Title: Alexithymia and Its Relationship with Anxiety in Individuals with Multiple Sclerosis

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Abstract

Background: Multiple sclerosis (MS) is a chronic disease with an increasing prevalence worldwide. Individuals with MS exhibit higher levels of psychological disorders compared to those without the disease. Among the most common of these disorders are anxiety and alexithymia. Few studies, especially in Iran, have explored these states in MS patients. This study aims to investigate the relationship between alexithymia and anxiety in people with MS.

Methods: This cross-sectional, descriptive-correlational study was conducted among 265 individuals reffering to the Iran MS Society in Tehran, using a continuous sampling method from June to August 2024. The tools used included a Sociodemographic information form, the Toronto Alexithymia Scale-20 (TAS-20), and the Beck Anxiety Inventory (BAI). The Pearson correlation coefficient, Independent Samples T-Test and Analysis of variance were utilized for the analytical evaluation of the data by using SPSS version 16. The significance level in all tests was considered to be $p < 0.05$.

Results: The mean alexithymia score in this population was (60.16± 18.80) indicating a high prevalence of alexithymia in individuals with MS. A significant proportion of the participants experienced severe anxiety level (41.5%). Statistical analyses revealed a significant positive correlation between alexithymia and its subscales with the level of anxiety ($p < 0.001$), meaning that with an increase in the alexithymia score and its subscales, the anxiety score also increases. Alexithymia demonstrated a correlation with education level ($p= 0.012$), a direct relationship with the age at the time of MS diagnosis ($p= 0.021$) and an inverse relationship with the time passed since MS diagnosis ($p= 0.031$). Anxiety levels were associated with gender (more prevalent in women with $p=0.011$), employment status ($p=0.047$) and type of MS ($p=0.02$).

Conclusion: Considering the results of this study, healthcare team is suggested to prioritize the recognition of the symptoms of these disorders and use strategies to improve the mental health of patients with MS.

Keywords: Alexithymia, Anxiety, Multiple sclerosis, Alexithymia Scale-20 (TAS-20), Beck Anxiety Inventory (BAI)

Highlights

- Alexithymia in MS can interfere with the treatment process of these patients.

- Emotional states, including anxiety, are prevalent among individuals with MS.

- There was a statistically significant positive correlation between alexithymia and anxiety level in individuals with MS.

Plain Language Summary

The treatment process for multiple sclerosis poses significant challenges in individuals' lives. Meanwhile, the related psychological issues are sometimes ignored among these challenges. Alexithymia is a psychological feature, characterized by difficulty in identifying and describing feelings; meanwhile as a trait, it can disrupt the continuity of treatment and hinder the communication between the medical staff and the patient, leading to the patient's needs being ignored. This study demonstrated that alexithymia is highly prevalent in this population and has a significant positive correlation with their anxiety levels. Therefore, monitoring the symptoms of alexithymia and its treatment can reduce anxiety and enhance the effectiveness and quality of nursing care and the treatment process for patients with MS.

Introduction:

Multiple sclerosis(MS) is a chronic and unpredictable disease (Sutton, 2017), in which the immune system attacks the central nervous system (CNS)(McGinley et al., 2021). It is the most common demyelinating disease of the CNS (Thomopoulos, 2021). MS is characterized by distinct phenotypes, including Relapsing-Remitting MS (RRMS), Primary Progressive MS (PPMS), Secondary Progressive MS (SPMS), and progressive relapsing MS (PRMS) (Hoehne et al., 2025). The most common type is RRMS, which is marked by episodes of fully or partially reversible deficits in the CNS. However, it may advance over time to SPMS, characterized by progressive accumulation of neurological disability in the absence of clinical relapses (Klineova and Lublin, 2018). A smaller portion of MS patients- about 10-15%- show a PPMS form from the onset of the disease (Hoehne et al., 2025).

