The Psychological Flexibility in Epilepsy Questionnaire (PFEQ): Psychometric properties of the Persian version

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ABSTRACT

The present study aimed to evaluate the psychometric properties of a Persian version of the Psychological Flexibility Epilepsy Questionnaire (P-PFEQ). Transcultural adaptation and validation of the Persian version of the PFEQ were performed using translation and back-translation with pilot testing (on 17 patients) and expert evaluation. Participants in the current study involved 100 patients with an EEG-verified epilepsy diagnosis and an average age of 30.96 years (SD ± 6.46) (63% were female). Data collection included a sociodemographic questionnaire, epilepsy-specific questionnaire, the Depression-Anxiety-stress scale (DASS-21), the Insomnia Severity Index (ISI), the 31-item Quality-of-Life questionnaire in Epilepsy (QOLIE-31), the Acceptance and Action Questionnaire (AAQ), the Committed Action Questionnaire (CAQ), and the short form of the Freiburg Mindfulness Inventory (FMI). Descriptive and inferential analyses were conducted by SPSS software V.26. The P-PFEQ demonstrated semantic, conceptual, and content validity in equivalence with the Swedish version. Based on Exploratory Factor Analysis (EFA), five items were eliminated and unidimensional scale of PFEQ with 12 items, explaining 50.38% of the total variance, was accepted. The scale showed good reliability through internal consistency (Cronbach’s α of 0.9) and temporal stability on retest (n = 85, Intraclass correlation = 0.92). Convergent and divergent validity findings were acceptable for the P-PFEQ. The findings show that the P-PFEQ is a reliable and valid scale for assessing psychological flexibility in the Iranian patients with epilepsy. Also, it can be confidently recommended as a useful instrument in clinical practice.

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1. Introduction

Epilepsy is one of the most common neurological conditions in the world and it has significant bio-psycho-social impacts on patients with epilepsy and their families [1]. Given the significant impacts of epilepsy and antiseizure medication on mental health and health-related quality of life, it is essential to provide psychological evaluations and treatments to reduce side effects and increase well-being in patients with epilepsy [2].

The health-related quality of life and well-being in patients with epilepsy are significantly related to psychological factors [3]. So, self-management and psychological interventions have the potential to help patients with epilepsy to reduce psychiatric complaints and increase the health-related quality of life [3–5].

In that, the adaptation of Acceptance and Commitment Therapy (ACT), often called a third wave of cognitive-behavioral therapy, has been developed and tested to influence psychological problems for those who suffer from epilepsy [6,7].

The purpose of ACT is to increase psychological flexibility (PF). Psychological flexibility refers to the active engagement in the present moment, non-judgmentally embracing private events (i.e., thoughts, feelings, bodily sensations), and acting in line with what is meaningful, valuable, and effective [8–10]. Acceptance of negative feelings and emotions, which is a part of the PF construct, can play an essential role in improving health-related quality of life and behaviors in patients with epilepsy [6,7]. Therefore, it is essential to understand and assess PF in patients with epilepsy. For assessing PF, the Acceptance and Action Questionnaires have been developed and widely used in various populations and different conditions [11–14].

However, new research has shown that self-report scales that specifically address psychological flexibility in specific conditions...
are more context-sensitive measures than general scales in terms of better incremental validity and treatment sensitivity [15]. For example, the Acceptance and Action Diabetes Questionnaire (AADQ) appears to be a more acceptable instrument than the AAQ, related to persons with diabetes [16]. In the context of epilepsy, Burket and colleagues recently developed a scale to measure psychological flexibility in patients with epilepsy, the Psychological Flexibility in Epilepsy Questionnaire (PFEQ). This scale initially consists of 17 items designed explicitly to assess PF in the context of epilepsy. The final scale, consisting of 12 items, showed satisfactory psychometric properties, i.e., a reliable factor structure, good internal consistency, and satisfactory concurrent and convergent validity in a Swedish sample consisting of individuals self-reporting with epilepsy [17].

