

## Impact of Symptoms of Maternal Anxiety and Depression on Quality of Life of Children with Cerebral Palsy

### Annenin Anksiyete ve Depresyon Belirtilerinin Serebral Palsili Çocukların Yaşam Kalitesi Üzerine Etkisi

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#### ABSTRACT

**Introduction:** Cerebral palsy (CP) interferes with the quality of life (QOL) of children with CP, and given that parents report having to often guide their children's decision making, it is important to understand the psychosocial factors that have a potential influence on parent-proxy reports. The purpose of this study was to investigate the impact of maternal anxiety and depression symptoms on parent proxy-reported health-related QOL (HRQOL) for children with CP, while controlling other clinical and demographical variables that may have affect HRQOL.

**Methods:** The HRQOL scores of 97 outpatients with CP, aged 7–18 years, were assessed using the Pediatric QOL Inventory, Parent version (PedsQL-P). Each patient's type of CP, gross and fine motor function levels, severity of intellectual disability (ID), and other clinical variables were recorded. The levels of depression symptoms in each mother were assessed using the Beck Depression Inventory

(BDI), and the levels of anxiety symptoms were assessed with the Beck Anxiety Inventory (BAI).

**Results:** According to regression analyses, male gender, severity of ID, and higher mothers' BAI scores had negative effects on the PedsQL-P physical scores, and severity of ID and higher mothers' BDI scores had negative effects on the PedsQL-P psychosocial scores. Regarding the determinants of total HRQOL, severity of ID, GMFCS score, and higher mothers' BDI scores negatively impacted the PedsQL-P total scores.

**Conclusion:** Our findings show significant predictor effects of the mothers' anxiety and depressive symptoms, independent from other clinical variables, on the mother-rated HRQOL scores in children with CP.

**Keywords:** Cerebral palsy, quality of life, maternal anxiety/depression, child and adolescent

#### Öz

**Amaç:** Serebral palsi (SP) çocukların yaşam kalitesi üzerine belirgin etkilere sahiptir. Çocukların yaşam kalitesinin belirlenmesinde ebeveyn bildirimlerinin sıklıkla belirleyici olduğu düşünüldüğünde, ebeveyn bildirimini etkileyen potansiyel psikososyal faktörlerin anlaşılması önemlidir. Bu çalışmanın amacı; SP'li çocuklarına bakım veren annenin depresif ve anksiyete belirtilerinin, etkileme ihtimali olan klinik ve demografik verilerden bağımsız olarak çocukların yaşam kalitesi üzerine etkisini araştırmaktır.

**Yöntem:** Polikliniğe başvuran 7-18 yaş aralığındaki 97 SP olgusu Çocuklar İçin Yaşam Kalitesi Ölçeği- Ebeveyn formu (ÇİYKÖ-E) ile değerlendirilmiştir. Hastaların SP tipi, kaba ve ince motor fonksiyonları, zihinsel gelişim düzeyleri ve diğer klinik değişkenleri kaydedilmiştir. Annelerin depresyon belirtisi düzeyi Beck Depresyon Ölçeği (BDÖ), anksiyete belirtisi düzeyi ise Beck Anksiyete Ölçeği (BAÖ) ile değerlendirilmiştir.

**Bulgular:** Regresyon analizine göre; erkek cinsiyet, zihinsel yetersizlik düzeyi ve yüksek anne BAÖ skorlarının ÇİYKÖ-E fiziksel sağlık puanı üzerine; zihinsel yetersizlik düzeyi ve yüksek anne BDÖ skorlarının ÇİYKÖ-E psikososyal sağlık puanı üzerine negatif etkisinin olduğu saptanmıştır. Zihinsel yetersizlik düzeyi, kaba motor fonksiyon kaybı düzeyi ve yüksek anne BDÖ skorlarının ise ÇİYKÖ-E toplam puanını negatif yordadığı bulunmuştur.

**Sonuç:** Bu bulgular, SP'li çocuklarda annenin depresyon ve anksiyete belirtisi düzeyinin, diğer klinik değişkenlerden bağımsız olarak ÇİYKÖ-E skorları üzerine yordayıcı olduğunu göstermiştir.

