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Adaptation of the depression scale for neurological disorders in young people with epilepsy in Turkey and determination of depression characteristics

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ABSTRACT

Aim: The aim of this study was to determine the psychometric properties of the depression scale in neurological disorders and to determine the characteristics of depression in young people with a diagnosis of epilepsy.
Methods: The population of the study consisted of epileptic youth aged 12–17 years (96 people) who attended the paediatric neurology outpatient clinic of a university hospital during the data collection process and who were able to make self-reports.Validity and reliability analyzes were performed with IBM SPSS 22 and AMOS 22 programs.
Results: The scale; Sensitivity was found to be 81 %, Specificity was 98.1 %, Positive Predictive Values (PPV) was 97.14 %, and Negative Predictive Values (NPV) was 86.88 %. The reliability coefficient (cronbach's alpha) of the scale was 0.924, which indicates a high level of reliability. In confirmatory factor analysis (CFA), CFA factor loading values of the items were found to be valid in the range of 0.575–0.904. The depression rate of young people with epilepsy was 36.5 % and the mean score of depression levels was 25.4 ± 9.0, which is above the average.
Conclusions: The depression scale in neurological disorders adapted to Turkish for young people who were diagnosed with epilepsy was found to be valid and reliabl.
Practical implications: The Turkish version of the Depression Inventory in Neurological Disorders can be used as a valid and reliable measurement tool to assess depression in young people aged 12–17 years diagnosed with epilepsy.

Introduction

Although epilepsy can be seen at almost any age, it is a neurological disease that is most common in childhood and requires long-term treatment and monitoring. It is thought to affect approximately 22 million young people worldwide (Temple et al., 2023; WHO, 2023). The reported prevalence rate of adolescent epilepsy varies between countries and ranges from 0.5 % to 0.8 %. (Auvin, 2022; Gogou & Cross, 2022; Khan et al., 2020; Pınar & Karadakovan, 2021; Yang, Yu, et al., 2020). In Turkey, there are 800.000 epilepsy patients and more than 400.000 of them are children (Ayar et al., 2022). According to the study conducted by Serdaroğlu et al. to determine the prevalence of epilepsy in children aged 0–16 years in Turkey, it was determined as 0.8 % (Serdaroglu et al., 2004).

Unfamiliarity with physicians and misdiagnosis, especially in developing countries and rural areas (Boling et al., 2018) or seizures may not be recognised by patients and their families (Pellinen, 2022) burdening national economies by causing delay in diagnosis and treatment of the disease (Boling et al., 2018). In 2015, the World Health Organisation presented the first global public health report summarising the available evidence on the burden of epilepsy at regional, national and global levels. This report is a call for sustained and coordinated action to ensure that young people live with epilepsy have access to the treatment and care they need and the opportunity to live free from stigma and discrimination worldwide (WHO, 2023).

The World Health Organisation emphasises physical problems in epileptic young people, as well as psychological disorders such as anxiety and depression (WHO, 2021). Depression is the most common psychiatric comorbidity in adolescents diagnosed with epilepsy, with a prevalence rate ranging from 9.5 % to 63 % (Chaka et al., 2018). Similarly, Davies et al. investigated the prevalence of depression in children with epilepsy and found that 16 % of children with epilepsy had emotional disorders (Davies et al., 2003). In addition, the prevalence of suicidal ideation in people with epilepsy ranges from 6 % to 11.9 %, and early and comprehensive treatment is essential to be considered

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(Giambarberi & Munger Clary, 2022). The high incidence of suicide is 3–4 times higher in patients with epilepsy in relation to the duration and severity of epilepsy. (Devinsky et al., 2016; Yıldız Miniksar et al., 2022).

Although psychological and behavioural disorders are very common in young people who have epilepsy, they are considered to be age- and disease-specific behaviours in young people with chronic health problems and are often overlooked (Gray et al., 2017). Therefore, up to 50 % of cases are not detected and treated (Coppola et al., 2019; Turner et al., 2023). In the general population, 35 % of people who have epilepsy do not receive treatment for their depression and another 21 % receive inadequate treatment (Neurology, 2020). In a study conducted with children aged 5–16 years with epilepsy, it was found that 60 % of the children met DSM-IV psychiatric diagnostic criteria, but only 33 % received psychiatric treatment (Ott et al., 2003).

