD scores range from 9 to 45, indicating maximal IGD features. It has a high Cronbach's alpha coefficient of 0.92, indicating high reliability (21). The Cronbach's alpha value for the IGD-SF9 was reported to be 0.87 in the present sample.

Psychological Distress

The 21-item Depression Anxiety Stress Scale (DASS-21) consists of three psychological distress domains measuring anxiety, depression, and stress. Every domain has 7 items. The depression domain (DASS-21-D) assesses hopelessness, anhedonia, inertia, negative cognitive value of life, dysphoria and self-effacing behaviour. The anxiety domain (DASS-21-A) assesses hyperarousal, situational anxiety, subjective experience of anxiety symptoms and skeletal muscle tension. The stress domain (DASS-21-S) assesses the components of hyperarousal, being easily upset and agitated, irritable,

difficulty in relaxing, being impatient and over reactive (25). It is important to mention that DASS-21 does not actually provide a clinical diagnosis, but it could be used for screening. Higher scores indicate more psychological distress problems (26). The DASS-21 was used to examine criteria-related validity in prior research as there was a link between IGD and psychological problems (27). The DASS-21 was found to have very good validity and reliability (28,29). Cronbach's alpha values of 0.81, 0.89, and 0.78 for the DASS-21-D, DASS-21-A, and DASS-21-S, respectively, reported in the present sample.

Data Analysis

SPSS software version 21 was used for statistical analyses. Sociodemographic background, time spent weekly, and mode of playing were expressed in the form of descriptive parameters. For continuous variables, mean, median and standard deviation were obtained. Continuous variables were checked for skewness and kurtosis values for normality test. Pearson's r analyses were performed to examine the relations among study variables at the bivariate level. Hierarchical multiple regression analysis was performed to investigate the relations of depression, anxiety, and distress (Step 2) to IGD, while controlling for age, gender, and academic performance (Step 1). Independent sample t-test was used to examine the differences of IGD between male and female participants. All p values were set at below 0.05.

RESULTS

Socio-Demographic Characteristics, Psychological Distress, and Internet Gaming Disorder

Tables I and II show descriptive statistics for study variables. As far as normality is concerned, skewness and kurtosis values were within acceptable range. Kline (30) stated that the violation of normality assumption is detected when the absolute value exceeds 3 for skewness index and when the absolute value exceeds 10 for kurtosis index. The present sample included 441 participants with an average age of 21.81 years (SD = 1.42). About 60.1% of the present sample were female, 49% were from the Faculty of Medicine. The mean CGPA (academic performance) was 3.18 (SD = 0.34). As for smartphone use, 62.8% of the participants spent less than 7 hours in gaming per week, 58% were only playing single player offline mode, and 52.8% had high IGD.

Table III summarizes the bivariate findings for study variables. A significant negative correlation between age and IGD was found, $r = 0.12$, $p = 0.01$. In the present sample, we observed that as age increases, IGD decreases. There was a significant difference in IGD between male ($M = 22.78$, $SD = 6.63$) and female ($M = 15.98$, $SD = 6.98$) participants, $t = 10.22$, $p < 0.001$. Male participants had higher IGD than female

Table I: Descriptive Statistics of Study Variables

Variables	f	Percentage (%)	M	SD	Skewness	Kurtosis
Socio-demographic characteristics						
Age			21.81	1.42	-0.06	-0.70
19-21	209	47.4				
22-25	232	52.5				
Gender						
Male	176	39.9				
Female	265	60.1				
Year of Study*			2.95	1.10	-0.46	-1.24
1	55	12.5				
2	113	25.6				
3	73	16.5				
4	200	45.4				

Note. *For descriptive purposes only

Table II: Descriptive Statistics of Study Variables

Course of Study*						
Medicine	217	49.0				
Pharmacy	53	12.0				
Electric and Electronic Engineering	36	7.9				
Food Science and Business Management	30	6.8				
Food Science and Nutrition	33	7.5				
Chemistry	15	3.4				
Multimedia system and Development	3	0.7				
Information technology	33	7.5				
Information System Development	22	5.0				
Faculty*						
Medicine	217	49.0				
Pharmacy	53	12.0				
Engineering and Built Environment	36	8.2				
Science	77	17.5				
Technology Information Science and Technology	59	13.4				
Time spent in gaming per week*						
Less than 7 hours	277	62.8				
8-14 hours	48	10.9				
15-20 hours	25	5.7				
21-30 hours	40	9.1				
31-40 hours	39	8.8				
> 40 hours	12	2.7				
Mode of playing*						
Single	256	58.0				
Multiple	47	10.7				
Both	138	31.3				
Academic performance			3.18	0.34	-0.29	1.31
Internet gaming disorder behaviour			18.69	7.60	0.21	-1.17
High	233	52.8				
Low	208	47.2				
Psychological association						
Depression			2.74	3.70	2.20	5.89
Anxiety			3.16	3.79	1.81	3.96
Stress			3.56	3.85	1.40	1.83

Note. * For descriptive purposes only

participants did.

