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# Internet addiction and loneliness as predictors of internet gaming disorder in adolescents

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**The purpose of this research is to present the relationship of teenagers' internet gaming disorder (IGD) with their levels of internet addiction and loneliness, as well as to test the created model in terms of these relations. This research analyzes the predictive relationships among adolescents' IGD, internet addiction and loneliness through the statistics program in accordance with the structural equation model. The research's study group has been selected among teenage students in different schools in Ankara, during the 2018-2019 academic years using the random sampling method. Of the students, 305 are male and 101 are female. The participants were 406 students (males = 75.12%, female = 24.87%, Mage = 15.63 years, SDage = 1.11) aged between 14 and 18 years. The variables predicting IGD are internet addiction (β = 0.54) and loneliness (β = 0.11). Additionally, loneliness significantly predicts internet addiction (β = 0.24, p <0.01).**

**Key words:** Internet gaming disorder, internet addiction, loneliness, adolescents.

## INTRODUCTION

With the increase in the use of technology in social areas, there have been some changes in game and entertainment preferences. There is no significant difference between online gaming as an entertainment tool and other forms of entertainment such as sports, dance, work and workouts (Aarseth et al., 2016). The common point among all these recreational vehicles is that they have the potential to be rewarding, so that they are capable of making addiction (Wenzel et al., 2012). Despite the fact that the game-playing behaviour on the Internet is an entertainment event that many people around the world enjoy without problems, it is clear that problematic game-playing behaviour cannot be ignored. In recent years, researches about Internet games have started to address the extreme and problematic game-play behaviors that cause significant psychological problems and various distortions in the individual's life, rather than making the game problematic, which is a healthy entertainment method (Griffiths et al., 2017).

It is found that playing games on the Internet in a healthy way has a positive impact on educational, social and therapeutic aspects (Granic et al., 2014; Colder et

al., 2018; Griffiths et al., 2017; Nuyens et al., 2019). King and Delfabbro (2014) state that the game playing behavior can improve self-esteem and that self-esteem can be a contributing factor to the problematic nature of game addiction. According to Yee (2006), one of the positive things about playing games on the internet is that it gives the possibility of coping with stress or avoiding stressful situations. However, in some individuals, when used dysfunctionally, playing may be one of the criteria that meet dependence as a result of cognitive, psychological and emotional effects (Griffiths, 2005; Pontes and Griffiths, 2015).

According to the ICD-11, digital or video gaming disorder is defined as a behavior pattern characterized by the deterioration of the individual's ability to control the play, gaming's taking the place of individual's other interests and daily activities, and keeping up gaming and increase in gaming, despite negative results (WHO, 2017). The notion of internet gaming disorder (IGD) was included in DSM-5 in 2013 (Wartberg et al., 2019). The IGD was evaluated in a behavioral addiction category, and was included in the Diagnostic and Statistical Manual in the 5th edition of the DSM-5 (American Psychiatric Association, 2013) in order to enable performing further research. DSM-5 defines IGD as excessive and long-term internet gaming behavior in which cognitive and behavioral symptoms are observed, including loss of control, tolerance development and withdrawal symptoms similar to the ones seen in substance use disorder, in the last 12 months (APA, 2013). Here, the term *similar to the ones seen in substance use disorder* clear the main way of defining the IGD as an addiction (Arıcak et al., 2018).

Excessive game playing on the internet can lead to negative outcomes like poor academic performance, risky life relationships, family communication problems and physical problems (Kuss and Griffiths, 2012). The weakness of interpersonal relationships, dissatisfaction with physical appearance and weakness of problem-solving skills can be counted among the factors that increase the IGD (Young, 2009). The IGD seems to be more common among adolescents (Kuss and Griffiths, 2012; Schneider et al., 2017). This situation seems to have contributed to performing further researches on the addiction of adolescents. On the other hand, social functions cut a wider swath in factors starting or maintaining games. For all age groups, social functions like helping others in starting or maintaining games, joining a group and being invited to play are important (Griffiths et al., 2004). Digital game addiction, high hyperactivity and carelessness (Wartberg et al., 2019; Stavropoulos et al., 2019), low self-efficacy (Jeong and Kim, 2011), academic failure, sleep problems (Ferguson et al., 2011), anxiety (Wei et al., 2012; King and Delfabbro, 2014), low self-esteem and impulsivity (Billieux et al., 2015; Gentile et al., 2011), incompatible cognitions (King and Delfabbro, 2014), depression and

stress (Loton et al., 2016; Mentzoni et al., 2011), were associated with problematic internet use (Andreassen et al., 2016).