Identification of depressive symptoms in young people who have epilepsy may be more difficult than in the normal paediatric population (Wagner et al., 2016). Brain pathology, which can cause depression in some cases, can mask some of the symptoms of depression while increasing some of them (Wagner et al., 2016). Time constraints, lack of available screening tools and clinical resources, lack of mutual patient referrals between neurologists and psychiatrists prevent routine screening of young people who have epilepsy for depressive symptoms during their visits (Gandy et al., 2021; Gill et al., 2017; Wagner et al., 2016). In people suffering from epilepsy, suboptimal patient outcomes, such as poor quality of life, drug-resistant seizures, injuries and medication non-adherence, may mask mental health comorbidities, particularly depression (Gandy et al., 2021; Momeni et al., 2015). Conceptually, the diagnostic symptoms of depression are often confused with the neurocognitive symptoms common in young people who have epilepsy and the clinical manifestations of side effects of antiepileptic drugs (fatigue, concentration and sleep disturbances) (Wagner et al., 2016). Side effects of antiepileptic drugs and other medications are overlooked as a contributing factor to mood disorders (Sirven, 2016). The Food and Drug Administration (FDA) has concluded that antiepileptic drugs (AEDs) increase the risk of suicidal thoughts and behavior in people with epilepsy, psychiatric disorders, or other disorders, and has mandated screening for depression in patients with epilepsy (Hesdorffer et al., 2012). However, there is a lot of consensus among health professionals (neurologists, psychiatrists and other health professionals) about the management of mental health problems in patients with Epilepsy, and a systematic approach or protocol has not been developed Decently (Lopez et al., 2019). Increasing awareness of the importance and morbidity of mental health in epilepsy, the International League Against Epilepsy (ILAE) Commission's consensus statements on Neuropsychiatric Aspects of Epilepsy, the Neuropsychobiology Commission's statements and the American Academy of Neurology's quality indicators recommend routine screening for depression and anxiety in patients with epilepsy. (Gandy et al., 2021).

Considering the chronic nature of epilepsy and the negative effects of mental disorders seen in these patients on the quality of life of the individual, it is very important for clinicians to be aware of the psychiatric symptoms that may accompany epilepsy and to take measures against these disorders in the early period (Arman, 2015). Several depression screening tools have been developed for use in the general population (Gill et al., 2017). Responses to these instruments make it difficult to assess symptoms of depression both practically and conceptually. Standardised depression measurement tools are costly and require application and interpretation skills. A behavioural health professional (psychologist, psychiatrist, social worker) is needed to interpret such measures. It is not always possible to access these specialists during routine epilepsy controls (Wagner et al., 2016).

Nurses have a key role in the management of children who have epilepsy (Alam et al., 2020). Physical and psychosocial problems are inevitable in patients who have epilepsy when there is a lack of information and inadequate professional support (Karaca & Durna, 2018). In addition, it is important for paediatric nurses, public health nurses or epilepsy specialist nurses to work in coordination with team members by putting the patient at the centre while providing health support to young people with epilepsy and their families (Güven & Dalgıç, 2024). In this process, nurses support adolescents and their parents in the process of adaptation to treatment by giving advice to adolescents and their parents on issues such as the conditions caused by the disease, difficulties in the treatment process, drug dose adjustment, possible drug interactions, side effects of drugs and the benefits of antiepileptic drugs for the disease (Güven & Dalgıç, 2024). Every clinical appointment should be an opportunity for patient assessment by nurses (Brett, 2019).

The Neurological Disorders Depression Inventory for epileptic youth (NDDI-*E*-Y) was developed for rapid and objective assessment of depression and is the only depression screening tool useful in clinical practice (Rampling et al., 2012). NDDI-*E*-Y, developed by Wagner et al. (2016), is a valid and reliable diagnostic tool that can be used in young people who have epilepsy between the ages of 12–17, is short, free of charge and can be applied individually to young people with epilepsy without the need for a behavioural health specialist. This scale differentiates the symptoms that overlap with epilepsy and antiepileptic drug side effects and determines the depression levels of young people diagnosed with epilepsy and guides the treatment process more accurately. The NDDI-*E*-Y has been adapted into French and Italian as well as English (Coppola et al., 2019; Viellard et al., 2019). However, there is no study validating depression screening tools in children and adolescents diagnosed with epilepsy in our country. Therefore, the aim of this study is to determine the level of depression by performing the validity and reliability of the NDDI-*E*-Y developed by Wagner et al. (2016) in Turkish adolescents.

Hypotheses of the study

H1. The scale adapted to Turkish is a validated measurement tool.

H2. The scale adapted to Turkish is a reliable measurement tool.

