# A randomized controlled study: Evaluating the efficacy of a mobile application developed for mothers who have children with epilepsy in Turkiye

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## ARTICLE INFO

## ABSTRACT

*Purpose:* This study was conducted for the purposes of developing the Mobile Epilepsy Education Package (MEEP) for mothers who have children with epilepsy, and evaluating the efficacy of such a package.

*Design and methods:* The research consisted of a randomized, controlled experimental study. DISCERN measuring tool was used to evaluate the content of MEEP. The evaluation of the package was conducted with a total of 60 mothers-30 participants in the intervention group and 30 controls. This study was conducted in the Pediatric Neurology Outpatient Clinic of a hospital with mothers who had children with epilepsy, ages 3-6. A Description Form, the Epilepsy Knowledge Scale for Parents, and Parental Anxiety over Seizures Scale were used in the data collection.

*Results:* The general quality evaluation of MEEP according to the experts was rated $70.35 \pm 6.20$, with interrater agreement at a good level. Knowledge and anxiety scores were similar in the groups prior to the mobile application. Following the application, a significant increase was seen in the level of knowledge about epilepsy among the intervention group mothers ($p < .001$), while a significant decrease was observed in anxiety over seizures ($p = .009$).

*Conclusions:* MEEP, which was developed to evaluate mothers' levels of knowledge about epilepsy and their state of anxiety over seizures, resulted in an increase in knowledge and reduced anxiety.

*Practice implications:* A simple-to-use, easy-to-access and low-cost mobile application has been developed that facilitates epilepsy diagnosis, follow-up and treatment, increases mothers' knowledge levels, and reduces anxiety levels.

## Introduction and rationale

Childhood epilepsy is the most common neurological disorder in children (Liu et al., 2016; National Institute for Health and Care Excellence (NICE), 2021). Epilepsy affects 0.5%–20.0% of the world's children and is more common in children under the age of one (Aaberg et al., 2017). In Turkey, the prevalence of epilepsy in children is between 0.6% and 0.8% (Canpolat et al., 2014; Topbas et al., 2012). The main goal in the treatment of epilepsy is to ensure a seizure-free life without harming the child's growth and development potential (Scheffer et al., 2017).

Parents whose children are diagnosed with epilepsy are faced with diagnosis and treatment methods that they are not familiar with, and they are therefore inexperienced in adapting these techniques to daily life (Wo et al., 2018). As a result, parents may experience anxiety, stress, and depression (Bakula et al., 2021; Güven et al., 2020; Pfäfflin et al., 2012). Parents need to learn how to deal with a crisis situation and organize their daily lives accordingly (Adadioglu & Oguz, 2016). In this period, it is important that health professionals provide information, education, and psychological support for children with epilepsy and their parents (Bakula et al., 2021; Güven et al., 2020; Wo et al., 2018). Support given to the family and the child should not be limited to the times when they come to the hospital for check-ups or for emergency reasons but should be continuous. Using mobile apps to assure the continuation of this help can be a useful approach.

Smart mobile devices allow users to access and communicate needed information by connecting to internet networks irrespective of

time and place (Demirer & Erbas, 2015; Pandher & Bhullar, 2016). Our review of the literature revealed various training programs prepared for parents of children diagnosed with epilepsy (Bakula et al., 2021; Escoffery et al., 2018; Pfäfflin et al., 2012; Taksande et al., 2020; Tutar Guven, 2018). Studies that examined the education given to children with diagnosed epilepsy and their families revealed an increase in knowledge levels (Escoffery et al., 2018; Le Marne et al., 2018; Reilly et al., 2017; Taksande et al., 2020; Tutar Guven, 2018), improved family functions (Bakula et al., 2021), reduced parental anxiety, improvements in learning how to deal with a crisis along with an increased ability to act (Le Marne et al., 2018; Pfäfflin et al., 2012; Reilly et al., 2017), and a positive change in attitudes and behaviors towards epilepsy (Bakula et al., 2021; Tutar Guven, 2018). No training apps on mobile devices were found however that provide daily follow-ups of treatment compliance, including treatments received by and examinations of the patient, enabling the family to communicate with the healthcare professional via a smart phone at any time needed. This study was conducted to develop an android-based Mobile Epilepsy Education Package (MEEP) for mothers with a child diagnosed with epilepsy and to evaluate the content, quality, and effectiveness of the package.

It was hypothesized that mothers of children diagnosed with epilepsy who accessed MEEP will gain experience in managing epilepsy and adapting to daily life. The aim in using this application is to increase mothers' levels of knowledge about epilepsy and to reduce their anxiety levels.

The hypotheses tested in this study were:

**H1.** MEEP increases the mothers' level of knowledge about epilepsy.

**H2.** MEEP reduces the anxiety level of mothers regarding epilepsy.

## Method

### Study design and participants

This research is a randomized, controlled experimental study. Data for the study were collected between July 14 and December 10, 2020 in a pediatric neurology outpatient clinic of the City Hospital in Eskişehir, Turkey.