In recent years, researches have been carried out on psychosocial problems related to IGD; however, since everyone may not display symptoms and outcomes in the same way, the researchers working on problematic game playing work on different symptoms (Aarseth et al., 2016). For this reason, IGD and loneliness variables, which are thought to be related to internet game playing behavior, are considered as predictive variables in this study.

Nowadays, the internet is widely used (Frozzi and Mazzoni, 2011) because of its many functions such as social communication and facilitating daily life. Conducted by TÜİK (Tuik, 2018) in Turkey, the use of information technologies in households' survey revealed that the rate of household with access to the internet was 25.4% in 2008 and 80.7% in 2017, with an increase every year. There was an increase in the number of households with internet access and the number of internet users reached 35.8% in 2008 and 66.8% in 2017.

The problematic internet use process is conceptualized as a behavioral addiction in which symptoms such as being busy with the internet, urgent use expectancy, using longer than expected, withdrawal and signs of tolerance and significant deterioration in life are displayed (Widyanto and Griffiths, 2006). Factors that contribute to this include the availability, utility, advertising and the quality of the activity (Maiti, 2019). Internet addiction prevalence rates tend to be the highest among adolescents (Kuss et al., 2014). For some adolescents and adults, abuse of the internet may be a risk factor (Anderson et al., 2016; Öztemel and Traş, 2019). Because of mobility and easy access to the internet for adolescents with smartphones, dependence properties in users can be triggered (Jang et al., 2008; Kim et al., 2012). Significant relationships were found between cyberbullying and hopelessness in adolescents (Dilmaç, 2017). This finding is noteworthy in terms of showing negative results due to negative use of internet.

Today, the use of social media through the internet has a very important place especially in the lives of young people (Boyd, 2014; Keipi et al., 2017; Kuss and Griffiths, 2017). However, depending on the reasons or results of using the internet, its role in reducing/increasing the problems may change (Mazzoni et al., 2016). It is obvious that individuals who are dependent on the internet spend more time by playing multiplayer games instead of using communication tools such as e-mail or social networks (Young, 2009).

Staying away from the internet as a result of excessive use can cause negative psychological effects in some individuals (Kuss et al., 2014). Excessive use of the internet was found to be similar to the psycho-addictive substance dependence which has a neurobiological basis

(Maiti, 2019). Young (2009) described the problematic internet use as a psychiatric disorder. Psychological/social factors in the internet addiction are important because of their role in changing behaviors as are in substance abuse (Maiti, 2019). When the literature is examined, it was found that the internet addiction was named by researchers in various ways. Internet dependency, pathological internet use, problematic internet use, excessive internet use, internet abuse and internet addiction disorder can be counted as examples (Dinç, 2016).

When the findings of the study were examined, researches on explaining the relationship of internet addiction with insecure attachment styles (Eichenberg et al., 2017; Monacis et al., 2017), ADHD (Ko et al., 2012), physical or sexual abuse and insecure attachment attitudes in childhood (Schimmenti et al., 2014), anxiety and depression (Ebeling-Witte et al., 2007), obsessive-compulsive symptoms (Dong et al., 2011), individualism and psychological needs (Arpacı et al., 2018) and social phobia (Yen et al., 2007) were found. There have been researches stating that loneliness feeling is displayed in individuals who are addicted to internet games (Kim et al., 2009; Nowland et al., 2017; Snodgrass et al., 2018). It is understood that excessive internet use lie at the bottom of Facebook intensity, fear of missing out and smartphone addiction (Traş and Öztemel, 2019). Although individuals often state that they utilize internet socialization function of the internet, excessive internet use decreases the participation in social relations paradoxically (Davis et al., 2002) and consequently, loneliness and lack of social contact may be seen more.