Methods

Study design

This study was conducted between April–October 2021 using a descriptive and methodological research design and reported in accordance with STROBE reporting guidelines.

Population and sample of the research

The population of the study included young people with epilepsy ($n = 96$) who were aged 12 to 17, who were able to self-report, and who visited the child neurology outpatient clinic of a university hospital during the data collection process (We have no data loss). Since the data from model adaptation studies cannot be generalized to a population, no study sample was determined. The number of samples sufficient to conduct factor analysis is important in scale development or adaptation studies. In the literature, it is stated that in scale development/adaptation studies, 5–10 times as many individuals as the scale items should constitute the sample (Esin, 2015). In this study, 96 sample sizes were found to have a sufficient sample size of 8 times when considering 12 items. In this study, in order to minimise potential sources of bias; sample selection, data collection process, use of data collection tools and data analysis were carried out meticulously.

Data collection process

In the study, young patients diagnosed diagnosed with epilepsy between the ages of 12–17 years who were admitted to the University Hospital in the last 6 months and their families were reached by using the electronic records of the hospital. They were informed about the purpose and procedure of the study and their consent was obtained. Questions of both parents and children were answered by telephone and they were invited to a face-to-face interview. The data collection forms were completed by the adolescents themselves in the patient interview room in a period of 15–20 min.

Data collection tools

Data were collected through the Neurological Disorders Depression Inventory- Epilepsy for Youth and the DSM-5 Level 2- Depression Scale- Self-Report Form (for children aged 11 to 17 years).

Descriptive Characteristics Form: It consisted of questions determining the sociodemographic and disease characteristics of epilepsy patients (Wagner et al., 2016). This form provides information about age, gender, educational status, age of onset of epilepsy, age of first seizure, seizure type and seizure frequency, number of medications used, whether they use their medications regularly, what they do when they have problems with medication, whether they receive family support during the disease process.

The Neurological Disorders Depression Inventory- Epilepsy for Youth: The Neurological Disorders Depression Inventory- Epilepsy for Youth (NDDI-*E*-Y) developed by Wagner et al. (2016) contains a total of 14 items, but 12 items are rated. While item 13 asks whether something upsetting happened in the last two weeks (Yes/No), item 14 asks for clarification for item 13, so items 13 and 14 are not scored. Items 13 and 14 are included to decide whether responses to items 1 to 12 represent depressive symptoms or are specific responses to a situation experienced in the last two weeks. Each of these 12 items is intended to be scored on a scale from 1 to 4 (1 = never; 2 = rarely; 3 = sometimes; 4 = almost always), resulting in a total score ranging from 12 to 48. Wagner et al. reported the reliability coefficient Cronbach's alpha value of the scale as 0.92, and it was found to be 0.924 in this study (Wagner et al., 2016).

DSM-5 Level 2- Depression Scale-Self Report Form (for children aged 11 to 17 years); For criterion-dependent validity, this study utilized the DSM-5 Level 2- Depression Scale-Self Report Form, which was adapted into Turkish by Yalın-Sapmaz Ş. et al. (9). The 14-item PROMIS Depression Short Form assesses the field of depression in children and adolescents. The PROMIS depression scale was developed for children aged 8 to 17. In the initial evaluation, cases that report feeling mildly or more severely bothered by “having little interest or pleasure in doing things” and/or “feeling down, depressed, or hopeless” over the past two weeks using the DSM-5 Level 1 Cross-sectional Symptom Questionnaire (which assesses significant mental health domains for the patient or informant) proceed to complete the DSM-5 Level 2 Depression Scale for further assessment purposes. It can also be used alone in the follow-up of symptoms and treatment results. It is filled out by the child before the interview with the clinician. It inquires about the child's depressive symptoms in the past seven days. The scale consists of a 5-point Likert scale (1 = never; 2 = almost never; 3 = sometimes; 4 = often; 5 = almost always). The total score ranges from 14 to 70. Higher scores indicate increased severity. In the study conducted by Yalın-Sapmaz et al., the reliability coefficient Cronbach's alpha value was reported to be 0.965, and it was found to be 0.939 in this study.