The study sample consisted of mothers ($N = 85$) of children aged 3–6 years with epilepsy who accessed the pediatric neurology outpatient clinic of a hospital in Eskisehir between July 14 and October 15, 2020. A power analysis (PASS 11 version 11.0.10) was used to determine the sample. For this purpose, the Parental Anxiety Scale over Seizures and the Epilepsy Information Scale for Parents (Unal, 2004) employed in a similar study (Tutar Guven, 2018) were used as a basis, using paired mean power analysis at a 99% power and a 0.05 Alpha margin of error. It was determined that at least 11 participants should be included in the sample. However, considering that there may be a decrease in the number of cases sampled in the study, and in order to perform parametric tests (Sonmez & Alacapinar, 2016), the study was completed with a total of 60 participants (mothers)-30 controls and 30 in the intervention group. The participant inclusion process was terminated when a total of 60 mothers who met study inclusion criteria was reached on October 15, 2020. In the power analysis (advanced repeated measures ANOVA power analysis) performed at the end of the study, power was determined as 100.0%, Type 1 error level being 0.05.

The inclusion criteria of the study were: a) Mothers whose child was diagnosed with epilepsy at least six months ago; b) Mothers whose child diagnosed with epilepsy was at least 3 and at most 6 years old; c) Mothers whose child did not have any other chronic disease besides epilepsy; d) Mothers owning and using an Android-based smart mobile phone; e) Mothers who were able to read and write; and f) Mothers who volunteered to participate in the study.

Exclusion criteria of the study were: a) Mothers with a child diagnosed with epilepsy who was younger than 3 or older than 6 years old; b) Mothers whose child had any other chronic disease besides epilepsy; c) Mothers who were using an IOS-based smart mobile phone; d) Mothers not able to read and write Turkish; and e) Mothers who did not volunteer to participate in the study.

### Randomization

Stratified block randomization was used in the study. Mothers were stratified according to their scores on the Epilepsy Knowledge Scale for Parents, and an equal number of participants in each group were randomized (blocking) using the Propensity Score Matching program. In performing the randomization, care was taken so that there was no difference between the scale scores of the mothers to be divided into 2 groups, making the statistical probability (p) value as close as possible to 1.00. In this way, the scores were not distributed according to a certain range but were distributed between the groups in such a way that their averages were the same. The CONSORT flowchart of the research is presented in Fig. 1.

### Data collection tools

Tools used in this study were:

The DISCERN measurement tool (Quality of Criteria for Consumer Health Information) (Charnock et al., 1999; Gokdogan et al., 2003) was used in the study to evaluate the MEEP content, and an Expert Evaluation Form was used to evaluate the epilepsy education package questions. The Family Description Form (Liu et al., 2016; Pfäfflin et al., 2012; Wo et al., 2018), Epilepsy Knowledge Scale for Parents (Austin et al., 2002; Unal, 2004), and Parental Anxiety over Seizures Scale (Austin et al., 1998; Unal, 2004) were used in the data collection.

### DISCERN measurement tool

This measurement tool was developed by Charnock et al. (1999) to evaluate the content and quality of a training document. The scale consists of 3 parts and a total of 16 questions. In the first and second sections, scores are obtained between 15 and 75 points. An increase in the score indicates that the training content is of good quality. Question 16 is calculated separately; this question is scored between 1 and 5. An increase in the total score indicates that the educational content has been evaluated to be of good quality (Charnock, 1998; Charnock et al., 1999). The Turkish validity and reliability of the DISCERN measurement tool was performed by Gokdogan et al. (2003).

### Expert evaluation form

Questions in the Epilepsy Education Package were prepared by the researchers in accordance with the MEEP content. The researchers created the 4-point Likert type of scale for the purpose of evaluating the questions in the Package. Each item in the questionnaire is scored between 1 and 4 (Not Appropriate = 1, Slightly Appropriate = 2, Moderately Appropriate = 3, Very Appropriate = 4). An increase in the score indicates that the questions are suitable.

### The family description form

This form was created by the researchers in line with the literature (Liu et al., 2016; Pfäfflin et al., 2012; Wo et al., 2018). The form contains questions that include sociodemographic data about the child diagnosed with epilepsy and his/her parents, as well as information about the diagnosis and treatment of epilepsy.