One of the basic needs of humans, the need of belonging (Baumeister and Leary, 1995) refers to being in a social community such as a family, class or group. People whose social contact needs are not sufficiently met can experience a sense of loneliness as a result of an emotionally intense, unwanted subjective experience resulting from inadequacy perceived in social relations (Perlman and Peplau, 1981). Due to the diminution of the social contact of the individual and the inadequate social relations, perceived loneliness may occur as a result of the weakness of communication (Heinrich and Gullone, 2006; Hughes et al., 2004; Masi et al., 2011). Loneliness is a feeling that can be overcome as a result of people's trust in others and social contact with the individuals they can feel socially connected to (Nowland et al., 2017).

The feeling of loneliness, which can be seen in every developmental period in human life, may have more effects on adolescence and young adulthood (Qualter et al., 2015). In adolescents and young adults, loneliness is a risk factor for many psychosocial difficulties such as depression (Matthews et al., 2016). At the same time, loneliness was found to be associated with various addictive behaviors (Bian and Leung, 2015; Kuss et al., 2014) and risky behaviors such as substance use

(Stickley et al., 2014). Some significant relationships were found between adolescents' sense of loneliness, problematic online games (King et al., 2010) and excessive internet use (Kuss et al., 2014). Feeling of inadequacy of individuals who felt lonely in social settings becomes a motivation factor for participation in online communities (Barak et al., 2008; Csipke and Horne, 2007). Individuals tend to use supporting online networks as an alternative to offline relations they are not satisfied with (Kwon et al., 2011).

Researches on IGD among adolescents in Turkey, who has a very young population rate, are becoming increasingly important. In this context, the purpose of this research is to investigate the direct effects of internet addiction on IGD and their indirect effects on loneliness, as well as the direct effects of loneliness on IGD.

## Hypothesis

In accordance with the aim of the research, the following hypotheses were tested:
1. Internet addiction has a relationship on IGD.
2. Internet addiction has a relationship on loneliness.
3. Loneliness has a relationship on IGD.

## METHODOLOGY

### Research model

The purpose of the research is to present the relationship among teenagers' IGD, internet disorder and loneliness, as well as to test the created model in terms of these relations. The relational survey model, a sub-type of the general survey model, has been used in the research. Relational survey is a research model conducted in order to define the relationships among two or more variables and in order to obtain clues concerning cause-and-effect relationships (Büyüköztürk et al., 2008).

### Study group

Simple random sampling was employed to select the study group, which consists of 406 high school students studying at four five schools in Ankara during the 2018-2019 academic years. The study group was composed of 406 students, 101 (24.87%) female and 305 (75.12%) male students. Ages of participants vary between 14 and 18, and the average age is 15.63 (Ss = 1.11).

### Measurement tools

#### Internet gaming disorder scale-short form

The nine-item internet gaming disorder scale – short form (IGDS9-SF) is one of the most popular instruments developed based on DSM-5 to assess gaming addiction internationally. Given the number of common instruments to assess and diagnose gaming disorder cross-culturally, validity and reliability studies of instruments such as the IGDS9-SF have become more important. Validity of the IGDS9-SF was assessed in two ways; confirmatory

factor analysis (CFA) and criterion-related validity. CFA revealed that IGDS9-SF was one-dimensional. A significant correlation between IGDS9-SF and internet addiction scale indicated criterion-related validity. One supportive finding for the validity was the significant difference found between the upper and lower 27-percentile groups in terms of IGDS9-SF scores. The IGDS9-SF also showed satisfactory levels of reliability using Cronbach's alpha (0.82), Guttman's split-half (0.75), and test-retest reliability coefficient (0.78). It is concluded that the IGDS9-SF appears to be a valid and reliable scale to assess IGD among Turkish adolescents and young adults (Arıcak et al., 2018).

### Internet addiction scale

This scale constitutes the diagnosis survey adapted by Young (1998) from the diagnostic criteria for pathological gambling in the American Psychological Association's Diagnostic Service Manual (Version 4, 2000). The scale is a 6-point Likert-type whose answers are *never*, *rarely*, *sometimes*, *mostly*, *very often* and *always*. These options are scored respectively from 0 to 5. Scores of 80 or higher indicate an *internet addict*; scores from 50 to 79 indicate *limited symptoms*; and scores under 50 indicate *no symptoms* (Bayraktar, 2001). The scale was translated by Bayraktar (2001), investigated by five instructors from the Faculty of Literature, Ege University, and adjusted for suitability to adolescents between 12 and 17 years old. Cronbach's Alpha for the translated test was 0.93, and the Spearman-Brown value for reliability is 0.87.