Data analysis

Data analysis was performed using SPSS 22 (Statistical Package for the Social Sciences) and AMOS 22 (Analysis of Moment Structures) programs. The validity of the scales was determined by performing content validity, criterion validity (internal and external criterion) and construct validity (exploratory and confirmatory). A value above 0.80 is used for content validity. Criterion validity was determined by performing internal criterion validity (lower-upper group comparison and item-total correlations) and external criterion validity (DSM-5 Level 2- Depression Scale). Kaiser Meyer Olkin and Barlett tests, data quality, eigenvalues, total variance explanation, and correlation matrix values were analyzed in exploratory factor analysis for construct validity. Factor loads of the items, X2/sd, NFI, TLI, CFI, IFI, RFI, GFI, AGFI, RMSEA and RMR compliance values were examined in the confirmatory factor analysis. The reliability of the scales was determined by performing internal consistency reliability coefficients (Cronbach's alpha), split-half method, average of inter-item correlation coefficients, item-total score correlation (item discrimination index), scoring consistency, intra-class correlation, SEM (measurement accuracy of scales), floor-ceiling effect analysis (scale homogeneity), and Hotelling's T2 test.

Ethical principles of the study

For the Turkish adaptation of the Depression Inventory in Neurological Disorder (NDDI-*E*-Y) for young people with epilepsy, adaptation permission was obtained from Janelle L. Wagner, the author of the scale, institutional permission from the hospital, and ethics committee permission from Toros University Scientific Research and Publication Ethics Committee (Decision No: 15 [Decision Date: 05.01.2021]). In addition, informed consent of parents and children were obtained.

Results

Descriptive characteristics of young people with epilepsy disease

The descriptive characteristics of the young people with epilepsy disease who participated in the study are presented in Table 1.

Validity analyses for NDDI-E-Y

Content Validity; The general content validity index of the scale was found to be 0.92 based on 10 expert opinions.

Criterion Validity; In the lower (27 %)-upper (27 %) group comparison ($n = 26$), a significant difference ($t = 66.756$) and correlation ($r = 0.954$) was found between the lowest (14.9 ± 2.4) and highest (37.5 ± 3.9) 27 % of the distribution within the total score ($p = .000$). Item total score correlation (item discrimination index) values were found between 0.551 and 0.865 (Table 2).

Construct Validity: In the exploratory factor analysis (EFA), KMO and Bartlett's Test were performed for the sampling adequacy of the 12-item scale and the KMO value was determined as 0.931. Barlett's test result was calculated as x^2:646.946, $p < .001$. As a result of EFA, the factor loadings (communalities) of the items ranged between 0.379 and 0.806 and no item was excluded from the scale since no item had a factor loading below 0.30 (Fig. 1). It was observed that all items in the correlation matrix had significant correlations with each other in the range of 0.615–0.898 ($p < .05$). The scale exhibits a one-factor structure (6.608) with an eigenvalue above 1 in the total variance explanation. It explains 55.069 % of the total variance. In confirmatory factor analysis (CFA), the CFA factor loadings of the items were in the range of 0.575–0.904 and no item was removed from the scale because none of the items had a factor loading below 0.30. Regression weights were in the range of 5.670–9.510 and statistically significant ($p = .000$).

Reliability analysis for NDDI-E-Y

The internal reliability coefficient (cronbach's alpha) of the scale was found to be 0.924 and has a high level of reliability. In the split-half method, the scale was divided into two by forming a group of items consisting of odd numbers (1-3-5-7-9-11) and a group of items

Table 1
The descriptive characteristics of the young people with epilepsy disease.

Descriptive features		n (96)	%
Gender	Female	43	45
	Male	**53**	**55**
Education status	**Secondary school**	**49**	**51**
	High School	47	49
Family history of epilepsy	Yes	22	23
	No	**74**	**77**
Status of going to check-ups related to the disease	**Yes**	**94**	**98**
	No	2	2
Frequency of disease-related check-ups	**According to physician's order**	**35**	**37**
	Every three months	32	33
	Every six months	25	26
	Once a year	4	4
Seizure frequency in the last year	**No Seizure**	**65**	**68**
	Once or twice a month	10	11
	Two every three months	7	7
	Two every six months	5	5
	Once a year	9	9
Regular use of the medication	**Yes**	**88**	**92**
	No	8	8
Number of medication used	**One**	**57**	**60**
	Two	33	34
	Three	6	6
The situation of having problems with medication	**Going to the doctor**	**91**	**95**
	Continuing to use the medication	5	5
Age of first seizure	**0–60 months**	**64**	**67**
	61–120 months	17	18
	121–180 months	15	15
Status of receiving family support	**Yes**	**92**	**96**
	No	4	4
Epilepsy classification	**Generalized epilepsy**	**49**	**51**
	Non-generalized epilepsy	9	10
	Partial epilepsy	6	6
	Undefined	32	33

consisting of even numbers (2-4-6-8-10-12). The correlation between these two groups was found to be highly correlated with a score of 0.884. In the item analysis, the lowest mean score was found in item 6, "I think about dying or killing myself" (1.35 ± 0.7), and the highest mean score was found in item 8, "I feel sad about some things". When