### Epilepsy knowledge scale for parents

This scale was developed by Austin et al. (2002) to measure the level of knowledge of parents about epilepsy (Cronbach Alpha = 0.69).
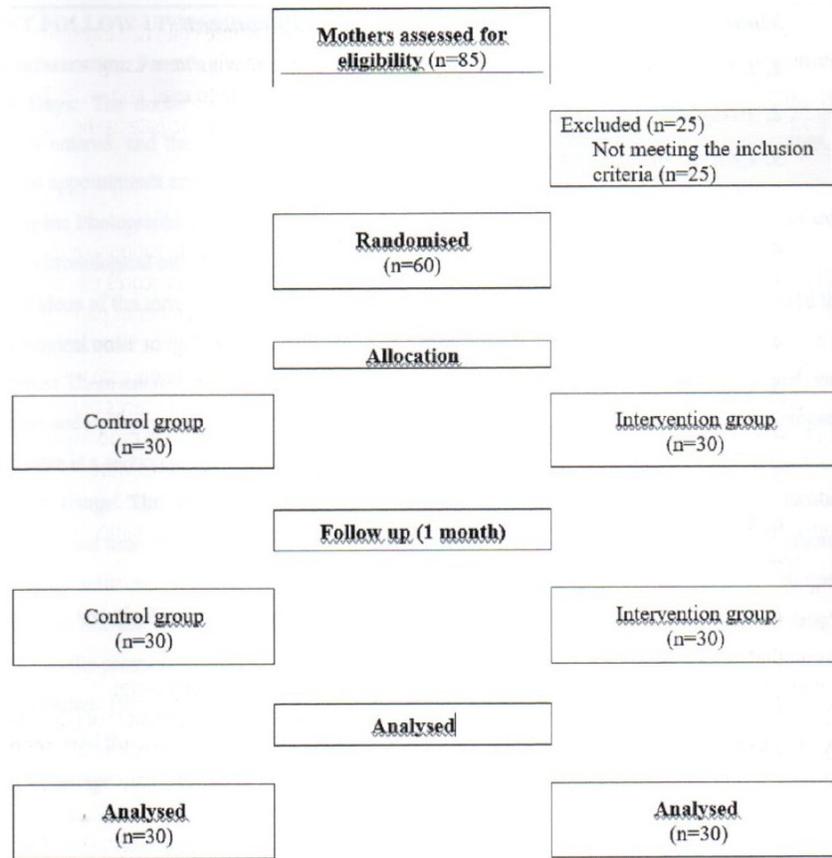
**Fig. 1.** CONSORT flowchart of the research.

It consists of 20 questions. In scoring the items on the scale, "false" signifies "0" and "true" signifies "1." Possible scores on the scale are between 0 and 20. A high total score indicates that the parent has a high level of knowledge about epilepsy (Austin et al., 2002). The Turkish adaptation of the scale was produced by Unal (2004) (Cronbach Alpha = 0.78). In this study, Cronbach Alpha coefficient was found to be 0.77 (pretest) and 0.78 (posttest).

*Parental anxiety over seizures scale*

This scale was developed by Austin et al. (1998) to measure anxiety levels of parents about seizures (Cronbach Alpha = 0.83–0.94). It consists of 9 items. Each item on the scale is scored between 1 and 5 (always = 1, often = 2, sometimes = 3, almost never = 4, never = 5). Possible scores on the scale are between 9 and 45. A high total score indicates that parents have low anxiety over seizures (Austin et al., 1998). The Turkish adaptation of the scale was produced by Unal (2004) (Cronbach Alpha = 0.88). In this study, Cronbach Alpha coefficient was found to be 0.89 (pretest) and 0.90 (posttest).

*Data collection*

The process of collecting research data consisted of two stages: Preparatory and Implementation phases.

**Preparatory phase:** The researchers prepared MEEP content and questions and then consulted experts for their opinions. Support for the Project was received from Eskisehir Osmangazi University Scientific Research Projects Commission for creation of an Android-based mobile application. The created content was transferred to the smartphone application after the opinions of the panel of experts were received [the panel of experts comprised Child Health and Diseases Nursing Lecturers (3), Child Health and Diseases Physicians (2), Psychologists (2), a Pediatric Neurology Physicians (1), a Neurology Physician (1), a Child Development Specialist (1) and a Child Psychiatrist (1)]. A pilot study was conducted with 3 mothers in order to determine the usability and comprehensibility of MEEP. Mothers who had participated in the pilot application were not included in the study. In line with the positive feedback from the mothers, the implementation phase of the study was started without any revision following the pilot application. The newly developed MEEP consists of two parts. These sections are the Education Package (Fig. 2) and the Parental Follow-up Section (Fig. 3). The admin interface allows researchers to track all stages of the mobile application.

*Part one: Education Package*

The topics in the epilepsy education package (Fig. 2) were divided into 4 weeks. The mobile application issued a weekly reminder to make sure participants log into the training. After completing the relevant section at the end of each week, parents could complete the end-of-section test for that week and move on to the next week's education. If any of the mothers' answers were missing or wrong, the training module automatically reopened, and the mother was directed to read the training on the relevant subject once again.

*Part two: Parental follow-up section*

In the parental follow-up section, mothers can register the gender, age, and descriptive information of the child diagnosed with epilepsy on the mobile application. Mothers can actively use the section where the child's diagnosis, test results, treatment, and seizures are recorded in the mobile app, as well as the treatment/examination checkup time reminder section that will help the child/mother to comply with the treatment. In addition, there is a message section that mothers can use to reach and consult the researcher whenever they wish to do so. Fig. 3 displays the parental follow-up section in the MEEP (Fig. 3).