Approximately 2.8 million people worldwide suffer from MS (Soldan and Lieberman, 2023). A rising prevalence of MS has been observed throughout the Middle East and North African area, as well as in the Russian Federation, Canada, Australia, and various European nations (Walton et al., 2020). Studies conducted in Iran have reported the prevalence of MS to be 29.3 per 100,000 individuals (Shafiee et al., 2023). The incidence of MS in Iran has significantly increased in recent years (Hosseininezhad et al., 2021) and diagnosis often occurs in the late 20s and early 30s (Sutton, 2017; Miclea et al., 2019). Additionally, the incidence of MS is higher in women and they are approximately two to three times more likely to develop MS than men (Voskuhl, 2020). Demyelination-induced lesions in the nervous system are associated with cognitive and emotional disorders commonly seen in MS (Raimo et al., 2017). Patients with MS have been shown to exhibit higher levels of psychological disorders than those without the disease (Chalah

and Ayache, 2017; Solaro et al., 2018; Corallo et al., 2019; Christopoulos et al., 2020). Psychological disorders, particularly anxiety and alexithymia, are prevalent among MS patients (Sonkaya et al., 2019; Mrabet et al., 2022). The prevalence of anxiety in the MS population ranges from 22 to 57% (Butler et al., 2016; Boeschoten et al., 2017; Pham et al., 2018) and has been reported to be 51% in the Iranian population with MS (Shafiee et al., 2023).

In MS, emotional distress associated with this disease can lead to maladaptive coping mechanisms, including inhibiting emotional expression (Christopoulos et al., 2020). Alexithymia is a personality trait (CHALAH, 2017 a), characterized by difficulty in identifying and describing feelings, limited imagination, and an external thinking style, which is associated with various psychological and physical disorders (Luminet et al., 2018; Christopoulos et al., 2020). The prevalence of alexithymia in the MS population is estimated to be between 10% and 53%, compared with a prevalence of 10% to 20.7% in the general population (Chalah and Ayache, 2017; Sonkaya et al., 2019; Stojanov and Stojanov, 2020).

Alexithymia leads to resistance against the treatment process (Pinna et al., 2020) and impaired seeking of necessary medical care (Sagar et al., 2021). At the same time, these individuals have a lower capacity to adapt to stressful situations, which, in addition to disrupting the treatment process (Safarzadeh and Sevari, 2020), can also cause anxiety (Quinto et al., 2022). People who have deficits in identifying and appropriately using their emotions may not be able to use their emotional world, leading to decreased positive emotions such as happiness and increased anxiety (Eftekhari Moghaddam et al., 2024). In fact, the inability to differentiate between emotional states and the lack of insight into the causes of various emotional states in alexithymia, are significant predictors of various psychological problems such as anxiety (Alpay et al., 2024).

Several studies have investigated alexithymia and its relationship with anxiety in patients with MS; however, the results have been contradictory(Chalah and Ayache, 2017; Eboni et al., 2018; Briones-Buixassa et al., 2019). Some research confirms significant relationships between alexithymia, psychological disorders, and multiple sclerosis (Özkan et al., 2016; Chalah and Ayache, 2017; Eboni et al., 2018; Briones-Buixassa et al., 2019; Stojanov and Stojanov, 2020; Christopoulos et al., 2020). Anxiety has been positively associated with alexithymia in some studies(Chahraoui et al., 2014; Mosson et al., 2014; Gay et al., 2017; Eboni et al., 2018; Briones-Buixassa et al., 2019), but in other studies, the results were contradictory(Dulau et al., 2017; Prakash et al., 2019) or no significant association was found between alexithymia and anxiety(Chalah et al., 2020).

Given the annual increase in the MS population and the necessity of considering their mental health status in the treatment and care process, it is essential to investigate the presence of alexithymia and associated psychological disorders in individuals with MS during medical care(Eboni et al., 2018). As mentioned, alexithymia is recognized as a precursor to anxiety in individuals; however, the findings from studies examining this relationship in people with MS have reported very contradictory outcomes. This study investigated alexithymia and its relationship with anxiety in individuals with MS in Iran.

Materials and Methods

Design, setting and sample

This was a cross-sectional descriptive-correlational study. The statistical population included clients with MS referring to the Tehran MS Association. Continuous sampling was conducted from patients who met the inclusion criteria and had expressed their consent to participate in the

study. The sample size was calculated to be 265 at a 95% confidence interval and 90% test power based on Equations 1 and 2. Also, for the relationship between alexithymia and anxiety to be considered statistically significant, the correlation coefficient was considered equal to 0.2.