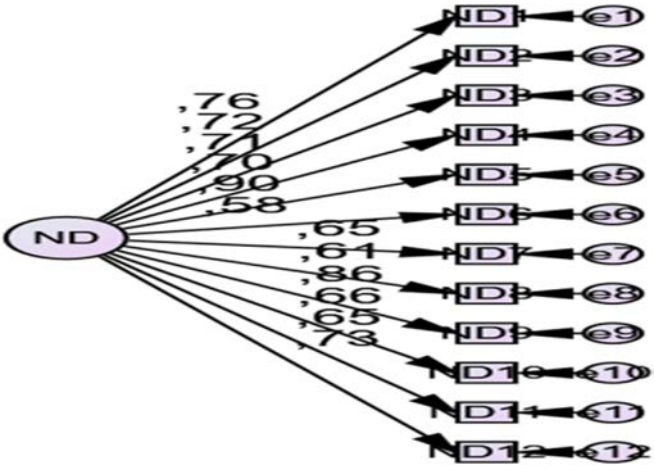

Fig. 1. Path diagram of neurological depression.

the item was deleted, no alpha value (ranging from 0.912 to 0.922) was above the total alpha value of the scale, which is 0.924. In the item-total score correlation, item-total score correlations were found to be in the range of 0.551–0.865 and were highly correlated. All inter-item correlations are significant ($p < .05$). Scoring consistency was determined as intra-class correlation value $r = 0.939$ ($F = 16.4$, $p = .000$). Standard Error, SEM ≤ S/2 suggested for measurement precision of scales in this study was taken into consideration and its suitability for the equation was observed. SEM value (2,48) ≤4,5 (SD value 9/2 = 4,5). In the Floor-Ceiling Effect Analysis, the floor and ceiling frequencies of the scales are below 15 % (12-point frequency = 1.0 %, 48-point frequency = 7.3 %). Hotelling's T2 test value shows that the difference between the item means is significant (Table 2).

Depression levels of young people having epilepsy

In this study, it was found that the depression levels defined in the depression scale of the Neurological Disorders Depression Inventory for Youth with Epilepsy (NDDI-*E*-Y) (total score of items 1–12) and the total scores of items 1–12 of those who answered 'yes' to item 13,

Table 2
Distribution of statistical values of the scale.

Items	X ± SS	Corr. Mtrx.	EFA Data Quality	CFA Data Quality	ITC *	α
Everything is a struggle	2.3 ± 1.0	0.898	0.617	0.758	0.733	0.915
I have trouble finding anythingthat makes me happy	2.3 ± 1.0	0.872	0.534	0.719	0.668	0.918
I feel like crying	2,1 ± 1.0	0.786	0.543	0.705	0.675	0.918
I feel frustrated	2.1 ± 1.0	0.760	0.526	0.699	0.665	0.918
I feel unhappy	2.1 ± 1.0	0.737	0.806	0.904	0.865	0.910
I think about dying or killing myself	1.3 ± 0.7	0.730	0.379	0.575	0.551	0.923
Nothing I do is ever right	1.9 ± 1.0	0.725	0.480	0.653	0.633	0.920
I feel sorry about things	2.5 ± 0.9	0.701	0.423	0.615	0.582	0.922
I feel sad	2.3 ± 0.9	0.693	0.760	0.859	0.835	0.912
I feel guilty	1.7 ± 0.9	0.687	0.491	0.660	0.641	0.919
I feel cranky or irritated	2.4 ± 1.0	0.650	0.473	0.649	0.625	0.920
I feel alone	2.0 ± 1.1	0.615	0.578	0.733	0.721	0.917
Total	25.4 ± 9.0	–				0.924
KMO, Barlett's test	0.931, **x^2**:646.946, **p < .001**					
Split-half consistency	**r**: 0.884					
Intraclass correlation	**r = 0**.939, **F = 16.4, p = .000**					
Standartd error (SEM ≤ SS/2)	2.48 ≤ 4.5					
Hotelling's T^2 test	**F = 245.328, p = .000**					
Top down impact analysis (15 % limit)	**Min.Fr** = %1.0**, Max.Fr** = 7.3					
27 % Lower - 27 % Upper group comparison	**%27 Lower grup (*n* = 26)**:14.9 ± 2.4		**r = 0**.954**, *p* = .000**			
	%27 Upper grup (*n* = 26): 37.5 ± 3.9		***t*** = 66.756**, p = .000**			