**Implementation phase:** The measures were applied to the mothers, who were then divided into groups. There are no nurses at the hospital involved in epilepsy training, and only one pediatric neurologist on duty. The hospital has no education program on epilepsy that is regularly given to patients and parents presenting at the outpatient clinic. Patients and their relatives are educated by a pediatric neurologist during the examination and control visits as a routine procedure at the hospital.

*Mobile Epilepsy Education Program (MEEP) content*

**1. Definition of Epilepsy**

**2. Frequency of Epilepsy**

**3. Causes of Epilepsy**

**4. Diagnostic Methods in Epilepsy**

*4.1. Detailed Story*

*4.2. Neurological and Physical Examination*

*4.3. Tests Used in Diagnosis*

**5. Classification of Epileptic Seizures**

*5.1. Focal (Partial-Partial) Onset Seizures*

*5.2. Common (General-Generalized) Onset Seizures*

**6. Characteristics of Epileptic Seizures**

**7. Factors Triggering an Epileptic Seizure**

**8. Four Basic Practices to Be Done During an Epileptic Seizure**

**9. Practices for Families on Epilepsy Seizure**

**10. Situations where an ambulance is required**

**11. Epilepsy Treatment**

*11.1. Antiepileptic Drug Treatment*

*11.2. Ketogenic Diet*

*11.3. Vagal Nerve Stimulation*

*11.4. Epilepsy Surgery*

**12. Effect of Epilepsy on Family Members**

**13. The Effect of Epilepsy on a Child**

**14. Coping with Stress, Problem Solving Strategies**

**Fig. 2.** The topics in the MEEP.

Training and information given to the mothers in the intervention group by the physician as a part of the hospital's routine practice continued in the polyclinic. In addition, MEEP was downloaded to the phones of the mothers in this group. The researcher provided the mothers with practical instructions as to how to use the package. The mothers in the intervention group used MEEP every day for 1 month. The scales were re-administered to the mothers 3 weeks after MEEP had ended (December 10, 2020).

The usual procedure of the hospital was applied to the mothers in the control group, but MEEP was not applied. The routine practice of the hospital is to have a physician provide the family with education and information during time in the outpatient clinic. Three weeks after the end of the MEEP administered to the intervention group (December 10, 2020), a posttest (Epilepsy Knowledge Scale for Parents and Parental Anxiety over Seizures Scale) was administered to parents in both the control and intervention groups at the time the children were brought to the outpatient clinic for a follow-up visit. After the end of the study, the mobile application was made available to the mothers in the control group ($n = 30$), enabling them to use the application.

*Statistical analysis*

Continuous data are provided in terms of mean standard deviation ($\pm$SD). Categorical data are given in percentages (%). Paired means power analysis was used to determine the sample. Research strength was calculated with Advanced Repeated Measures ANOVA Power Analysis. The Shapiro-Wilk test was used to investigate the suitability of the data for normal distribution. The two-way repeated measurements ANOVA (one factor repetition) "Two Way Repeated Distances ANOVA (One Factor Repetition)" test was used for repeated measurements. The Pearson chi-square and Pearson exact chi-square analyses were used in the analysis of the cross tables created. Interrater agreement for the questionnaire was calculated with Kendall's Tau coefficient. IBM SPSS Statistics 21.0 was used in the analysis (IBM, Corp. Released, 2012). A value of $p < .05$ was accepted for statistical significance.

*Ethics*

Ethics committee approval was obtained from the Eskisehir Osmangazi University Ethics Committee and institutional permission from the Provincial Health Directorate prior to the start of the research. Only mothers whose informed consent had been received were included in the study. Necessary permissions were also obtained for the scales used. After the end of the study, a mobile application was installed on the phones of the mothers in the control group ($n = 30$). These mothers were taught to use the application and were enabled to use the application actively for 1 month.