Although considerable attention has been given to develop psychological interventions to help patients with epilepsy, little attention has been placed on studying the processes underlying the maintenance and persistence of psychosocial problems. In that, PF is relatively little studied in the context of epilepsy. However, there are no appropriate scales for assessing psychological flexibility in clinically oriented research in Iranian patients with epilepsy. In addition, PF is likely to be dependent on a specific context such as culture [18]. Therefore, it is important to study the psychometric properties of translated PF instruments in different contexts. The current study aimed to investigate the psychometric properties of the Persian version of PFEQ (P-PFEQ) and study the internal consistency, test–retest reliability, and construct validity of the P-PFEQ among patients with epilepsy in Iran.

2. Methods

2.1. Participants

The participants were recruited through collaboration with private neurology clinics and rehabilitation centers (Asma rehabilitation hospital and Rofeideh rehabilitation hospital) in Tehran, Iran. Inclusion criteria were being 18 years or older and a diagnosis of epilepsy. Participants were excluded if there were serious cognitive abnormalities, intellectual decline, and learning disabilities based on the information gained from patients’ medical records. We used the guidelines for sample size in psychometric properties’ research [19,20]. By considering 17 items of the PFEQ, Cronbach’s alpha interval estimation between 0.8 and 0.85, significance level = 0.05, the sample size needed for the current study was approximately 102 patients. Thus, considering an approximately 20% drop-out rate, 117 patients were invited to take participation in this study. All patients have been diagnosed with surface EEG recordings by expert neurologists. Seventeen participants were excluded because they did not consent (N = 5), complete questionnaires (N = 8), or fulfill the inclusion criteria (N = 4). The final sample consisted of 100 participants (see Table 1).

All procedures utilized in this study were in accordance with the ethical standards of the Helsinki Declaration of 1964 and subsequent amendments [21]. All participants provided written informed consent based on the ethical standards.

2.2. Cross-cultural translation of the PFEQ

The PFEQ was designed to assess psychological flexibility among patients with epilepsy. The original 17-item version of the PFEQ was used in the current study. Items were responded to on a seven-point Likert scale, from one (Never true) to seven (Always true), with higher scores indicating less epilepsy-related psychological flexibility. Participants were asked to answer the questions of this questionnaire considering the last two weeks.

Table 1

| Characteristics            | n   | Percentage (%) |
|---------------------------|-----|----------------|
| Gender                    | 100 |                |
| Female                    | 63  | 63             |
| Working status            | 97  |                |
| Unemployed/unpaid work    | 33  | 34.02          |
| Working part-time         | 13  | 13.40          |
| Working full time         | 17  | 17.52          |
| Parental leave            | 8   | 8.25           |
| Sick leave                | 7   | 7.21           |
| Retired                   | 4   | 4.12           |
| Student                   | 15  | 15.47          |
| Education                 | 95  |                |
| Pre-secondary             | 1   | 1.05           |
| Secondary                 | 48  | 50.52          |
| Bachelor                  | 29  | 30.52          |
| Master and higher         | 17  | 17.89          |
| Self-rated economic status| 96  |                |
| Very bad                  | 8   | 8.33           |
| Bad                       | 23  | 23.96          |
| Middle                    | 49  | 51.04          |
| Good                      | 14  | 14.58          |
| Very good                 | 2   | 2.08           |
| Marital status            | 99  |                |
| Single                    | 50  | 50.5           |
| Married                   | 42  | 42.42          |
| In a relationship         | 5   | 5.05           |
| Separated/divorced/widowed| 2   | 2.02           |

The linguistic validation of the PFEQ from Swedish to Persian consisted of the following steps according to guidelines on cross-cultural adaptation and validation of psychological instruments [22]. First, the original Swedish version of the PFEQ was translated into Persian by two independent, bilingual Persian-native speakers with a related background. A consensus version was developed through discussion and revision of the translated versions by the authors. Next, back-translation of the consensus version was performed independently by one bilingual Swedish native speaker. The translated version’s adequacy was confirmed by comparison of the original with the back-translated versions. All differences were resolved through discussion before consensus was reached.