Corr. Mtrx. = Correlation Matrices, **EFA Data Quality** = Exploratory Factor Analysis Data Quality, **CFA Data Quality** = Confirmatory Factor Analysis Data Quality, **ITC** = Item Total Correlation,* **p** = .000, **α** = Cronbach Alpha.

which is the representative of depressive symptoms, were significantly different (t: 3.191, p:0.002) and related (r: 313, p:0.002). The lowest score that can be obtained from the scale is 12 and the highest score is 48. According to the Turkish version of NDDI-*E*-Y, the rate of depression was 36.5 %. The mean score of depression levels of young people with epilepsy was 25.4 ± 9.0. DSM-5 Level 2 Depression Scale depression measurement was found to be (31.5 ± 13.2).

When the Turkish version of NDDI-*E*-Y was evaluated according to the DSM-5 Level Depression Scale; the area under the curve was 0.935, $P < .05$. Using the cut-off score of 32 according to DSM-5, the cut-off value of the Turkish version of NDDI-*E*-Y was determined as 27.5. Sensitivity was 81 %, Specifity was 98.1 %, Positive Predictive Values (PPV) were 97.14 %, Negative Predictive Values (NPV) were 86.88 % (Fig. 2).

Discussion

When a scale is adapted to another language and culture, it is expected that the factor structure of the original scale is essentially unchanged. The factor structure of an adapted scale is compared with the factor structure of the original scale and similarities and dissimilarities are observed. (Çapık et al., 2018). As a result of this study examining the validity and reliability of the Turkish adaptation of the Depression Inventory for Neurological Disorders in Youth with Epilepsy (NDDI-*E*-Y), developed by Wagner et al. (2016), it was found that the adapted scale was valid and reliable, in line with the factor structure of the original scale. This result confirms our research hypotheses and reveals that it is a valid and reliable measurement tool similar to Wagner et al.

In the data analysis for the Turkish Validity and Reliability of the Depression in Neurological Disorder Scale for Young People with Epilepsy, the ability to distinguish between population and clinical samples was demonstrated with the Receiver Operating Characteristic (ROC) curve. The areas under the ROC curve are interpreted as 0.90–1.00 = excellent, 0.90–0.80 = good, 0.80–0.70 = fair, 0.70–0.60 = poor and 0.60–0.50 = poor (Bahadır & Kalender, 2018). When the literature was examined, it was found that there were different cut-off scores in various studies in different countries and that it was important to test the validity and reliability of the scales before using them (Coppola et al., 2019; Viellard et al., 2019). In this study, the large area under the ROC curve (0.935) is an indication that the diagnostic test provides good measurements. The Turkish version of the NDDI-*E*-Y has a cut-off value of 27.5, sensitivity of 81 %, specificity of 98.1 %, Positive Predictive Values (PPV) of 97.14 % and Negative Predictive Values (NPV) of 86.88 %, which can be interpreted as an excellent discrimination of the clinical sample. Viellard et al. (2019) reported high sensitivity (83.9 %), specificity (82.9 %), PPV (61.8 %) and NPV (100 %) for the NDDI-*E*-Y in their analysis of 97 young people with epilepsy in the French population, using an area under the ROC of 0.967 and 23 cut-off points relative to the CDI (Viellard et al., 2019). Wagner et al. 143 used an area under the curve of 0.866 and a cut-off score of 32 relative to the CDI-2 in their analysis of the young person's NDDI-*E*-Y and showed a sensitivity of 79 % and specificity of 92.1 % (Wagner et al., 2016). Coppola et al. (2019) obtained a cut-off score of 32 according to the CDI-2 and reported that the psychometric properties of the NDDI-*E*-Y showed similar sensitivity/specificity to the CDI-2. Our findings suggest that the Turkish version of the study provides higher sensitivity in terms of better discrimination of the presence of depression and clinical features in young people with epilepsy. Viellard et al. (2019) created a 15-item questionnaire by adding the items "Nothing I do is right"; "I have difficulty finding pleasure" and "I would rather die" from the NDDI-E to the 12-item NDDI-EY and created a 27-item multiple-choice questionnaire assessing the severity of depressive symptoms over the previous 2 weeks (Viellard et al., 2019). The Turkish version of the NDDI-*E*-Y has a total of 14 items, as in the original scale, but there are 12 items to be scored.