**Results**

*Preparation phase for the MEEP*

A content evaluation for the prepared MEEP was performed by 14 experts using the DISCERN measurement tool. The expert opinions
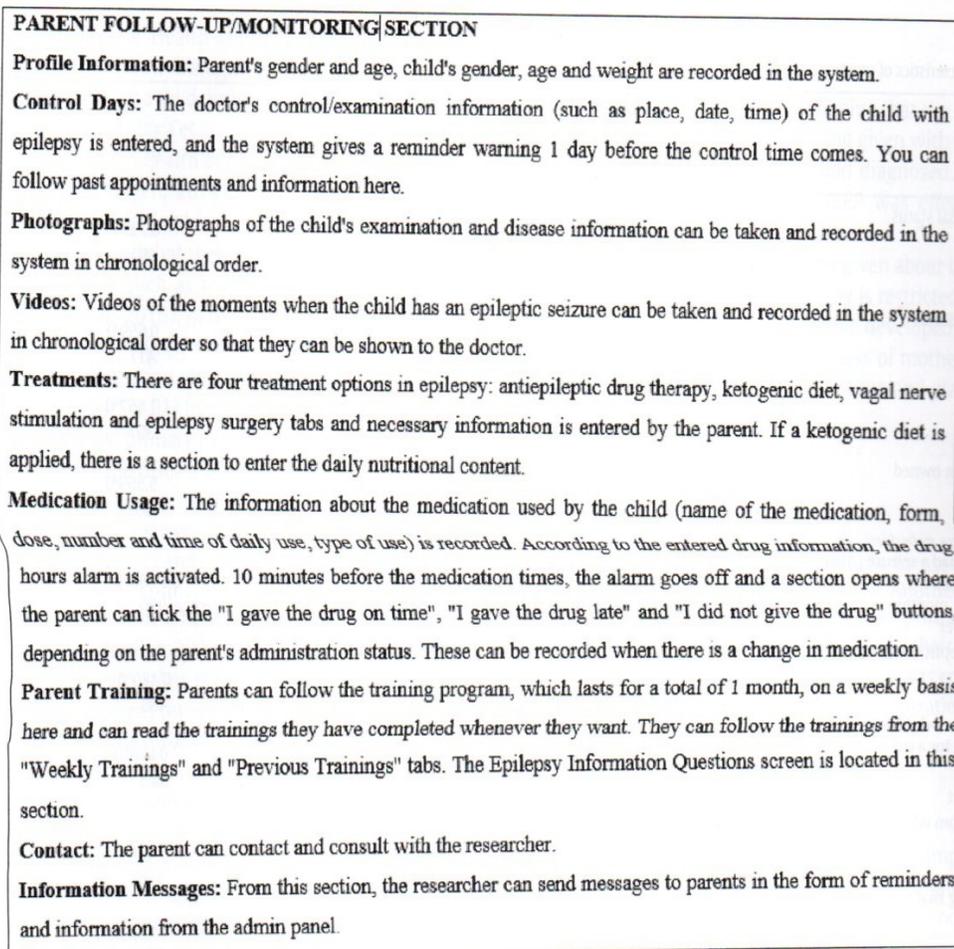
> **PARENT FOLLOW-UP/MONITORING SECTION**
>
> **Profile Information:** Parent's gender and age, child's gender, age and weight are recorded in the system.
>
> **Control Days:** The doctor's control/examination information (such as place, date, time) of the child with epilepsy is entered, and the system gives a reminder warning 1 day before the control time comes. You can follow past appointments and information here.
>
> **Photographs:** Photographs of the child's examination and disease information can be taken and recorded in the system in chronological order.
>
> **Videos:** Videos of the moments when the child has an epileptic seizure can be taken and recorded in the system in chronological order so that they can be shown to the doctor.
>
> **Treatments:** There are four treatment options in epilepsy: antiepileptic drug therapy, ketogenic diet, vagal nerve stimulation and epilepsy surgery tabs and necessary information is entered by the parent. If a ketogenic diet is applied, there is a section to enter the daily nutritional content.
>
> **Medication Usage:** The information about the medication used by the child (name of the medication, form, dose, number and time of daily use, type of use) is recorded. According to the entered drug information, the drug hours alarm is activated. 10 minutes before the medication times, the alarm goes off and a section opens where the parent can tick the "I gave the drug on time", "I gave the drug late" and "I did not give the drug" buttons, depending on the parent's administration status. These can be recorded when there is a change in medication.
>
> **Parent Training:** Parents can follow the training program, which lasts for a total of 1 month, on a weekly basis here and can read the trainings they have completed whenever they want. They can follow the trainings from the "Weekly Trainings" and "Previous Trainings" tabs. The Epilepsy Information Questions screen is located in this section.
>
> **Contact:** The parent can contact and consult with the researcher.
>
> **Information Messages:** From this section, the researcher can send messages to parents in the form of reminders and information from the admin panel.

**Fig. 3.** Parental follow-up section in the MEEP.

were evaluated with the Kendall Coefficient of Fit (Kendall W = 0.835). The evaluation of the MEEP questions was conducted by 11 experts with the Epilepsy Education Package Questions Evaluation Form (mean score = 3.94). The expert opinions for these were evaluated with the Kendall Coefficient of Fit (Kendall W = 0.765). Table 1 shows the DISCERN measurement tool and the descriptive values given by the experts for the MEEP.

*Findings concerning the mothers and their children diagnosed with epilepsy*

The ages of the mothers ranged from 22 to 43, with a mean age of $31.80 \pm 5.29$. The income of 65.0% ($n = 39$) of the mothers was equal to their expenses. Of the mothers, 98.3% ($n = 59$) were married, 76.7% ($n = 46$) lived in a nuclear family, and 28.3% ($n = 17$) had consanguineous marriages with their spouses. There was no difference between the intervention and control groups in terms of these characteristics ($p > .05$).