### UCLA loneliness scale

Russell et al. (1978) re-examined all the materials in the UCLA loneliness scale they developed to measure individuals' levels of loneliness with the assumption that this leads to systematic bias in negative statements. Half of the items were transformed into negative expressions (Demir, 1989). 10 of the 20 items that make up the UCLA loneliness scale were reverse-coded. In each of the scale's items, feelings and thoughts about social relations were presented, and individuals were asked to mark the Likert-type scale on how often they experienced these expressions. The answers *never* (4), *rarely* (3), *sometimes* (2), *often* (1) are possible, sometimes reverse-scored. The total scores that individuals receive from all the items give their overall loneliness score. The highest score that can be gained in the scale was 80 and the lowest score was 20. A high score indicates a high level of loneliness. In addition, the Cronbach's alpha value for this scale was 0.88.

### Sociodemographics

The survey also included questions concerning sociodemographic characteristics of the participants including gender, age, game genre and gaming experience.

### Procedure and data analysis

Data were collected face-to-face using a paper-and-pen form in classrooms with student volunteers. Prior to distributing the data collection instruments, the students were informed that participation in the study was voluntary. Data were collected from students who verbally stated that they would participate in voluntarily. It took approximately 25 min for the students to complete the form.

It was first investigated as to whether there existed any missing data, and it was determined that all the data were present in the variable set. After testing for univariate and multivariate outliers, 9 observations were excluded from the data set, leaving a total of 406 participants whose data were analyzed. This research analyzes the predictor relationship among adolescents' IGD, internet addiction and loneliness using the program, AMOS 19, in accordance with structural equation modeling. Structural equation modeling is a statistical approach that reveals causative and reciprocal relationships between observed and latent variables (Schumacker and Lomax, 2004). The model proposed in this study relating to the relationships among subjective IGD, internet addiction and loneliness is presented in Figure 1.

## RESULTS

In the final model ($X2 / sd = 1.26$, $p < .001$), there is one exogenous (loneliness) and two endogenous (IGD and internet addiction) data. Each of the paths shown in the model was statistically significant. The Bentler-Bonett normed fit index (NFI), the Tucker-Lewis coefficient of fit index (TLI) and other fit indices showed that the model was well-aligned as shown in Table 1. Each of the two-way correlations between the endogenous data in the model had high values and was statistically significant.

When the compliance values in Table 1 are examined, it is found that $X^2 / sd = 1.26$, RMSEA = 0.03, SRMR = 0.02, NFI = 0.98, CFI = 0.99, GFI = 0.99, AGFI = 0.97, TLI = 0.98. In general, it is understood that the model has the desired level of compliance values (Bollen, 1989; Browne and Cudeck, 1993; Byrne, 2010; Hu and Bentler, 1999; Kline, 2011; Tanaka and Huba, 1985). The tested single-factor model is shown in Figure 1. All paths shown in the model are significant at the level of 0.001.

When the model in Figure 1 is examined, it is seen that the most important independent variable ($t = 13.31$, $p < 0.01$) affecting IGD of adolescents is internet addiction. The link coefficient value for this factor is $\beta = 0.54$. When the predictive relationship between adolescents' internet dependencies and game dependence variables were examined, it was determined that there was a positive linear relationship between them. In other words, the findings show that the increase in internet addiction increases the IGD.

When the values in Table 2 are examined, it is seen that the second independent variable ($t = 2.74$, $p < 0.01$) which affects IGD is loneliness. The link coefficient value for this factor was determined as $\beta = 0.11$. When the adolescents' predictive relationships between loneliness and game dependencies were examined, it was determined that there was a positive linear relationship. In other words, the findings suggest that the addiction of the adolescents will increase as their loneliness increases.