After the translation procedure, we conducted a pilot study. In the pilot phase, two steps were executed. First, the P-PFEQ was sent to three clinical psychologists, all experts in ACT. They were asked to determine the appropriateness of questions for the clinical settings and the accuracy of the Persian translation. Then, the revised P-PFEQ was completed by 17 patients with epilepsy to check whether the participants had any trouble to understand the instruction and items and the participant’s interpretation of all items. The participants were asked to identify the meaning of any questions they did not understand through cognitive interviews. Two of native Persian authors of the present study (the first author and the corresponding author) discussed the items and then revised the P-PFEQ. Finally, proofreading was performed by all the authors of this publication, and discussion regarding the items was done until consensus was reached.

2.3. Study procedure

The final translation of the PFEQ was tested for the validity and reliability. Validity of the P-PFEQ was determined with Exploratory Factor Analysis (EFA) in order to evaluate the factor structure and convergent and divergent validity using the psychological health, quality of life, and psychological flexibility measures. Reliability of the PFEQ in this study was examined by its internal consistency using Cronbach’s alpha values and one-month test–retest reliability (with 25 patients). For the current study, the patients were asked to fill out the questionnaires in their meetings in neurology.
clinics and rehabilitation centers. Two research assistants trained by the first author were present at the time of data collection in the clinics and centers to answer questions and provide clarifications when necessary. The data collection process took place from 1st April to 30th August 2021.

2.4. Measures

2.4.1. Demographic variables

Demographic variables in the present study included age, gender, working status, education level, and marital status. Participants were also asked to rate their economic status on a 5-point scale from 1 (very bad) to 5 (very good) (see Table 1).

2.4.2. Epilepsy-specific variables

The epilepsy-specific variables consisted of ten items developed for the purpose of this study, based on the scientific literature about epilepsy and other neurological diseases. To further clarify, patients were asked about their age of epilepsy onset; history of epilepsy in the family on a 2-point scale (yes, no); type of their seizure on a 3-point scale (focal, generalized, do not know); whether they were suffering from memory deficits, learning difficulties, concentration difficulties on a 4-point scale (to a large extent, to some extent, some, no); number of medicines on a 5-point scale (1, 2, 3, more than 3, no medication); type of other treatment than medicine on a 5-point scale (diet, operation, physiotherapy, psychotherapy, other). Furthermore, previous studies have shown that persons with epilepsy report greater number of unhealthy behaviors, such as less exercise, more smoking, and less healthy diet than controls [23,24]. Therefore, patients in the current study were also asked about smoking status on a 4-point scale (never, sometimes, often, live with smoker) and asked to write down their weight in kilograms and height in meters in order to calculate Body Mass Index (BMI) (see Table 2).

2.4.3. Depression, anxiety, and stress

The Depression, Anxiety, and Stress Scale (DASS-21) was designed to measure key symptoms of depression, anxiety, and stress over the past week. This scale was used to evaluate divergent validity in this study. The items are organized in three-dimensions; depression, anxiety, and stress (7 items per subscale). All items were expressed on a four-point scale (from 0 = did not apply to me at all to 3 = applied to me very much, or most of the time) [25]. The calculation of the scores acquired from each subscale was duplicated by two [26]. The range for each scale is zero to forty-two. Higher scores indicate higher levels of depression, anxiety, and stress. The Persian version of DASS-21 shows acceptable psychometric properties in the Iranian population [26]. Cronbach’s alphas of the DASS-21 in the current study were α = 0.76 for depression, α = 0.85 for anxiety, and α = 0.79 for stress.

2.4.4. Insomnia

The Insomnia Severity Index (ISI) was used to assess insomnia and divergent validity in the current study. The ISI consists of seven items and evaluates severity, nature, and impact of insomnia in patients’ lives (e.g., sleep maintenance problems, sleep dissatisfaction, and distress caused by sleep difficulties). A five-point Likert scale rates each item (from 0 = No problem to 4 = very severe problems) yielding the total score ranging from 0 to 28. Previous research shows that this scale has acceptable psychometric properties in various countries worldwide [27–31]. The internal consistency of the ISI was α = 0.85 based on the current sample.