Of the children diagnosed with epilepsy 65.0% ($n = 39$) were male; their ages were between 36 and 72 months (mean 59.73 $\pm$

11.56 months). The age of onset of seizures in children with epilepsy ranged from 1 to 62 months (mean $32.9 \pm 16.5$ months), and the time to the diagnosis of epilepsy ranged from 7 to 68 months (mean $26.75 \pm 16.59$ months). All children diagnosed with epilepsy ($n = 60$, 100.0%) were taking anti-epileptic drugs. It was determined that the most common anti-epileptic drugs used ($n = 51.4$, 51.4%) were drugs containing valproic acid. In the study, 31.7% ($n = 19$) of the children diagnosed with epilepsy did not have epileptic seizures again after the epilepsy had been diagnosed and the drug started. In terms of these characteristics, the intervention and control groups were similar ($p > .05$).

Only 10.0% ($n = 6$) of the mothers in the study knew the type of epilepsy their child had; 90.0% ($n = 54$) took their child with epilepsy to the hospital regularly, and 41.7% ($n = 25$) were able to record the moment of their child's seizure on video. It was found that the groups were similar ($p > .05$). In the study, 18.3% ($n = 11$) of the mothers responded by saying, "After my child was diagnosed with epilepsy, my relationships with other family members were adversely affected" and 21.7% ($n = 13$) said, "I have difficulty caring for my child with epilepsy." No difference was found between the groups ($p > .05$).

Table 2 displays the descriptive characteristics of the mothers and information about the children's epilepsy seizures.

*Mothers' knowledge and anxiety levels before and after the MEEP*

Posttest scores of the Epilepsy Knowledge Scale for Parents differed significantly between the two groups ($p < .001$). In the intragroup comparison, it was found that there was a significant difference between the pre- and post-test scores in the Parental Anxiety over Seizures Scale of the intervention group ($p = .009$), while there was no difference in the control group ($p = .981$) (Table 3).

**Table 1**
The mean score and standard deviation values of DISCERN Measurement Tool of MEEP ($n = 14$).

| DISCERN measuring tool sub-dimension | min - max | $\bar{X} \pm SS$ |
|---|---|---|
| Reliability of the training package (Items 1–8) | 32.00–40.00 | 38.14 $\pm$ 2.38 |
| Quality of information presented in the training package (Items 9–15) | 21.00–35.00 | 32.21 $\pm$ 4.22 |
| Total score (Items 1–15) | 57.00–75.00 | 70.35 $\pm$ 6.20 |
| General quality of the training package (Item 16) | 3.00–5.00 | 4.79 $\pm$ 0.57 |

MEEP = Mobile Epilepsy Education Package.
DISCERN = Quality of Criteria for Consumer Health Information.

**Table 2**

The descriptive characteristics of mothers and information about the children's epilepsy ($n = 60$).

| Features | Groups | | $\chi^2$ p | Total (60) n (%) |
|---|---|---|---|---|
| | Control (30) n (%) | Intervention (30) n (%) | | |
| **Mother's educational status** | | | | |
| Primary | 8 (26.7) | 11 (36.7) | 0.739[0] | 19 (31.6) |
| High School | 10 (33.3) | 8 (26.6) | .691 | 18 (30.0) |
| University | 12 (40.0) | 11 (36.7) | | 23 (38.4) |
| **Mother's working status** | | | | |
| Working | 9 (30.0) | 12 (40.0) | 0.659[0] | 21 (35.0) |
| Not working | 21 (70.0) | 18 (60.0) | .417 | 39 (65.0) |
| **Living Place** | | | | |
| Province | 26 (86.7) | 22 (73.3) | 1.667[c]0 | 48 (80.0) |
| District/village | 4 (13.3) | 8 (26.7) | .197 | 12 (20.0) |
| **Number of children owned** | | | | |
| 1 child | 17 (56.6) | 8 (26.7) | 5.569[0] | 25 (41.6) |
| 2 children | 8 (26.7) | 14 (46.6) | .062 | 22 (36.7) |
| Children 3 or more 5 | 5 (16.7) | 8 (26.7) | | 13 (21.7) |
| **Time the child last had a seizure (months)** | | | | |
| 6 months and under | 18 (60.0) | 13 (43.4) | 1.880[b]0 | 31 (51.6) |
| Between 7 and 12 months | 6 (20.0) | 10 (33.3) | .390 | 16 (26.7) |
| 13 months and over | 6 (20.0) | 7 (23.3) | | 13 (21.7) |
| **Number of anti-epileptic drugs used** | | | | |
| Single drug use | 24 (80.0) | 26 (86.7) | 0.480[a]0 | 50 (83.3) |
| Use of two drugs | 6 (20.0) | 4 (13.3) | .488 | 10 (16.7) |
| **Primary caregiver for a child with epilepsy** | | | | |
| Primary caregiver for a child with epilepsy | 21 (70.0) | 18 (60.0) | 0.808[b]0 | 39 (65.0) |
| Grandmothers | 6 (20.0) | 7 (23.3) | .668 | 13 (21.7) |
| Carer, aunt or aunt | 3 (10.0) | 5 (16.7) | | 8 (13.3) |
| **Health personnel from whom the mother received information about the disease and treatment of the child with epilepsy** | | | | |
| Doctor | 24 (80.0) | 28 (93.3) | 2.308[c]0 | 52 (86.7) |
| Doctor and Nurse | 6 (20.0) | 2 (6.7) | .129 | 8 (13.3) |
| **The state of thinking that the mother has enough information about epilepsy** | | | | |
| Yes | 8 (26.7) | 9 (30.0) | 0.082[a]0 | 17 (28.3) |
| No | 22 (73.3) | 21 (70.0) | .774 | 43 (71.7) |