Moreover, when the Table 2 are examined, the predictive effect of loneliness on internet addiction ($t = 5.19$, $p < 0.01$) was observed in the model tested. The link coefficient value for this factor was determined as $\beta = 0.24$. When the predictive relationships between
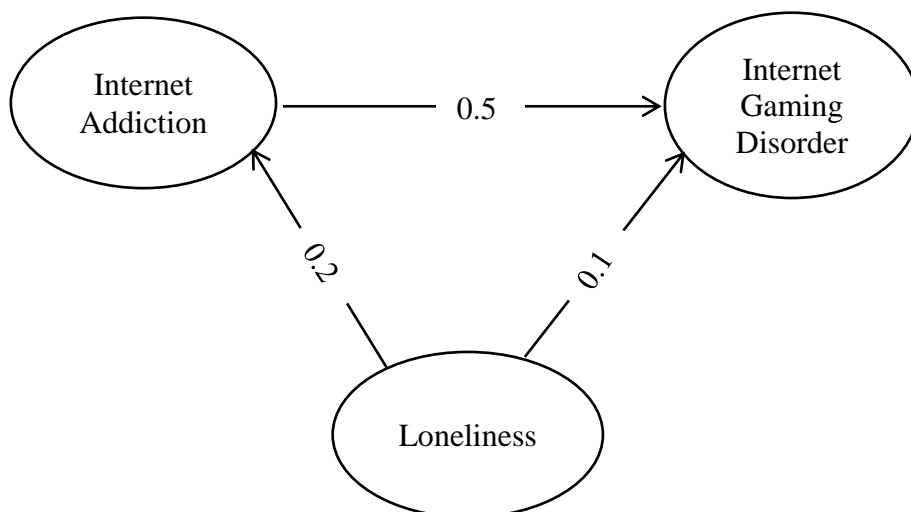
**Figure 1.** The path diagram of the study's model.

**Table 1.** Statistical values related to the structural equation model's fit ındex.

| Measure | Good fit | Acceptable fit | Fit ındex values of the model |
|---------|----------|----------------|-------------------------------|
| (X2/sd) | ≤ 3 | ≤ 4-5 | 1.26 |
| RMSEA | ≤ 0.05 | 0.06-0.08 | 0.03 |
| SRMR | ≤ 0.05 | 0.06-0.08 | 0.02 |
| NFI | ≥ 0.95 | 0.94-0.90 | 0.98 |
| CFI | ≥ 0.97 | ≥ 0.95 | 0.99 |
| GFI | ≥ 0.90 | 0.89-0.85 | 0.99 |
| AGFI | ≥ 0.90 | 0.89-0.85 | 0.97 |
| TLI | ≥ 0.95 | 0.94-0.90 | 0.98 |

**Table 2.** Model on predictor relations among ınternet gaming disorder, ınternet addiction and loneliness for protecting adolescents.

| Predictor variable | Dependent variable | Total effect | Direct effect | Indirect effect | Standard error | Critical value |
|--------------------|--------------------|--------------|---------------|-----------------|----------------|----------------|
| Internet addiction | Internet gaming disorder | 0.54 | 0.54 | - | 0.03 | 13.31* |
| Loneliness | Internet gaming disorder | 0.24 | 0.11 | 0.13 | 0.02 | 2.74* |
| Loneliness | Internet addiction | 0.24 | 0.24 | - | 0.04 | 5.19* |

*p <0.01.

adolescents' loneliness and internet addiction were examined, a positive linear relationship was determined. In other words, the findings suggest that the increase in loneliness levels of adolescents will increase internet addiction.

**Conclusions and discussion**

In this section, the findings of the study are examined and interpreted by examining the predictive relationships between the IGD, internet addiction and loneliness levels of adolescents constituting the study group.

According to the first hypothesis of the research, internet addiction predicts internet game addiction. It is seen that the findings of the researches confirm this hypothesis. Excessive use of the internet may cause adverse effects. In literature, researches having a significant correlation between excessive internet usage and digital gaming addiction (Andreassen et al., 2016)

support this finding. Playing internet and video games has become one of the most popular leisure activities regardless of culture, age and gender (Király et al., 2014; Kuss, 2013). Psychosocial factors such as low self-esteem, loneliness, depression, high anxiety and stress appear to be common behavioral addictions (Griffiths, 2015). Despite this, numerous instruments continue to include screening items for tolerance in gaming and internet use disorders (King et al., 2013; Lemmens et al., 2015; Lortie and Guitton, 2013).