**Anahtar kelimeler:** Serebral palsi, yaşam kalitesi, anne anksiyete/depresyonu, çocuk ve ergen

#### INTRODUCTION

Cerebral palsy (CP) is the leading cause of physical disability, with a prevalence of 2 to 3 per 1000 live births in childhood (1). Children with CP experience difficulties related to various motor and sensory impairments in daily activities. These impairments interfere with their quality of life (QOL) (2,3,4). Theoretically, QOL is not based upon the assessment of functional domains only. It is a complex multidimensional construct that comprises of elements of general functioning, as well as the judgement of individuals about their life experiences and social/emotional well-being (5). Health-related QOL (HRQOL) is used to define a QOL domain that is directly associated with a person's health (6). Though both child- and parent-rated instruments that assess HRQOL are available, the use of parent-reported instruments appears to be more reasonable (2).



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Because QOL has a multidimensional nature, various variables may impact it. Type of CP, gross and fine motor functioning, cognitive levels, and coexisting disorders are among the variables that have been reported to impact QOL (7,8,9,10). Given that parents report having to often guide their children's QOL, it is also important to understand the psychosocial factors that have a potential influence on parent-proxy reports. Parental mental health appears to be one of the most important psychosocial factors regarding the parent-rated QOL measure, and there may also be a mutual interaction among parental psychopathology and QOL of the children. For most children with CP, the care supplied by their parents is a valuable environmental factor. Thus, if the parents are incapable to meet the challenges of providing care for their child due to psychiatric disorders, the child may not achieve his/her optimum level of functioning. In addition to the direct negative impacts of poor caregiving related to parental emotional problems, parents who have psychiatric problems may subjectively view their child's functionality as negative. On the other hand, there is evidence that caregivers of children with poor functioning levels and QOL show a tendency to have more psychiatric problems than caregivers of healthy children (11,12).

In the literature, limited studies have examined the relationship between parental psychiatric status and parent proxy-reported QOL for children with CP (4,13). Davis et al. (13) observed that parental psychological distress was negatively correlated with all domains of parent-rated QOL and that the relationship between physical impairment and parent-rated QOL was mediated by parental distress. Similar results reported by Murphy et al. (4) indicated correlations between parent mental health and the psychosocial functioning and overall QOL of their children with CP. However, potential confounders, such as age, gender, CP severity, and cognitive level, have not been well controlled in such studies.

The present study aimed to evaluate the impact of maternal anxiety and depression symptoms on parent proxy-reported HRQOL for children with CP, while controlling other clinical and demographical variables that may affect HRQOL. The main hypothesis of this study was that maternal mental health plays an independent role in HRQOL in children with CP.

## METHODS

The sample comprised 97 children and adolescents with CP who applied to Physical Therapy and Rehabilitation outpatient clinics. The participants were evaluated by an experienced clinician to determine their eligibility for inclusion in the study according to the following criteria: (i) diagnosis of CP, (ii) 7–18 years of age, (iii) and a mother with at least 5 years of education and the cognitive ability to answer the questionnaire. The exclusion criteria were as follows: (i) a history of major surgery or having received injections of botulinum toxin-A 6 months prior to the evaluation (ii) or the use of systemic treatments such as steroids and psychotropic drugs 3 months prior to the evaluation.

The study protocol was reviewed and confirmed by the Selçuk University Ethical Committee. The patients, control subjects, and their mothers who agreed to take part read a patient information sheet and provided written informed consent. A standardized form was used to collect sociodemographical and clinical data. Age, sex, birth weight, hearing and speech problems, visual deficits, gestational age, and presence of epilepsy were recorded. The intellectual disability (ID) levels of the children were determined by the Turkish version of the Wechsler Intelligence Scale for Children-Revised (WISC-R) or Ankara Developmental Screening Inventory (ADSI) (14,15,16). The ADSI was administered to mothers of those children who were not suitable for the implementation of the WISC-R test because of their cognitive levels or comorbid disorders.

The CP type was ascertained by an expert physician according to the Surveillance of Cerebral Palsy in Europe (SCPE) classification tree (1). Using

the SCPE, each child's movement disorder type and topographical distribution was graded into 1 of the following 6 categories: spastic bilateral, spastic unilateral, dystonic, choreoathetoid, ataxic, and mixed.