2.4.5. Quality of life

The 31-item Quality-of-Life questionnaire in Epilepsy (QOLIE-31) was used to evaluate quality of life in patients with epilepsy and convergent validity in the present study. This scale has seven subscales: seizure worry, emotional well-being, energy and fatigue issues, social functioning, medication effects, overall quality of life, and cognitive functioning. Each item has a specific scoring system (from 0 to 3 or from 0 to 6), and each scale has a specific weight for calculating the total score (from 0, the worst HRQOL, to 100, the best HRQOL). This scale was initially developed by Cramer et al. and showed acceptable reliability and validity in patients with epilepsy [32]. The Persian version of the QOLIE-31 was translated and validated by Ghaem and Borhani-Haghighi. The Persian version of the QOLIE-31 has acceptable psychometric properties and can be utilized to evaluate the quality of life in Iranian patients with epilepsy [33]. The internal consistency of the QOLIE-31 was α = 0.88 based on the current sample.

2.4.6. Acceptance and action

The Acceptance and Action Questionnaire (AAQ) was developed to evaluate psychological flexibility [8,34]. This scale was used to measure convergent validity in current study. The Persian version of the AAQ consists of ten items evaluating psychological flexibil-

| Table 2: Epilepsy-specific characteristics of participants. |
|-------------------------------------------------------------|
| **Characteristics**                                         | **n** | **Percentage (%)** |
| History of epilepsy in the family                           | 100   |                   |
| Yes                                                        | 24    | 24                |
| No                                                         | 76    | 76                |
| Type of seizure                                            | 98    |                   |
| Focal                                                      | 22    | 22.44             |
| Generalized                                                | 13    | 13.26             |
| I do not know                                              | 63    | 64.29             |
| Memory deficits                                            | 90    |                   |
| Yes, to a large extent                                      | 13    | 14.44             |
| Yes, to some extent                                        | 25    | 27.77             |
| Yes, some                                                  | 15    | 16.66             |
| No                                                         | 37    | 41.11             |
| Learning difficulties                                       | 90    |                   |
| Yes, to a large extent                                      | 16    | 17.77             |
| Yes, to some extent                                        | 24    | 26.66             |
| Yes, some                                                  | 18    | 20                |
| No                                                         | 42    | 46.66             |
| Concentration difficulties                                  | 90    |                   |
| Yes, to a large extent                                      | 51    | 56.66             |
| Yes, to some extent                                        | 8     | 8.88              |
| Yes, some                                                  | 9     | 10                |
| No                                                         | 32    | 35.55             |
| Number of medicines                                        | 100   |                   |
| 1                                                          | 19    | 19                |
| 2                                                          | 37    | 37                |
| 3                                                          | 14    | 14                |
| More than 3                                                | 6     | 6                 |
| No medicine"                                              | 4     | 24                |
| Other treatment than medicine"                             | 24    |                   |
| Diet                                                       | 13    | 13                |
| Operation                                                  | 2     | 2                 |
| Physiotherapy                                              | 4     | 4                 |
| Psychotherapy                                              | 7     | 7                 |
| Other                                                      | 6     | 6                 |
| Smoking                                                    | 90    |                   |
| Never                                                      | 54    | 60                |
| Sometimes                                                  | 7     | 7.77              |
| Often                                                      | 12    | 13.33             |
| Live with smoker                                           | 17    | 18.88             |
| Body Mass Index                                            | 73    |                   |
| Underweight"                                               | 9     | 12.32             |
| Normal, Healthy"                                           | 35    | 47.94             |
| Overweight"                                                | 21    | 28.76             |
| Obesity"                                                   | 8     | 10.96             |

*Participants were able to choose more than one of the choices.
*Under 18.5: Underweight.
*Between 18.5 and 24.9: Normal/healthy.
*Between 25.0 and 29.9: Overweight.
*Above 30: Obesity.
2.4.7. Committed action

The Persian version of the Committed Action Questionnaire (CAQ-8) was used to assess committed action and convergent validity. This scale consists of eight items rated on a seven-point scale. The CAQ-8 includes two subscales, four items that are positively phrased and four items that are negatively phrased, yielding a total score ranging from 0 to 48 [36,37]. The Persian version of the CAQ-8 has demonstrated a reliable and valid scale for evaluating the concept of committed action in an Iranian sample [38]. The internal consistency of the CAQ-8 was $\alpha = 0.64$ based on the current sample.