1. $$w = \frac{1}{2} \ln \frac{1 + r}{1 - r}$$

2. $$n = \frac{(z_{1-\alpha/2} + z_{1-\beta})^2}{w^2} + 3$$

The inclusion criteria were as follows: confirmation of the diagnosis of MS (based on medical records), no history of alcohol or drug abuse, age range between 18 to 77 years, no history of psychiatric illness, no diagnosis of any chronic disease other than MS, no major psychiatric disorders up to 5 years before the diagnosis of MS, no severe visual, motor, or cognitive impairments (based on medical records or self-reported), and consent to participate in the study. After providing a complete explanation of the study method and objectives and obtaining written consent, the questionnaires were completed by the subjects in a suitable environment without interruptions, within 20 to 30 minutes.

Data Collection Instruments

The data collection tool consisted of three parts, including the Sociodemographic and disease information form, the Toronto Alexithymia Scale-20 (TAS-20), and the Beck Anxiety Inventory(BAI).

The Sociodemographic and disease information form included age, gender, marital status, education level, employment status, type of MS, time since diagnosis of MS, and the individual's age at the time of diagnosis of MS.

Toronto Alexithymia Scale-20 (TAS-20) consists of 20 items and three subscales (Externally Oriented Thinking (EOT), Difficulty Describing Feelings (DDF), Difficulty Identifying Feelings (DIF). The scoring of this tool is based on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Items 4, 5, 10, 18, and 19 are reverse scored: from 1 (strongly agree) to 5 (strongly disagree). The higher the scores individuals receive on these subscales, the greater their difficulty in expressing and identifying emotions. The total score is obtained by summing the three subscales, with a minimum possible score of 20 and a maximum of 100 (Bagby et al., 1994). Besharat (2007) reported Cronbach's α for overall Alexithymia and the subscales of DIF, DDF, and EOT as 0.85, 0.82, 0.75, and 0.72, respectively. In this study, Cronbach's α was as follows: overall Alexithymia= 0.916, DIF= 0.909, DDF= 0.774, and EOT= 0.765.

The Beck Anxiety Inventory (BAI) is a 21-item questionnaire designed to measure the severity of anxiety in adolescents and adults. Each statement reflects one of the common symptoms of anxiety (mental, physical, and panic symptoms). The responses are scored on a 4-point Likert scale (0 to 3) as not at all (0), mild (1), moderate (2), and severe (3). Thus, the final score ranges from zero to 63. The final score interpretation is as follows: 0 to 7 no anxiety or minimal anxiety, 8 to 15 mild anxiety, 16 to 25 moderate anxiety, and 26 to 63 severe anxiety (Beck et al., 1988). The intra-class correlation between the two scores obtained from the Persian version of BAI and the clinical expert assessment of the level of anxiety of individuals in the anxious population indicated that the tool has adequate validity ($p<0.001$, $r=0.72$). Calculation of the interclass correlation between test-retest scores in the anxious population indicates that the reliability of the BAI in the Iranian population is adequate ($r=0.83$, $p<0.001$). The index also showed high

internal consistency (Cronbach's α =0.92) (Kaviani and Mousavi, 2008). In this study, Cronbach's α for the Beck Anxiety Inventory was calculated to be 0.906.

Data analysis

Data analysis was performed using SPSS version 16. Statistical analyses were conducted using a combination of descriptive and inferential techniques. Descriptive statistics, including frequency (percentage), mean (M), and standard deviation (SD), were employed to characterize the distribution of the research variables. Inferential statistics consisting of the independent samples t-test, one-way ANOVA, and the Pearson correlation coefficient were used to assess the relationship between demographic variables, alexithymia and anxiety. It is worth noting that the significance level for all tests is considered to be $p < 0.05$. Data distribution considered normal based on kurtosis and skewness, which were between -2 to +2.