Motor functions of the children were classified using the Gross Motor Function Classification System (GMFCS) and Bimanual Fine Motor Function (BMFMF) measurement by a trained physician. The GMFCS is a categorical measure that evaluates gross motor functions into 5 levels (17). It defines the clinical meaningful motor performance of children with CP on the basis of their daily functional abilities and need for assistive technologies. Further, the BMFMF comprises 5 levels and defines the grade of the functioning of the hands separately (18). Each child's levels of the GMFCS and BMFMF were classified by the same examiner.

## Questionnaire

**Pediatric QOL Inventory, Parent version (PedsQL-P):** The PedsQL-P was developed by Varni et al. (19) to assess HRQOL during childhood. It includes two subscale scores as "physical health" and "psychosocial" and a total score. The reliability and validity of the PedsQL-P for Turkish children and adolescents were reported by Cakin and Memik et al. (20,21). The PedsQL-P is a fast and easy measurement device that is scored on a 5-point Likert-type scale. Higher PedsQL total scores indicate better HRQOL. In this study, the PedsQL-P scale was fulfilled by the mother.

**Beck Depression Inventory (BDI):** The BDI is a self-report scale that was developed by Beck (22) to determine the severity of depression symptoms in individuals. The scale is composed of 21 questions and every item is scaled from "0" to "3" to obtain total scores of between "0" and "63." The reliability and validity of the BDI were reported by Hisli (23).

**Beck Anxiety Scale (BAS):** The BAS is a self-report scale developed by Beck (24) to measure the severity of anxiety symptoms in adults. It is a Likert-type scale and comprises 21 items that are scored between "0" and "3." Scores range between "0" and "63." The reliability and validity of the BAS for Turkish populations were reported by Ulusoy (25).

**Ankara Developmental Screening Inventory (ADSI):** The ADSI was developed to evaluate the developmental degrees of young children in Turkey (16). It is applied to the caregiver and comprises a total of 154 items across 5 categories (language, cognitive, fine motor abilities, gross motor abilities, social skills, and self-care skills). The total score of these subscales gives the general developmental score. The degree of ID was estimated by dividing the developmental level score ascertained by the ADSI with the normative data matched for age.

## Wechsler Intelligence Scale for Children-Revised (WISC-R):

The WISC-R was developed to assess the IQs of children between the ages of 6 and 16 years (14). The reliability and validity of the Turkish version was reported by Savaşır and Şahin (15). Each participant's level of ID was classified as borderline, mild, moderate, and severe using the WISC-R scores and a psychiatric examination.

## Statistical Analysis

Data analysis was performed using Statistical Package for the Social Sciences (IBM SPSS Statistics; New York, USA) 20.0 statistical software. Descriptive statistics were used to characterize the sample and outcomes. Pearson's or Spearman's correlation coefficient was calculated to investigate the association among the psychological measures. Multivariable categorical regression analysis was performed to evaluate the determinants of the QOL scores of participants. Associations with  $p < 0.10$  were entered into regression models. Given the sample size limitations, a maximum of 10 independent variables were included in each regression model. The significance level was set at  $p < 0.05$  (two-tailed).

## RESULTS

Four of the parents refused to participate, and 9 children were excluded based on the exclusion/inclusion criteria. A total of 97 patients, which comprised 49 (50.5%) boys and 48 (49.5%) girls, were included. The mean age of the sample was  $9.97 \pm 2.59$  years (range: 7–18 years). The most frequent CP type was spastic bilateral hemiplegia (43.3%), followed by spastic unilateral hemiplegia (12.4%), choreoathetoid CP (12.4%), ataxic CP (12.4%), dystonic CP (11.3%), and mixed CP (8.2%). The children's gross motor functions were distributed fairly evenly across the GMFCS levels. However, majority of the children scored at level 2, according to the BMFMF. The sociodemographical and clinical features are summarized in Table 1. The mean score of the mother's BAI and BDI were  $31.46 \pm 12.58$  and  $29.25 \pm 12.50$ , respectively.