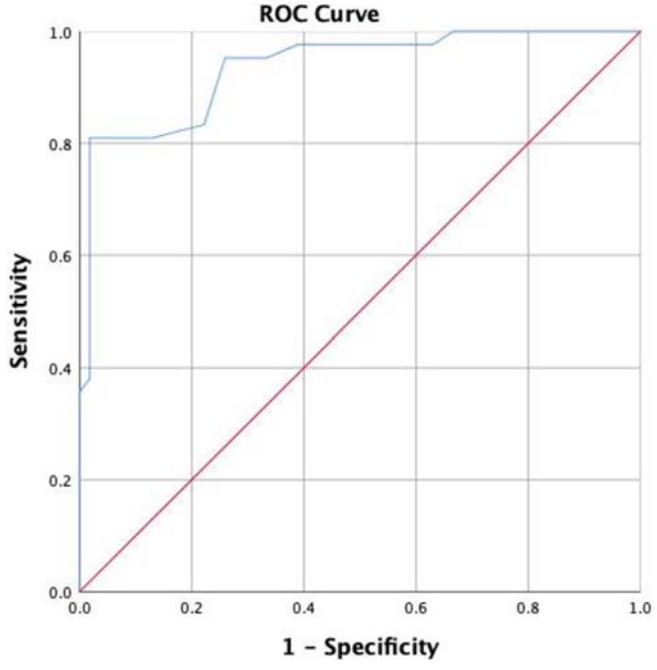

Fig. 2. ROC curve for the model.

In a study in China investigating depression in children who have epilepsy using the Depression Self-Rating Scale for Children (DSRSC), the mean score on the DSRSC was 9.65 ± 6.45. Using a cut-off point of 15 on the DSRSC to indicate depression, 16.9 % of children in the sample were reported to be depressed (Yang, Hao, et al., 2020). In the study by Puka et al. evaluating the relationship between anxiety and depression symptoms and caregiver and family factors in children and adolescents with localisation-related epilepsy resistant to medical treatment (i.e., not responding to at least two epilepsy medications), the mean score of depression levels of adolescents aged 12–18 years was 5.62 ± 4.3 (Puka et al., 2017). In the study reported by Puka et al., children were asked to complete the Revised Child Anxiety and Depression Scale (RCADS) using the major depression subscale (10 questions; range 0–30) and generalized anxiety subscale (six questions; range 0–18) to assess depression and anxiety symptoms, respectively. According to the study of Aliyeva et al. in which the comorbidity of epilepsy and depression was investigated, 51.62 % of young people who have epilepsy were found to have depression (Aliyeva et al., 2019). In another study by Berg et al. (2011), in the long-term follow-up of children with new-onset seizures approximately nine years after their first seizure, depression was observed in 12 % of children (Berg et al., 2011), Russ et al. found that 8 % of children who have epilepsy and 7 % of children who had seizures in the past had depression (Russ et al., 2012). Studies conducted in epilepsy clinics indicate that depression ranges from 12.7 % to 36.5 % in children with epilepsy (Dunn et al., 2016; Guilfoyle et al., 2015; Pastorino et al., 2024). In these studies, the NDDI-*E*-Y scale was not used. Viellard et al. (2019), who made a French version of the NDDI-E-Y scale, found that 10–30 % of young people who have epilepsy had depressive symptoms (Viellard et al., 2019). In clinical and surveillance studies conducted by Wagner et al. (2016) with depression questionnaires and current diagnosis codes defined in young people with epilepsy, depression rates were found to be 20–25 % (Wagner et al., 2016). When this rate is compared with the rate of 36.5 % obtained in the study with the Turkish version, it indicates that depression may be more common among Turkish youth who have epilepsy. Depression in young people who have epilepsy has been investigated in Turkey without using the NDDI-*E*-Y scale. According to the study conducted by Baki et al. in Turkey, the rate of depression in

children who have epilepsy was found to be 12 % (Baki et al., 2004). Oguz et al. found that the rate of depression in young people with epilepsy aged 12–18 years was 40 % (Oguz et al., 2002). In this study, a specially developed scale for young people with epilepsy (NDDI-*E*-Y) was used, while Baki et al. and Oğuz et al. used the Kovac Children's Depression Inventory (CDI). The difference between these studies and our study may be due to the different measurement tools and patient characteristics used to determine the level of depression in young people who have epilepsy, the differences in the cut-off points of the screening tools used, and the fact that there were interviews and rating studies with expert clinicians. These results are important for understanding epilepsy-related depression and determining appropriate interventions.