2.4.8. Mindfulness

The short form of the Freiburg Mindfulness Inventory (FMI-14) was used to assess mindfulness and measure convergent validity in the present study. This scale consists of 14 items and each item is rated on a four-point Likert scale (from 1 = strongly disagree to 4 = to strongly agree) [39,40]. According to Ghasemi Jobaneh et al., the short form of the Freiburg mindfulness inventory is a valid instrument and has acceptable psychometric properties to measure the levels of mindfulness in the Iranian population [41]. The internal consistency of the FMI-14 was $\alpha = 0.74$ based on the current sample.

2.5. Statistical analyses

Data were analyzed using IBM SPSS version 27.0. Data screening was first performed to examine normality, missing values, outliers, or any errors in data. First, a descriptive analysis of the demographic and epilepsy-specific variables is presented in Table 1 and Table 2. The means, standard deviations, minimum, and maximum of the scales are shown in Table 3. Second, we performed an Exploratory Factor Analysis (EFA) to investigate the factor structure of the P-PFEQ. In the EFA, we used maximum likelihood extraction method and also used the Promax method, assuming components to be correlated, as a method of factor rotation. The dimension's internal consistency was computed using Cronbach's alpha scores [42]. In addition, we examined the one-month test–retest reliability of P-PFEQ. Finally, Pearson's $r$ was calculated to assess the instrument's construct validity as a form of divergent and convergent validity.

3. Results

3.1. Descriptive statistics for participant characteristics and measures

Demographic and epilepsy-specific characteristics of the participants are presented in Table 1 and Table 2. This study involved 100 patients with an average age of 30.9 years ranging between 18 and 50 years ($SD \pm 6.4$). The mean age of epilepsy onset was 13.4 ($SD \pm 7$) and the mean Body Mass Index (BMI) was 23.8 ($SD \pm 4.5$).

The descriptive statistics of measures are shown in Table 3.

3.2. Exploratory factor analysis (EFA)

The Kaiser–Meyer–Olkin test (0.824) and the Bartlett test of sphericity (Chi-square (136) = 757.489, $p < 0.001$) indicated the suitability of the data for factor analysis. The maximum-likelihood communalities were performed and the solution was rotated using the Promax method. Initial EFA results showed the emergence of two factors with eigenvalues greater than 1, overall explaining the 48.40% of the variance. However, the factor loading showed several items that were either poorly loading (<0.40) or cross-loading onto one or more components ($\geq 0.30$). Then, EFA was repeated and one factor was extracted. As a result, five items were removed because they had either low factor loadings (<0.40) or cross-loadings onto one or more components ($\geq 0.30$), making the solution very difficult to interpret. The remaining 12 items loaded highly onto a single factor of the P-PFEQ ($>0.40$). A one-factor solution with an eigenvalue of 6.04, explaining 50.38% of the total variance, was accepted. All items had statistically significant loadings (0.44–0.84). The standardized factor loadings for the Persian version of PFEQ and the Swedish version of the PFEQ are shown in Table 4.

3.3. Reliability

The reliability of the Persian version of the PFEQ was assessed in terms of its internal consistency and one-month test–retest reliability. High internal consistency ($\alpha = 0.90$) and relatively high test–retest reliability (ICC was between 0.65 and 0.96 for each item, and ICC = 0.92 for the total score) were determined (see Table 4), confirming that the questionnaire is reliable.