According to the second hypothesis of the study, a significant relationship was found between loneliness and IGD. As a result of insufficient family relations of adolescents, search for socialization through internet games (Li and Wang, 2013) can be interpreted as an attempt to deal with the feeling of loneliness. The games played on the internet can be interpreted as the socialization effort of the individual to communicate with other players, to take part in a team and to perform difficult tasks with the support of other players (Smahel et al., 2008). Some researches with problematic internet gaming have attracted attention to the parent-child relationship (Schneider et al., 2017). Positive family relationships (Adams et al., 2018) and positive father relationship (Schneider et al., 2017) can be counted among IGD protective factors. Therefore, high levels of perceived online social support may lead to excessive internet use (Hardie and Tee, 2007). These findings show that gaming-related distress can be experienced by the internet gamers' experiences of loneliness (Kim et al., 2009; Nowland et al., 2017; Snodgrass et al., 2018). In online environments, that especially adolescents feel social pressure to actively participate in peer activities (Turel and Osatuyi, 2017) can be considered as a way to deal with loneliness. Therefore, this can cause negative consequences such as internet addiction and IGD. These findings also reveal the importance of social isolation that follows problematic game playing, addiction and loneliness that may arise as a result of addiction (Kim et al., 2009; Nowland et al., 2017). The findings of this study may be beneficial in several ways. Very little is known about the psychodynamic mechanisms that initiate and maintain the excessive use of the internet, loneliness and IGD. According to the findings obtained, there is a positive linear relationship between adolescents' IGD and loneliness levels. Findings of the study are supported by the research findings suggesting that individuals who use the internet excessively but do not have enough social skills show more internet game disorder where the face to face interaction is seen less (Caplan, 2003; Davis, 2001; Davis et al., 2002).

According to the third hypothesis of the study, loneliness predicts internet addiction. This finding is supported by the results of a research in which internet addiction, which is one of the negative consequences of excessive internet use, is found to be related to loneliness (Kuss et al., 2014). Those findings also suggested the importance of loneliness and social isolation in addictive and problematic gaming, which echoed a now substantial body of literature (Kim et al., 2009; Nowland et al., 2017; Snodgrass et al., 2018). The findings of this study are supported by the findings that show social media platforms can reduce the loneliness of users (Pittman and Reich, 2016). This finding of the research is supported by the literature stating that some people find online interaction is safer, more efficient and more suitable than real-life interactions, and that it is a better option for individuals who are socially inadequate (Caplan; 2003). However, this situation makes it difficult for individuals to develop social relations outside the online environment (Davis et al., 2002) and hence create a cycle between loneliness and internet addiction. According to the findings of the research hypothesis, it is shown that addictive feature of IGD needs for a standard conceptualization (Aarseth et al., 2016; Petry et al., 2014; Pontes and Griffiths, 2015). However, further research is needed to clarify the relevance of dependence (Pontes et al., 2014).

Internet games can be quite appealing especially for adolescents. In this study, the IGD was predicted (explained) by internet addiction and loneliness. The results of this study are thought to be helpful in revealing possible problems in adolescents who are at risk of being addicted to internet games. Further research is needed to better understand the psychological dynamics of adolescents who are at risk of IGD. With the results of the study, the benefits and risks of IGD were tried to be explained better.

Despite the strengths of the study, there are some limitations. First of all, this study was carried out cross-sectional, so the causal mechanisms could not be studied. In future studies, different psychosocial reasons that can reveal IGD can be studied. In addition, longitudinal studies can provide detailed information about factors associated with IGD. Secondly, this study was conducted in Turkey and on adolescents. However, more research is needed for individuals of different age groups and other developmental stages. Thirdly, impact sizes may be relatively low. It can be suggested that working groups should be formed from different socio-economic groups, different geographical regions and school types.

Based on the findings of this study, it can be suggested to identify, prevent and develop strategies for early intervention in individuals who are at risk of developing IGD. Király et al. (2014) suggests that a one-size-fits-all solution does not exist considering the fact that there are players with different motivations and different developmental characteristics. Moreover, researches have shown that the same behavior, such as playing for 14 h a day, does not lead to comparable problems among players (Griffiths, 2010). It may be advisable to

take into account the different characteristics defined as IGD symptoms among the adolescents. In researches on adolescents, preventive guidance studies (Korkut, 2004) and more causal research findings are needed.

## CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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