$\chi^2$: Chi-square, a Pearson chi-square test, b Pearson exact chi-square test, c Fisher exact chi-square test.

## Discussion

In this study, agreement between the experts was examined for MEEP content. The Kendall W value can range from 0 (no compatibility) to 1 (full compatibility). A value approaching 1 indicates that there is a good level of agreement between the experts (Kendall & Babington-Smith, 1939). It was determined in the study that the agreement between the experts was at a good level.

The reliability of the MEEP education package, the quality of information, and the general quality assessment scores were found to be high. The high scores obtained on the scale indicate that the educational content was evaluated to be of good quality and appropriate (Charnock, 1998; Charnock et al., 1999).

Most of the mothers in the study who had a child with epilepsy between the ages of 3–6 received epilepsy training from a doctor, while much less received training from a doctor and nurse together. Mothers in the study displayed a low rate of obtaining information about the disease from nurses. It can be said that one of the most important reasons for this is that the majority of children with epilepsy receive outpatient services, and only a physician is present in the polyclinic. In addition, there are no epilepsy nursing services provided in hospitals where patients can receive training and/or consultation following the examination at the outpatient clinic. Since 2013, the National Institute for Health and Care Excellence (NICE) has been emphasizing that nurses specialized in epilepsy should be employed and made available in the effort to manage epilepsy effectively. The epilepsy nurse's roles include multidimensional care planning for children with epilepsy and their parents, providing coordination between the members of the health team and the family to increase adherence to treatment, and supplying the family and child with the necessary information and educational

**Table 3**

Comparison of mothers' knowledge and anxiety scale pretest-posttest scores, within and between groups ($n = 60$).

| Epilepsy Knowledge Scale for Parents | Pretest | | Posttest | | p |
|---|---|---|---|---|---|
| | min -max | ± SD | min - max | ± SD | |
| Control (30) | 7.00–17.00 | 12.93 ± 2.65 | 7.00–17.00 | 13.00 ± 2.81 | 0.996[d] |
| Intervention (30) | 8.00–17.00 | 12.96 ± 2.67 | 13.00–20.00 | 17.16 ± 1.46 | <.001[d] |
| p | 1.000[d] | | <.001[d] | | |
| **Parental Anxiety over Seizures Scale** | Pretest | | Posttest | | p |
| | min - max | ± SD | min -max | ± SD | |
| Control (30) | 10.00–39.00 | 24.46 ± 8.42 | 10.00–43.00 | 26.13 ± 7.70 | .251[d] |
| Intervention (30) | 10.00–41.00 | 23.60 ± 9.29 | 13.00–43.00 | 26.53 ± 8.79 | .009[d] |
| p | .981[d] | | .998[d] | | |

d = Dependent sample T-test.
± SD = mean standard deviation.

support (National Institute for Health and Care Excellence (NICE), 2021). In the studies conducted on this topic, it is reported that 77.7%–90.2% of parents/caregivers with a child diagnosed with epilepsy receive information from a doctor (Gazibara et al., 2014; Kolahi et al., 2017; Liu et al., 2016), 17.7%–30.6% from health personnel/nurses (Avci, 2010; Kolahi et al., 2017; Tutar Guven, 2018), 10.0%–78.1% from online sources (Gazibara et al., 2014; Kolahi et al., 2017; Liu et al., 2016), while a lesser percentage stated that they received information about epilepsy from other sources such as teachers and the print media (Kolahi et al., 2017; Liu et al., 2016). In the study by Liu et al. (2016), the authors determined that 54.8% ($n = 214$) of caregivers of children with epilepsy obtained information about epilepsy from the internet via a smartphone and 23.3% ($n = 91$) from the internet via a computer. It is important for parents and primary caregivers of children with epilepsy to be informed about the disease and to be guided so that they can effectively manage the disease in their daily lives (Adadioglu & Oguz, 2016). Thanks to today's smart mobile devices and the easier accessibility of the internet (Pandher & Bhullar, 2016; Sahin & Yucel, 2021), individuals can connect to internet networks and access the information they want whenever they wish to (Demirer & Erbas, 2015; Pandher & Bhullar, 2016). However, information obtained from online sources rather than from health professionals may include complex medical terminology that makes it difficult for parents to understand the information they read (O'Toole et al., 2016; Sahin & Yucel, 2021). In addition, families may not know how to access reliable information and may obtain false information from uncontrolled sites. It is important for this reason that it is health professionals that provide information and educational support to children with epilepsy and their families.