The correlations among the clinical variables, such as children's motor functions, intellectual levels, mothers' psychological status, and PedsQL scores were calculated. The BMFMF and GMFCS scores, the severity of the children's speech problems and intellectual disabilities, and the higher mothers' anxiety and depressive symptoms had strongly negative correlations with both the PedsQL physical and psychosocial scores. There were also mildly negative correlations between the presence of epilepsy and PedsQL-P physical and psychosocial scores, and among female gender, gestational age, and PedsQL-P physical scores. All of the bivariate correlations among the variables are presented in Table 2.

We tested the predictors of the PedsQL-P scores using multivariable categorical regression analysis. The models contained the mothers' psychological test scores (BDI and BAI) and some clinical and demographical variables (such as gross and fine motor functions, intellectual levels, presence of speech problems, presence of epilepsy, mothers' psychological status, gestational age, and gender) that showed significant correlations with the PedsQL scales. The analyses observed that male gender, severity of ID, and higher mothers' BAI scores had negative effects on the PedsQL-P physical scores, and severity of ID and higher mothers' BDI scores had negative effects on the PedsQL-P psychosocial scores. On the other hand, regarding the determinants of total HRQOL, the severity of ID, GMFCS scores, and mothers' BDI scores negatively impacted the PedsQL-P total scores. CP type was also related to all of the PedsQL-P scores, according to the regression analysis (Table 3).

## DISCUSSION

Understanding the impact of parental mental health on the parent-rated QOL measure may be important for a more objective assessment of this construct in children with CP. The results of this study showed that both severity of maternal anxiety and depressive symptoms were strongly and negatively correlated with all of the parent-rated HRQOL scores of the patients. Moreover, after controlling other clinical and sociodemographical variables, the negative impacts of maternal anxiety and depressive symptoms on the mother-rated physical and psychosocial well-being of the children were significant, respectively. The present study also uncovered other predictors of HRQOL such as CP type and intellectual levels in these children.

The findings regarding the negative effects of maternal depressive and anxiety symptoms on the child's well-being are congruent with previous studies that examined the relationship between parental psychosocial distress and parent-reporting QOL in children with CP. In the literature, parenting stress, parents' depressive symptoms, and family functions have been proposed as important correlates of child behavior problems, functionality, and QOL (4,13,26). However, past studies generally controlled only a few confounders, which may have potentially impacted QOL or parental mental health, or they did not use specific questionnaires on anxiety or depression. This study is an expansion of such previous studies, demonstrating the mild independent predictor effect of maternal anxiety

**Table 1.** Characteristics of children with cerebral palsy

Measures	Mean $\pm$ SD	n (%)
Age	9.97 $\pm$ 2.59	
Gender (M/F)		49 (50.5)/48 (49.5)
<b>Natal history</b>		
Duration of pregnancy (weeks)	37.19 $\pm$ 3.78	N/A
Birth weight (grams)	2647.84 $\pm$ 865.09	N/A
<b>Clinical characteristics of CP</b>		
<b>Type of CP</b>		
Spastic bilateral hemiplegia	N/A	42 (43.3)
Spastic unilateral hemiplegia	N/A	12 (12.4)
Choreoathetoid	N/A	12 (12.4)
Dystonic	N/A	11 (11.3)
Ataxic	N/A	12 (12.4)
Mixed	N/A	8 (8.2)
<b>Gross motor function measure</b>		
Level 1	N/A	10 (10.3)
Level 2	N/A	29 (29.9)
Level 3	N/A	18 (18.6)
Level 4	N/A	16 (16.5)
Level 5	N/A	24 (24.7)
<b>Bimanual fine motor function</b>		
Level 1	N/A	16 (16.5)
Level 2	N/A	40 (41.2)
Level 3	N/A	15 (15.5)
Level 4	N/A	14 (14.4)
Level 5	N/A	12 (12.2)
<b>Intellectual level</b>		
Normal	N/A	26 (26.8)
Borderline IQ	N/A	15 (15.5)
Mild MR	N/A	21 (21.6)
Moderate MR	N/A	14 (14.4)
Severe MR	N/A	21 (21.6)
Hearing problem	N/A	6 (6.2)
Visual deficit	N/A	37 (38.1)
Speech problem	N/A	58 (59.8)
Epilepsy	N/A	26 (26.8)
<b>PedsQL-P</b>		
Psychosocial	50.38 $\pm$ 7.22	97 (100)
Physical	33.92 $\pm$ 9.12	97 (100)
Total	44.55 $\pm$ 7.44	97 (100)

SD: standard deviation; CP: cerebral palsy; MR: mental retardation; PedsQL-P: The Pediatric Quality of Life Inventory, Parent version; N/A: not applicable; M: male; F: female

on the HRQOL physical score and the strong independent predictor effect of maternal depression on the HRQOL psychosocial and total scores.