Results

The average age of the studied individuals was 42.22±10.59 years and the highest frequency (33.6%) was observed in the age range of 40 to 49. Most subjects (69.4%) were women. Regarding the type of MS, most subjects (46%) suffered from the relapsing-remitting type. The distribution of patients according to their sociodemographic and disease characteristics is reported in **table 1.**

Table 1. Distribution of the sociodemographic and disease characteristics of the subjects

characteristics		Frequency	Percentage
Age (years)	29 and less	34	12.8
	30-39	75	28.3
	40-49	89	33.6

	50-59	49	18.5
	60 and more	18	6.8
	M± SD	42.22 ± 10.59	
	Max –Min	19-72	
Gender	Female	184	69.4
	Male	81	30.6
Marital status	Single	59	22.3
	Married	175	66.0
	Other	31	11.7
Education level	Below Diploma	38	14.3
	Diploma	88	33.2
	University degree	139	52.5
Employment status	Clerk	66	24.9
	Self-employed	49	18.5
	Homemakers	124	46.8
	Unemployed	13	4.9
	Retired	13	4.9
Type of MS	Relapsing-remitting	122	46.0
	Primary progressive	48	18.1
	Secondary progressive	27	10.2

	Unknown	68	25.7
Age at the time of MS diagnosis (years)	19 and less	17	6.4
	20-29	96	36.2
	30-39	94	35.5
	40-49	44	16.6
	50 and more	14	5.3
	M± SD	32.46 ± 9.46	
	Max –Min	59-14	
Time since diagnosis of MS(years)	1 and less	32	12.1
	1-5	59	22.3
	5-9	58	21.9
	9-14	48	18.1
	14 and more	68	25.7
	M± SD	9.79±7.79	
	Max –Min	420-1	

The mean scores for alexithymia and anxiety were 60.16± 18.80 and 21.36± 13.46, respectively (**Table 2**). The majority of the study participants (41.5%) were at a severe level of anxiety, 18.9% had no anxiety or minimal anxiety, 21.9% had a mild level of anxiety and 17.7% experienced moderate anxiety.

Table 2. Descriptive data for alexithymia and anxiety

Variable	Min	Max	Mean	SD
Alexithymia	26	96	60.16	18.80
Anxiety	0	49	21.36	13.46

To examine the relationship between alexithymia and its subscales with anxiety, the Pearson correlation test was used. Based on the results, there was a significant positive weak correlation between alexithymia and its subscales with anxiety ($p < 0.001$). As the score of alexithymia and its subscales increased, the anxiety score also increased, and vice versa (**Table 3**).

Table 3. Correlation between alexithymia and its subscales and anxiety

Variable	Alexithymia and its subscales			
	DIF	DDF	EOT	Total Alexithymia
Anxiety	r=0.337 p < 0.001	r=0.286 p < 0.001	r=0.251 p < 0.001	r=0.329 p < 0.001

Abbreviations: DIF: Difficulty Identifying Feelings, DDF: Difficulty Describing Feelings, EOT: Externally Oriented Thinking

Relationship between Sociodemographic characteristics, alexithymia and anxiety are shown in

Table 4.

Anxiety had a significant relationship with gender (p=0.011), meaning that anxiety level was higher in women than in men. There was a significant correlation between employment status and anxiety (p=0.047), meaning that anxiety levels were higher in homemakers compared to self-employed workers (p=0.035). A significant association was observed between anxiety and MS type (p=0.02), meaning that anxiety levels were higher in subjects who were unaware of their MS type compared to those with RRMS (p=0.001).

There was a significant relationship between education level and alexithymia (p=0.012), with alexithymia being higher in individuals with diploma-level than those with university degrees(p=0.016). There was a statistically significant and inverse relationship between the time passed since MS diagnosis and alexithymia (p= 0.031), meaning that as the time passed since MS diagnosis increased, the score of alexithymia decreased. Additionally, alexithymia had a statistically significant and direct relationship with the age at the time of MS diagnosis (p= 0.021), indicating that the higher the age at which MS is diagnosed, the higher the score for alexithymia will be.

Table 4. *Correlation between sociodemographic characteristics, alexithymia and anxiety*

Personal and disease characteristics		Alexithymia		Anxiety		Test results	
		M	SD	M	SD	Anxiety	Alexithymia
Gender	Male	58.97	17.72	18.20	13.28	*t=2.564 df=263 p= 0.011	*t=0.681 df=263 p= 0.496
	Female	60.68	19.28	22.76	13.33		
Marital status	Single	55.83	18.55	19.01	13.90	**F=1.381 P=0.253	**F=2.218 P=0.111
	Married	61.06	18.49	21.78	13.22		
	Other	63.29	20.28	3.251	13.80		
Education level	Below Diploma	63.39	18.80	20.84	12.60	**F=0.047 P=0.954	**F=4.529 P=0.012
	Diploma	63.92	19.16	21.27	14.42		
	University degree	56.89	18.09	21.57	13.15		
Employment status	Clerk	59.13	19.55	21.12	13.15	**F=2.451 P=0.047	**F=0.624 P=0.646
	Self-employed	57.32	16.97	17.14	13.30		
	Homemakers	61.97	19.52	23.60	13.51		
	Unemployed	59.84	18.80	21.53	12.71		
	Retired	59.07	14.88	17.07	12.80		