Wagner et al. (2016) reported that 20 % of young people with epilepsy had suicidal thoughts despite not having clinical symptoms in their clinical and surveillance studies using depression questionnaires and current diagnosis codes (Wagner et al., 2016). In the Turkish version of the NDDI-*E*-Y, 77.1 % of the youth who have epilepsy reported never, 13.5 % rarely, 6.3 % sometimes, and 3.1 % always or often having suicidal thoughts. In accordance with the literature, the total percentage of those who rarely, often and always had suicidal thoughts in this study was found to be 22.9 %. In a study by Dagar et al. examining the screening of suicidal tendencies in children and adolescents with epilepsy and its relationship with undiagnosed psychiatric comorbidities, it was stated that 11 % of children without a psychiatric diagnosis had suicidal tendencies (Dagar et al., 2020). In the study by Hague et al. investigating the prevalence of suicidal tendency in children and adolescents with depressive disorders, the suicide risk of young people with (30 %) and without epilepsy (26 %) was quite high (Hague et al., 2023). In the study by Fecske et al. using a standardised screening tool in paediatric patients with epilepsy, 10.7 % of young people with epilepsy reported that they sometimes thought about dying or killing themselves (Fecske et al., 2020). It is of great importance for clinicians to be aware of suicidal thoughts that may accompany epilepsy and to take early measures against these thoughts.

Strengths and limitations

The lack of validated tools for the 12–17 age group highlights the need for a comprehensive and reliable tool for general depression self-assessment. The adaptation of this scale for Turkish young people with epilepsy aged 12 to17 is important as it is self-administered, concise, time-efficient, does not require specialized experts for interpretation, and helps to guide the treatment process more accurately by eliminating symptoms that overlap with epilepsy and antiepileptic drug side effects.

This study presents a methodological paper on the Turkish adaptation of the Depression Inventory in Neurological Disorder for Young People with Epilepsy (NDDI-*E*-Y). The scale was detailed for the authors/readers, and its statistical reliability and validity were evaluated with appropriate multiple methods. With a sufficient sample, this study contains the best theoretical analysis and a careful presentation of the detailed elaboration of the scales, following the best psychometric properties that the scales should have. There is no Turkish language and cultural adaptation of NDDI-*E*-Y in the literature. However, the weakness of this study is that it was conducted with epileptic young people who applied to only one hospital. Since culture is important in combating depression, it is thought that it would be important to conduct the study in different cultures and populations. Another weakness is that the research data was collected in the form of a questionnaire. Partially limited survey response rates may have limited accurate assessment, especially in terms of psychological issues.

Practical implications

This study successfully adapted the Depression in Neurological Disorders Scale for Young People with Epilepsy into Turkish, providing a valuable tool to assess depression in this special population. The high sensitivity and specificity values suggest that the Turkish version of the scale could be an effective screening tool in routine epilepsy check-ups and address a critical gap in the current clinical approach.

Conclusions

Turkish validity and reliability of the Depression in Neurological Disorders Scale for Young People with Epilepsy has been proven. The rate of depression in young people with epilepsy was 36.5 % and the mean score of depression levels was 25.4 ± 9.0, which was above the average.

Our findings suggest that this inventory can be used to determine the frequency and severity of depression in young people diagnosed with epilepsy. It is recommended that this scale should be offered for widespread use as it is an up-to-date and specific screening tool, identifies the clinic well, is free of charge, is easy to interpret, does not require a behavioural health specialist and facilitates comparisons in studies.

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Disclosure statement

The author(s) affirm that the methods used in the data analyses are suitably applied to their data within their study design and context, and the statistical findings have been implemented and interpreted correctly.

The author(s) agrees to take responsibility for ensuring that the choice of statistical approach is appropriate and is conducted and interpreted correctly as a condition to submit to the Journal.

Declarations

This study was carried out as a doctoral thesis. This study was published as an oral presentation at the I. International Congress on Programme Development in Nursing Education. This article has not been published before.

CRediT authorship contribution statement

Neslihan Özcanarslan: Writing – review & editing, Writing – original draft, Visualization, Software, Resources, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Zeynep Güngörmüş:** Writing – review & editing, Writing – original draft, Software, Resources, Project administration, Methodology, Data curation, Conceptualization.

Declaration of competing interest

There is no conflict of interest between the authors.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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