Table 3

Descriptive statistics of measures (N = 100).

| Study Variables                                  | Min | Max | Mean | SD  |
|-------------------------------------------------|-----|-----|------|-----|
| Depression, Anxiety, and Stress Scale – Depression | 0   | 28  | 10.79| 5.55|
| Depression, Anxiety, and Stress Scale – Anxiety  | 0   | 28  | 7.90 | 5.34|
| Depression, Anxiety, and Stress Scale – Stress  | 0   | 28  | 11.65| 5.52|
| Insomnia Severity Index                          | 0   | 28  | 13.36| 6.66|
| Quality of Life in Epilepsy                     |     |     |      |     |
| Seizure worry                                    | 0   | 100 | 46.07| 25.98|
| Overall quality of life                          | 7   | 109 | 55.8 | 18.4 |
| Emotional well-being                            | 0   | 88  | 46.78| 19.15|
| Energy/fatigue                                  | 0   | 85  | 42.51| 19.26|
| Cognitive                                       | 0   | 100 | 50.46| 19.90|
| Medication effects                              | 0   | 100 | 41.74| 25.62|
| Social function                                 | 10  | 100 | 56.56| 21.60|
| Total                                           | 10  | 100 | 49.79| 14.19|
| Acceptance and Action Questionnaire             | 10  | 70  | 37.69| 11.86|
| Committed Action Questionnaire                   | 0   | 48  | 25.53| 6.98 |
| Freiburg Mindfulness Inventory                   | 14  | 56  | 33.42| 7.11 |
3.4. Convergent and divergent validity

Table 5 presents the correlations between the P-PFEQ and other scales to measure the construct validity in the form of divergent and convergent validity. The P-PFEQ was positively associated with depression, anxiety, stress, and psychological inflexibility, and negatively correlated with the quality of life variables and committed action.

For the current study, we used the initial 17-item instrument taken from the original article. The factor pattern in the Persian translation is comparable with the Swedish version [17]. However, the factor analysis did not produce a structure precisely the same as the Swedish version. In that, item 2, “I avoid thinking about how the seizures affect my future” emerged in the Persian version, but not in the Swedish version, whereas item 5, “I would do almost anything to get rid of my epilepsy” was in the Swedish version, but not in the Persian version. Various reasons could explain the differences. One possible explanation for these findings lies in the health care services in Sweden and Iran. Item 2 in the Persian version could be explained by considering the lack of long-term planning for patients with epilepsy in Iran and the lack of rehabilitation facilities for managing epilepsy and living independently. Consequently, patients with epilepsy in Iran are likely to be highly concerned about their future, which makes them anxious and cope with avoidance of thinking about the future. Item 5 in the Swedish version could tentatively be explained by considering Sweden’s policy regarding providing facilities for patients with epilepsy to have power in daily life and normal daily activities. Therefore, it is important to consider the role of cultural, economic, social, and political factors in studying psychological flexibility, in line with previous research underscoring cross-cultural differences in psychological flexibility [43]. Another possible explanation of these results is the timing of data collection. Data for the current study were collected during the COVID-19 pandemic. Studies targeting patients with epilepsy during the COVID-19 pandemic show that the COVID-19 pandemic has been an additional challenge for those who suffer from epilepsy because they may be high-risk group for developing more severe symptoms with COVID-19, pandemic-related restrictions create an additional social and psychological burden for patients with epilepsy, and they have less access to medical care due to collapse of the healthcare services [44–46]. Therefore, it is reasonable to conclude that thinking about the future is more challenging for patients with epilepsy, especially for patients with epilepsy in Iran as this country has had to face several peaks of the COVID-19 pandemic.
Regarding the convergent and divergent validity, the results showed that the P-PFEQ was positively related to psychological health scales as depression, anxiety, stress, and insomnia, and negatively related to quality of life. However, the correlations were not high. Various reasons could explain the low correlations. First, epilepsy is a specific condition and statistical significance may not be suitable for interpreting correlations. Second, the small sample size in the current study could influence the amount of the correlations. Third, various studies have shown that psychological flexibility correlates significantly with psychological health problems ranging from \( r = 0.2 \) to \( r = 0.8 \) \cite{47, 48}. This may be due to differences in different clinical populations. Finally, psychological flexibility has various items with different content, from imagining avoidance to real-world situation avoidance. Therefore, one of the possible reasons for the low correlations is the differences in the content of PF scales.