There may be different explanations for the abovementioned findings. It can be considered that maternal distress affects mother proxy-reported

**Table 2.** Intercorrelations among study variables

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Age	-0.07	0.01	-0.03	0.09	0.01	-0.07	0.07	-0.15	0.06	0.11	0.05	-0.05	0.08	0.12	0.11
2. Gender		-0.13	-0.05	-0.11	-0.10	0.06	-0.06	-0.01	-0.13	0.06	-0.19	-0.08	0.22*	0.08	0.14
3. Gestational age			0.69***	0.02	0.13	0.04	0.10	-0.11	0.19	-0.12	0.16	0.07	-0.22*	-0.18	-0.22*
4. Birth weight				-0.01	0.09	0.11	-0.02	-0.27**	0.23*	-0.11	-0.01	-0.05	-0.16	-0.13	-0.16
5. BMFMF					0.70***	-0.01	0.57***	-0.06	0.42***	-0.61***	0.30**	0.25*	-0.50***	-0.40***	-0.46***
6. GMFCS						-0.11	0.45***	-0.06	0.30**	-0.60***	0.48***	0.41***	-0.65***	-0.54***	-0.62***
7. Visual deficits							-0.09	0.24*	0.04	0.07	0.06	-0.05	0.05	0.14	0.11
8. Speech problems								-0.19	0.34**	-0.62***	0.23*	0.26**	-0.39***	-0.35***	-0.40***
9. Hearing problems									-0.13	0.13	-0.08	-0.14	0.13	0.16	0.16
10. Epilepsy										-0.37***	0.08	0.02	-0.26*	-0.23*	-0.26*
11. Intellectual level											-0.36***	-0.34**	0.70***	0.56***	0.65***
12. BAI												0.81***	-0.66***	-0.55***	-0.63***
13. BDI													-0.59***	-0.60***	-0.63***
14. PedsQL-P physical														0.77***	0.91***
15. PedsQL-P psychosocial															0.96***
16. PedsQL-P total															

BMFMF: Bimanual Fine Motor Function; GMFM: Gross Motor Function Measure; PedsQL-P: The Pediatric Quality of Life Inventory, Parent version; BAI: Beck anxiety inventory; BDI: Beck depression inventory

QOL because distress distorts the mothers' decision (27). Alternatively, distressed mothers may create negative situations for their children; therefore, poor QOL may stem from secondary to maternal psychiatric problems (4,13,26), because parent functionality is an important component of a child's social environment. However, one might also argue that the relationship between maternal psychiatric status and the child's well-being could be related to other unaccounted factors, such as family socioeconomic status or paternal mental health, which influence this relationship.

Parents of children living in some countries were more likely to report physical and mental health problems in their children in comparison with others (28). Furthermore, cultural factors are considered to be a crucial aspect of family relationships and parenting styles (28). Considering the role of women in Turkish families, taking care of children with chronic diseases is primarily done by mothers. Thus, the burden of a disabled child is mainly on his/her mother. In this viewpoint, reducing caregiving burden of the mothers' by other family members may help improve the mother's mental health, which may also consequently ameliorate the psychosocial wellbeing and QOL of their disabled children (29). Overall, cultural characteristics of Turkish families may also have an impact on the reported relationship between maternal mental health status and QOL of children with CP. Moreover, cultural variables may be important for the management of psychiatric treatment and psychosocial supports in such patients and their mothers.

In our study, the severity of intellectual impairments and CP type were the strongest predictors of all of the PedsQL scores. Very limited data is available regarding the impact of these variables on psychosocial well-being in the literature (26,30). These findings show the importance of taking the effects of these variables into account when studying QOL in children with CP. Our results also showed that the level of gross motor functions is a predictor of the PedsQL total score in children with CP. Conflicting results about the relationship between functioning and QOL have been reported by previous studies. Two different studies found significant

sociations between all domains of the parent proxy-reported QOL and gross motor functions (8,10). However, Pirpiris et al. (31) demonstrated that gross motor function was not correlated with any of the domains of the PedsQL. Regarding fine motor functions, we did not find any relationship between the BMFMF and QOL scores. In a previous study, Chen et al. (7) showed an association between fine motor functions and QOL; however, the authors did not control any confounders.