A significant negative correlation between academic performance and IGD was also found, $r = 0.44$, $p < 0.001$. As participants' academic performance increases, their

Table III: Bivariate Analyses for Study Variables with Internet Gaming Disorder Behaviour as an Outcome Variable

Variable	Inferential Tests	<i>p</i>
Age	-.12 ^r	.01*
Gender	10.22 ^t	.00**
Academic Performance	-.44 ^r	.00**
Depression	.31 ^r	.00**
Anxiety	.28 ^r	.00**
Stress	.33 ^r	.00**

Note. *r* = Pearson correlation coefficient, *t* = Independent sample *t*-test.

* *p* < .05

** *p* < .001

IGD decreases. Significant positive correlations linking depression (*r* = 0.31), stress (*r* = 0.28), and anxiety (*r* = 0.33) to IGD were obtained (*ps* < 0.001). These findings suggest that as participants' scores on depression, anxiety, and stress on the DASS-21 increase, so do their scores on IGD.

Hierarchical Multiple Regression Analysis Predicting IGD from Age, Gender, Academic Performance, and Psychological Distress

The relevant assumptions surrounding sample size adequacy and singularity were tested prior to the computational of hierarchical multiple regression. The hierarchical multiple regression model included six independent variables (age, gender, academic performance, depression, anxiety, and stress). Hence, the present sample size of 441 was adequate for such analysis (31). As all independent variables were not presented as a combination of other independent variables, the assumption of singularity was met.

Table IV shows that all independent variables were not highly correlated, except for depression-and-stress relationship, and anxiety-and-stress relationship. The assumption of multicollinearity was not violated as the collinearity statistics (i.e., tolerance and variance inflation factors) were all within acceptable range (32,33).

To examine whether psychological distress was significantly correlated with IGD, while adjusting for

age, gender, and academic performance, a hierarchical multiple regression analysis was performed (Table V). In Step 1, socio-demographic characteristics (age, gender, and academic performance) were entered. Depression, anxiety and stress were entered in Step 2. The rationale to determine the statistical order was based on the proximal to distal approach (34). Socio-demographic characteristics were unmodifiable, so they were entered in Step 1. Psychological distress variables were modifiable, so they were entered in Step 2.

In Step 1, only gender contributed significantly as a predictor of IGD, $F(3, 425) = 35.79, p < 0.001$. Gender explained 20% of the variance in IGD (35). In Step 2, adding depression, anxiety and stress to the regression model gives explanation to a further 10% of the IGD variance, the change in R^2 was statistically significant, $F(3, 422) = 21.14, p < 0.001$.

Of the six independent variables that were entered in the regression model, only stress, age, and gender emerged as significant predictors of IGD. The strongest predictor of IGD being stress ($\beta = 0.23, p = 0.02$). Several independent variables were found to be consistent predictors of IGD. This includes being male, belonging to the younger age group, and having high stress. This was after socio-demographic characteristics were considered.

Table V: Hierarchical Multiple Regression Analysis Predicting Internet Gaming Disorder Behaviour From Socio-Demographic Characteristics and Psychological Distress (n = 429)

Variable	β	R^2	DR^2	<i>F</i> change	Tolerance	VIF
Step 1:		.20	.20	35.79**		
Age	-.07				.97	1.03
Gender	-.41**				.90	1.11
Academic performance	-.07				.92	1.09
Step 2:		.31	.10	21.14**		
Age	-.09*				.94	1.07
Gender	-.40**				.90	1.11
Academic performance	-.05				.91	1.11
Depression	.10				.29	3.48
Anxiety	.01				.27	3.66
Stress	.23*				.17	5.77

Note. 1 = Male, VIF = variance inflation factor.

* *p* < .05

** *p* < .001

Table IV: Intercorrelations among Study Variables

Variables	IGD	Age	Gender	AP	D	A	S
IGD	-	-.12**	-.44**	-.18**	.31**	.28**	.33**
Age		-	.14**	-.06	.03	-.00	.09*
Gender			-	.27**	-.05	-.03	-.03
AP				-	-.11*	-.05	-.07
D					-	.74**	.84**
A						-	.85**
S							-

Note. IGD = Internet Gaming Disorder, AP = Academic Performance, D = Depression, A = Anxiety, S = Stress.

* *p* < .05

** *p* < .001

DISCUSSION

The primary aim of the study was to describe the level of IGD and to examine its correlations with socio-demographic factors (age, gender, academic performance) and psychological distress (depression, anxiety, and stress) in undergraduate Malaysian university student samples. The mean age of 21.8. About 52.8% of the present sample had high IGD.