In this study, the Epilepsy Knowledge Scale for Parents pretest scores of mothers in the control and intervention groups were similar. The posttest knowledge score of the intervention group was higher than that of the control group. In addition, the posttest scores of mothers in the intervention group were significantly higher than their pretest levels. This result is important in terms of showing that the training given to the intervention group with the mobile application was effective. The results of this research thus confirm our hypothesis "MEEP increases mothers' levels of knowledge about epilepsy." Other studies (Avci, 2010; Güven et al., 2020; Pfäfflin et al., 2012; Taksande et al., 2020) also show that education given to parents and caregivers of children with epilepsy about the disease increases their levels of knowledge. Different research results (Dozières-Puyravel et al., 2020; Escoffery et al., 2018; Liu et al., 2016) have shown that adolescents with epilepsy, parents, and caregivers are willing to receive education with mobile applications. It was determined in one study (Liu et al., 2016) that 97.9% ($n = 382$) of caregivers of children with epilepsy have a smart phone, and 88.2% prefer to use a smart phone to surf the internet. These findings indicate that the MEEP created is beneficial in terms of boosting parents' awareness.

In this study, Parental Anxiety over Seizures Scale pretest scores of mothers in the control and intervention groups were also similar. After the study, the mothers in the intervention group had lower levels of anxiety, but the difference between groups was not statistically significant. In the comparison made within the groups in the study, it was determined that there was no difference in the anxiety status of the control group, while there was a significant decrease in anxiety in the intervention group in the posttest compared to the pretest. This research result thus confirms our hypothesis that "MEEP reduces the anxiety level of parents regarding epilepsy." The common conclusion drawn from studies (Avci, 2010; Güven et al., 2020; Pfäfflin et al., 2012) in which the type and duration of education given to parents about epilepsy are different is that education given to parents of children with epilepsy about the disease reduces anxiety levels. In line with these results, it can be said that the education given to individuals with epilepsy and their relatives will be beneficial in reducing anxiety.

*Practice implications*

The expert evaluation led to the finding that the quality of MEEP is good and appropriate. After the training given with MEEP, the knowledge level of mothers who had a child diagnosed with epilepsy increased. It was determined that MEEP was effective in reducing parental anxiety about seizures in mothers.

In Turkey, training and information given about the disease to parents of children diagnosed with epilepsy is restricted to the polyclinic. With this mobile application that has been developed, it will be possible to increase the knowledge and awareness of mothers about epilepsy and reduce their anxiety, regardless of time and place. This aspect of the research is very valuable.

*Limitations*

A limitation of the study is that it only includes mothers of children (ages 3–6) with epilepsy who know how to use an Android-based smartphone and can access the internet. Another limitation of the study is that fathers were not included, due primarily to the fact that mothers are usually the primary caregivers of their children in Turkey. A third disadvantage to the study was that it was conducted at a single center with no blinding except for the randomization and data analysis stages.

## Conclusions

The study resulted in the development of a simple-to-use, easy-to-access and low-cost mobile application that facilitates epilepsy diagnosis, follow-up and treatment, increases mothers' knowledge levels, and reduces anxiety levels.

*Future research*

In line with these results, our recommendation is that MEEP should be more widely used for parents and caregivers of children with epilepsy.

## Dissemination of results

- This study is based on the doctoral thesis titled 'A Randomized Controlled Study: Evaluating the Efficacy of the Mobile Application Developed for Parents of Children with Epilepsy'.

  ClinicalTrials.gov, ID: NCT04343352

- This study has not been published anywhere. The abstract of this study was accepted as an oral presentation at the "17th International Child Neurology Congress to be held October 3-7 in Antalya, Turkey".

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## Ethics

Ethics committee approval (Approval Date: 13.02.2020 and Number: 80558721–050.99-E.20230) from the Eskisehir Osmangazi University Ethics Committee and institutional permission from the Eskisehir Provincial Health Directorate (Approval Date: 13.07.2020 and Number: 52167207–604.02-E.1190) were obtained before the research was conducted. Only the mothers whose informed consent was obtained after the information were included in the study. Necessary permissions

were obtained for the scales used. After the end of the study, a mobile application was installed on the phones of the mothers in the control group ($n = 30$), they were taught to use the application and they were enabled to use the application actively for 1 month.

## CRediT authorship contribution statement

**Dilek Sayik:** Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration, Funding acquisition. **Ayfer Acikgoz:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization, Supervision, Funding acquisition. **Sevgi Yimenicioğlu:** Conceptualization, Methodology, Investigation, Writing – review & editing, Validation, Visualization, Funding acquisition.

## Declaration of Competing Interest

The authors declare that there is no conflict of interest, competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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