The results of our study should be interpreted in consideration of its limitations. One limitation of this study is its cross-sectional nature, which precludes the determination of a causal relationship between maternal mental health and mother proxy-reported QOL. Another limitation is that we obtained QOL and depression and anxiety scores only from mothers. The evaluation of the fathers' psychiatric status would be valuable, as it may be related to both maternal mental status and child QOL. This study also used a small number of samples, which is an additional limitation.

In conclusion, despite these limitations, the data reported by this study may allow clinicians to gain a better understanding of the factors associated with parent-rated HRQOL in children with CP. This study suggests that the improvement of mothers' psychiatric status affects the well-being of their children with CP. Further research in longitudinal studies that include larger samples and both parents as participants is necessary.

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**Table 3.** Determinants of parent-rated health-related quality of life scores in children with cerebral palsy, according to regression analyses

HRQOL outcome	Independent variables in the models	% variance explained by the models (r <sup>2</sup> )	β	F	p
PedsQL physical		81% (0.805)			
	1. Gender (M/F)		0.16	6.91	0.010
	2. Gestational age		-0.09	0.83	0.364
	3. Epilepsy		-0.28	0.39	0.535
	4. Speech problems		0.25	2.44	0.094
	5. Intellectual levels		0.54	14.04	<0.001
	6. BAI		-0.41	8.10	0.006
	7. BDI		-0.10	1.05	0.309
	8. GMFCS		-0.24	2.37	0.077
	9. BMFMF		0.03	0.04	0.849
	10. CP type		0.23	5.48	<0.001
		Quantifications			
	Spastic bilateral	0.78			
	Spastic unilateral	-1.28			
	Choreoathetoid	-0.61			
	Dystonic	-1.94			
	Ataxic	0.61			
Mixed	0.48				
PedsQL psychosocial		61% (0.605)			
	1. Gestational age		-0.06	0.21	0.814
	2. Epilepsy		-0.10	1.63	0.205
	3. Speech problems		0.26	1.86	0.163
	4. Intellectual levels		0.30	5.00	0.003
	5. BAI		-0.20	1.14	0.290
	6. BDI		-0.36	5.69	0.020
	7. GMFCS		-0.18	0.94	0.426
	8. BMFMF		-0.25	0.94	0.397
	9. CP type		0.23	7.97	<0.001
		Quantifications			
	Spastic bilateral	0.24			
	Spastic unilateral	-0.32			
	Choreoathetoid	-1.26			
	Dystonic	0.41			
	Ataxic	1.34			
	Mixed	2.53			
PedsQL total		75% (0.745)			
	1. Gender (M/F)		0.10	2.55	0.115
	2. Gestational age		-0.12	1.68	0.193
	3. Epilepsy		0.061	1.00	0.322
	4. Speech problems		0.24	2.46	0.092
	5. Intellectual levels		0.41	13.45	<0.001
	6. BAI		-0.25	2.84	0.096
	7. BDI		-0.31	6.63	0.012
	8. GMFCS		-0.22	3.64	0.009
	9. BMFMF		-0.17	0.64	0.530
	10. CP type	2.76	0.22	9.27	<0.001

**Table 3.** Determinants of parent-rated health-related quality of life scores in children with cerebral palsy, according to regression analyses (continued)

HRQOL outcome	Independent variables in the models	% variance explained by the models (r <sup>2</sup> )	β	F	p
		Quantifications			
	Spastic Bilateral	0.32			
	Spastic Unilateral	-0.46			
	Choreoathetoid	-1.32			
	Dystonic	-0.67			
	Ataxic	-0.55			
	Mixed				

CP: cerebral palsy; BMFMF: Bimanual Fine Motor Function; GMFM: Gross Motor Function Measure; PedsQL-P: The Pediatric Quality of Life Inventory, Parent version; BAI: Beck anxiety inventory; BDI: Beck depression inventory; M: male; F: female

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