Type of MS	Relapsing-remitting	58.71	18.28	18.68	13.08	**F=5.055 P=0.002	**F=1.436 P=0.233
	Primary progressive	64.00	18.85	21.50	13.01		
	Secondary progressive	56.25	18.46	20.59	14.03		
	Unknown	61.60	19.63	26.41	13.05		
Age (years)						***r=-0.006 P=0.921	***r=0.028 P=0.656
Age at time of MS diagnosis (years)						***r=0.045 P=0.464	***r=0.141 P=0.021
Time since diagnosis of MS **(years)**						***r=-0.078 P=0.205	***r=-0.133 P=0.031

* Independent Samples T-Test, ** Analysis of variance, *** Pearson correlation coefficient

Discussion

The results of the study showed that participants experienced a high level of alexithymia. The results of Sonkaya et al. (2019)and Yilmaz et al. (2023) research are also in line with the present study.

In the current study, the majority of the subjects exhibited anxiety at a severe level. In a study on individuals with MS, Starynets and Starynets (2021a) demonstrated that the majority of participants (81.3%) have experienced severe anxiety. Meanwhile, Gay et al. (2017) reported that the prevalent level of anxiety among participants with MS (70.37%) was categorized as mild,

which is not consistent with the findings of the present study. The inconsistency between Gay et al. (2017) and our results may be attributed to the smaller sample size of their investigation compared to the present study. In this study, a statistically significant positive correlation was observed between alexithymia and its subscales with anxiety, meaning that as the score of alexithymia and its subscales increases, the level of anxiety also increases, and vice versa. One possible explanation for this finding is that alexithymia is a risk factor for many psychological disorders, because individuals with this condition are severely affected by the physical stresses of emotions that cannot be verbalized. This deficiency hinders emotional regulation and makes successful adaptation challenging (Narimani et al., 2020). Additionally, previous studies have shown that alexithymia positively mediates anxiety (Farris et al., 2019; Kedare and Baliga, 2022; Mohammadbeigi et al., 2023). Consistent with our findings, in a longitudinal study of MS patients, the two subscales of alexithymia (i.e., difficulty describing and difficulty identifying feelings) were correlated with anxiety and depression, while there was no association between externally oriented thinking as the third component of alexithymia and anxiety or depression (Chahraoui et al., 2014). Also, several studies on patients with other diseases have reported a direct relationship between alexithymia and anxiety (Hamaideh, 2017; Fietz et al., 2018; Popović et al., 2018; Okanli et al., 2018; Basharpoor and Jani, 2020). Furthermore, in line with the present research, Aaron et al. (2019) demonstrated that alexithymia is associated with higher levels of anxiety.

In analyzing the relationship between alexithymia and sociodemographic characteristics, the results indicate a significant correlation between education and alexithymia, and alexithymia is more common in people with a diploma than in people with a university degree. Consistent with our findings, some studies showed that higher education was linked to lower levels of alexithymia

(Eboni et al., 2018). It can be inferred that improved physical health, better health-related behavior and an increase in empowerment might be some of the mechanisms through which higher education might have improved mental health (Kondirolli and Sunder, 2022). Additionally, it was shown that alexithymia has a significant inverse statistical correlation with the time passed since MS diagnosis, and a significant positive correlation with age at the time of MS diagnosis. In reviewing other studies Mrabet et al. (2022) reported an inverse association between alexithymia and the time passed since disease diagnosis. Stojanov and Stojanov (2020) reported that higher age, unemployment, and longer duration of disease were associated with higher levels of alexithymia, while Starynets and Starynets (2021b) found no correlation between any of the sociodemographic and disease variables and alexithymia. It seems that people with a longer illness duration have greater use of coping strategies and lower use of behavioral disengagement, which leads them to psychological adjustment (Padhy et al., 2021).