In general, the results in the current study are in line with previous studies that have shown PF can predict the levels of psychological health problems, such as depressive symptoms, anxiety as well as sleep disturbance and PF is related to the quality of life outcomes \cite{49–51}. In that, implementing an ACT intervention might improve quality of life and reduce mental health problems by increasing PF \cite{52–54}. In addition, P-PFEQ was positively associated with psychological inflexibility whereas negatively related to committed action, and interestingly, it was not related to mindfulness skills.

Mindfulness is defined as “a state of being aware of and focusing on the present moment” \cite{55}. This study showed that the correlation between P-PFEQ and the mindfulness scale was not significant \( r = -0.19 \). Thus, this lack of significance could tentatively be argued to be due to the fact that mindfulness dimensions are independent factors from psychological flexibility factors \cite{56, 57}.

Regarding reliability, some guidelines consider an alpha coefficient of 0.7 or above to be acceptable \cite{58}, and the higher alpha values may suggest redundancies on item level, which means that the items may test the same construct. The alpha value found in the present study \( (\alpha = 0.9) \) may thus be acceptable to some sources, while others may deem it problematic \cite{42, 59}. Also, the Intraclass correlation (ICC) showed that all items (except item 12) have ICC values greater than 0.8 in test–retest stability. These results indicate that the items in the P-PFEQ have acceptable test–retest reliability. The low ICC for item 12 (“Because of my epilepsy, I stay at home”) could be explained by considering the timing of data collection. While the first data collection was in the peak COVID-19 pandemic and the second data collection took place when the Iranian health ministry injected millions of COVID-19 vaccinations, so civilians (including the participants in this study) were able to spend time outdoors.

At the end, 24% of the sample was not on an antiseizure medication. It is worthy of mention that because of side effects of antiseizure medication, healthcare providers in Iran have interest to use complementary and alternative interventions. In addition, patients in Iran are also interested to test other interventions than medications. Finally, some patients had limitations to access antiseizure medication at the time of data collection mainly because of COVID-19 pandemic and increased costs of antiseizure medications.

### 4.1. Limitations and future directions

The current research has several limitations that should be considered when interpreting the findings. First, the study was limited by the use of voluntary participation and self-report scales. It would, therefore, be important to further investigate the PFEQ by developing and evaluating family-reported and clinician-reported versions of this scale. Second, notwithstanding the sufficiency of the sample size, it may not be nationally representative, and future research will need to verify the findings in a larger sample size. Finally, social and cultural factors were not considered in the current study.

Future research can use this scale as a process outcome in experimental studies, e.g., a randomized controlled trial focusing on the efficacy of Acceptance and Commitment Therapy (ACT) for patients with epilepsy. Also, future research needs to evaluate the dynamic changes in psychological flexibility in patients with epilepsy using longitudinal studies. Finally, future research can evaluate the role of psychological flexibility in predicting the outcomes such as treatment adherence, drug response, mental health situation in the context of epilepsy.

### 5. Conclusion

The Persian version of the PFEQ with 12 items has acceptable psychometric properties. More specifically, the current study showed that the Persian version of the PFEQ has a reliable factor structure, excellent internal consistency, good test–retest reliability, and satisfactory divergent and convergent validity. Finally, researchers and clinicians can use this scale for assessing psychological flexibility as part of an assessment battery, a process variable, and a clinical outcome of interventions in patients with epilepsy.

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### CRediT authorship contribution statement

Mohammadreza Davoudi: Conceptualization, Data curation, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Project administration. Tobias Lundgren: Conceptualization, Methodology, Writing – review & editing. Markus Jansson-Fröjmark: Conceptualization, Methodology, Writing – review & editing. Zahra Saeedipour: Data curation. Farzaneh Badinlou: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Project administration.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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### Appendix A. Supplementary data

Supplementary data to this article can be found online at [https://doi.org/10.1016/j.yebeh.2022.108672](https://doi.org/10.1016/j.yebeh.2022.108672).

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