Hierarchical multiple regression analysis showed that age, gender, and stress were the significant predictors of IGD. The present study identified that participants of the lower age group (19–21 years of age) had a higher risk of developing IGD compared to other age groups (22–25 years of age). It appears that younger undergraduate students are at greater risk to develop IGD than older undergraduate students. This might be due several factors such as having less parental guidance and having access to the internet which allow the students to engage online gaming easily (36). Our findings were consistent with previous studies (37,38).

A study in South Korea reported that 5.9% of youth participants were identified to fit the DSM-5 criteria for IGD (8), this result does not lend support to a Singaporean study demonstrating that the risk of developing IGD is proportional to age. It is possible that most adolescent gamers would become adult gamers gradually. Past IGD research highlights the need for examining IGD among young working adults (12,39). In the present study, male students were found to have a higher tendency for developing IGD behaviour than female students. This result was consistent with previous studies (14). Several studies have demonstrated that being male were associated with internet addiction development (3,40). The finding of the present study is also supported by a South Korean study demonstrating that the majority of adolescents with IGD were young adolescent males (11). Given that in some societies, gaming is viewed as a male specific habit as it is more acceptable for males to engage in gaming habit as opposed to females. This is, however, an outdated view as past research has found that females were also vulnerable to IGD due to the brain specific cortical changes. As reported by Wang et al., there was a decrease in cortical thickness in females with a diagnosis of IGD (41).

Regarding the relationship between IGD and psychological distress, undergraduates with higher stress were found to have higher risk of developing IGD. This indicates that those who have higher stress scores are more vulnerable to become problematic internet gamers compared with those with lower stress scores. This could be due to maladaptive coping strategy one applies to immerse themselves into the virtual reality in order to avoid facing actual adverse events (42,43). This result lends support to a past psychosocial well-being study reporting that IGD was conceptualized as a

form of negative stress coping mechanism to cope stress rather than as a form of an isolated pathology (44). It can be said that the primary motivation for engaging in virtual gaming activities in complicated gaming users is to escape from actual life stressors (45).

Apart from stress, previous studies have also postulated that online gaming addiction was positively associated with anxiety and depressive like symptoms. It has been suggested that increased severity of depression will lead to increased difficulty in modulating problematic gaming habit due to the blunted self-regulatory processes (46). Previous studies have also found that normal than average scores of self-reported depression and anxiety symptoms were associated with increased gaming time (16). In the present study, no significant multivariate correlations between psychological distress (in particular depression and anxiety) and IGD were found. However, at the bivariate level, our study did show that stress was correlated with IGD in the present sample, mirroring the previous mentioned research. Further research will be needed to explore the aetiology of stress as a potential precursor for IGD or vice versa.

The present study did not show that academic performance was a significant predictor for IGD. This finding does not lend support to previous research demonstrating that poor academic performance and failures in school as contributory factors for online gaming addiction (17). Furthermore, long time spent gaming was more prevalent in teenagers with deprived academic background (47,48). The small sample size used in this study could be responsible for these discrepancies.

There were four major limitations of the present study that should be noted here. The first limitation was generalizability as the present sample was chosen from a single university. Large-scale survey research will be needed in future studies to assess the prevalence rate of IGD and its correlations with socio-demographic and psychological distress. Second, a convenient sampling was used and almost 50% of the present sample were recruited from the same faculty (i.e., Faculty of Medicine). This method raised the issue of selection bias. It is possible that those who are heavy gamers with more severe symptoms were excluded from the study. The third limitation of the present study was that of measurement errors, data were obtained by using self-administered online questionnaire. Although anonymous survey format was used, however, as participants may not comfortable to give an honest response. The use of face-to-face interview method is recommended for future research as it ensures better data accuracy. Finally, the cut-off score of IGDS9-SF was not applied in this present study as the scale has yet to be validated clinically for Malaysian population. More reliable and valid screening tools to measure IGD should be used and developed for future studies.

CONCLUSION

Although IGD is yet to be formalized in the DSM-5, it has been shown that there are already a significant number of students who were at risk of IGD. At the multivariate level, stress along with age and gender were found to be significantly correlated with IGD. More research is needed to establish the comorbidity theorem of IGD. Given what we learn from substance addiction studies, it is theoretically reasonable to speculate that IGD would co-occur with other psychiatric disorders just like substance addiction does. The present study also indicates the need for stress tolerance programme targeting undergraduate university students to prevent problematic gaming engagement, a finding that is supported by past research (50). Gaming hygiene advice should be drawn up as soon as possible in an attempt to prevent at-risk undergraduate students from developing more severe IGD or other psychiatric symptoms. Further studies are required to confirm the status of IGD as a formal disorder in the DSM-5 to prevent unnecessary stigmatization among young gamers (51).

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