Present study also demonstrated that anxiety was higher in women than in men. Zhang (2023) showed that female MS patients were prone to have an increased rate of anxiety. Potential factors contributing to gender discrepancy include anxiety sensitivity, stress coping style, fluctuations in exposure to reproductive hormones and peptides during the menstrual cycle (Zhang, 2023). Contrary to the present study, Mrabet et al. (2022) reported, female gender was not found to be a risk factor for anxiety. The differences in findings across various studies are likely due to cultural and structural differences in the populations being examined as they conducted in different countries. The current study showed that the level of anxiety was higher in homemakers compared to those with self-employed work. The relationship between different jobs and anxiety is unclear, but numerous studies have explored the relationship between

employment status and mental health (Borrelli et al., 2024). It is said that unemployment is associated with increased rates of anxiety and other mental health disorders. This could be because of financial instability and the pressure to establish a career (Borrelli et al., 2024). Additionally, the present study showed that the level of anxiety was higher in individuals who were unaware of the type of MS compared to those with RRMS. Although, there is still a lack of updated studies regarding this subject, some investigations demonstrated that RRMS patients are more likely to develop anxiety than those with other types of MS (Peres et al., 2022; Zhang, 2023). It is possible that the higher level of anxiety in people who are unaware of their MS type compared to others in the study sample could be due to their lack of knowledge about MS and their greater ambiguity about the nature of this disease.

The association of alexithymia with anxiety in various populations (Li et al., 2015; Di Tella et al., 2017;Starynets and Starynets, 2021b) may be because alexithymia reduces an individual's ability to effectively regulate negative emotions (Aaron et al., 2019). Findings from several studies have indicated that anxiety is positively correlated with greater difficulty in verbal expression and identifying emotions (Preece et al., 2020; La Rosa et al., 2022; Oussi et al., 2023). As mentioned, individuals with alexithymia have a lower capacity to adapt appropriately to stressful situations, which leads to anxiety and disrupts the treatment process. At the same time, If diagnosed, alexithymia can be improved through appropriate interventions and it is not a stable psychological trait (Sagar et al., 2021). Therefore, considering the prevalence of this personality trait and its impact on various aspects of an individual's life, its diagnosis and improvement in individuals with MS can facilitate the treatment process, nursing care and required follow-up.

This study has limitations. First, the use of self-report instruments may make participants' responses susceptible to social desirability bias. Second, the restriction of the sample to MS clients referred to the Tehran MS Association necessitates caution in generalizing the findings. Finally, given the study's cross-sectional design, only a correlational relationship between alexithymia and anxiety can be established, rather than a causal one.

Conclusion

This study examined the relationship between alexithymia and anxiety in Individuals with Multiple Sclerosis. The results indicated that alexithymia and anxiety are common among MS patients. At the same time, a positive correlation was observed between alexithymia and anxiety, which means that as the level of alexithymia increases, the level of anxiety also increases. Given the high prevalence of anxiety and alexithymia in individuals with MS and the impact of alexithymia on psychological disorders and the treatment process, it is essential for the healthcare system to pay more attention to this personality trait and work towards improving it. However, the contradictory results of studies conducted in various populations about the relationship between alexithymia and the development of psychological problems indicate the necessity for further investigations in a larger statistical population and longitudinal studies on the impact of alexithymia on prevalent psychological disorders such as anxiety in individuals with MS.

Ethical Considerations

Compliance with ethical guidelines

The present study was approved by the ethics Committee of Iran University of Medical Sciences (code: IR.IUMS.REC.1403.057). It was emphasized that participation in the study is voluntary, the

data will be remain confidential, and the subjects can withdraw from the research without any effect on their treatment schedule. Written informed consent was obtained from all the subjects.

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Authors' contributions

Mahnaz seyedoshohadaee: Oversaw every phase of the research and conducted a thorough review; Mohadese Tajik: Involved in the design of the study, gathering of data, and drafting of the manuscript; and Shima Haghani: Carried out the statistical analysis and interpretation of the data for this project. All the authors approved the final version of the manuscript.

Conflict of interest

The authors declare no conflict of interest regarding the publication of this paper.

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