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Important knowledge items with regard to the benefits of exercise for patients with epilepsy: Findings of a qualitative study from Palestine

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ABSTRACT

Objectives: Physicians and complementary alternative medicine (CAM) specialists are not formally educated/trained on the benefits of exercises for people living with epilepsy (PWE). This study was performed to develop a consensus-based knowledge items on the benefits of exercises for PWE that physicians and CAM specialists need to know.
Methods: Knowledge items were collected after an extensive review of the scientific literature and from in-depth interviews with key contacts in the domain (6 primary healthcare providers, 4 neurologists, 4 exercise and medicine specialists, 4 CAM practitioners, 4 researchers who did studies on the benefits of exercise for PWE, and 4 PWE). Items collected were reviewed by 12 researchers who did studies on exercise for PWE. A Delphi technique was followed among a panel of 50 members to develop the consensus-based core list.
Results: The final consensus-based core list contained 64 items that were grouped into the following categories: 1) general items recommending exercise for PWE, 2) benefits of exercise on prevention of seizures, 3) benefits of exercise on antiepileptic therapy, 4) benefits of exercise in preventing comorbidities associated with epilepsy, 5) benefits of exercise in improving quality of life of PWE, and 6) psychosocial benefits of exercise for PWE.
Conclusion: This consensus-based core list might guide educators, trainers, or authorities while designing educational or training courses to increase knowledge of physicians in primary healthcare and CAM specialists with regard to the benefits of exercise for PWE. Further investigations are needed to determine if such consensus-based core list might improve care and wellbeing of PWE.

1. Introduction

Epilepsy is among the most frequent, chronic, and serious neurological conditions of the central nervous system and is often manifested by sudden seizures [1]. Recent epidemiological studies have shown that incidence and recurrence rates of epilepsy are on the rise, and currently, the number of people living with epilepsy (PWE) around the globe exceeds 65 million people [2–4]. Of those, about 10% are living in the Eastern Region of the Middle East. The World Health Organization (WHO) estimates that the majority (about 80%) of PWE live in low- and middle-income countries and of those, about 75% receive suboptimal healthcare [5]. Epidemiologic studies have shown that up to 70%–80% of PWE can achieve full control over their seizures and would be able to lead a normal life, while the remaining percentage of PWE would continue to experience relapses or breakthrough seizures [6,7].

In a classical healthcare system, PWE would receive the majority of healthcare services from epileptologists and/or neurologists in tertiary healthcare settings or private healthcare practice [8]. As the incidence and prevalence rates of epilepsy are on the rise, more PWE are expected to use healthcare services. Therefore, it has been argued that the epileptologist and/or neurologist-based model of healthcare delivery is no longer sustainable because of shortages in the number of epileptologists and/or neurologists [8,9]. Currently, PWE are experiencing long wait periods before they could see epileptologists and/or neurologists. Studies have reported that the majority of PWE do not meet conditions that warrant receiving healthcare services from epileptologists/neurologists [9,10]. Alternatively, it has been suggested that PWE can satisfactorily receive healthcare services from internists and primary healthcare practitioners [9,11,12]. A considerable percentage of healthcare needs of PWE can be met by seeing internists and other healthcare providers in primary healthcare facilities [13].

Caring for patients in primary healthcare facilities has recently been advocated for a variety of conditions that traditionally were cared for in tertiary and specialty healthcare settings. Examples include epilepsy and cancer. Primary healthcare professionals are increasingly involved

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in providing healthcare services to patients with cancer [14–17]. Some studies have shown that patients who were followed up in primary healthcare facilities were more satisfied than patients who were followed up in tertiary and specialty healthcare settings [18].

Primary healthcare professionals are trusted, accessible, and centered in the community; therefore, they can provide holistic healthcare services to patients including PWE. Patients who receive healthcare services and support in primary healthcare facilities experience enhanced support, improved teamwork interactions between different healthcare providers, and receiving proactive care [17,19–22]. In addition to primary healthcare practitioners, PWE might receive healthcare services from complementary and alternative medicine (CAM) practitioners. Recent studies have shown that many PWE see CAM practitioners [23].

Antiepileptic drugs (AEDs) are mainstay in the management of epilepsy [24–26]. They are associated with adverse effects. Moreover, some PWE might not be satisfied with the results obtained from using AEDs. As a result, some PWE do not adhere to taking their prescribed AEDs. Additionally, about 20%–30% of PWE have seizures that are refractory to treatment with AEDs [6,7]. These PWE might turn to different forms of nonpharmacological therapies including using CAM modalities. People living with epilepsy use CAM modalities as complementary or alternatives to AEDs [27].

Physical activities and exercises have been cited as a CAM modality used by PWE [28–32]. Benefits of exercises on control of seizures, comorbidities associated with epilepsy, broader health, reported quality of life of PWE, and other psychosocial benefits have been articulated by many researchers. Traditionally, PWE were discouraged from participation in exercises and different forms of sports because of fear, overprotection, and ignorance of the health and psychosocial benefits of exercise for PWE. As the evidence of benefits of exercises for PWE has increased, many health organizations including the International League Against Epilepsy (ILAE) have encouraged PWE to be more physically active and to participate in exercises and different forms of sports [33].

In modern healthcare delivery, patients are becoming more knowledgeable of all treatment modalities that can be used for their conditions [34]. It has been articulated that knowledgeable patients report enhanced quality of life, tolerate side effects of treatments, and do not overestimate the benefits of the treatment [35].

Although the benefits of exercise for PWE have been reported in many previous studies, little was narrated on what do physicians in primary healthcare and CAM specialists need to know on the benefits of exercise as a CAM modality for PWE. Physicians in primary healthcare and CAM specialists are increasingly required to expand their potential roles in providing healthcare services to PWE and support their decisions. Therefore, physicians in primary healthcare and CAM specialists might need to possess adequate knowledge of how exercise can be beneficial to PWE.

This study was performed to develop and achieve consensus on a core list of knowledge items that physicians in primary healthcare and CAM specialists might need to know on how exercise can be beneficial to PWE.

2. Methods

2.1. Study design

This study was performed using a modified Delphi technique to develop and achieve formal consensus on a core list of knowledge items that physicians in primary healthcare and CAM specialists need to know on how exercise can be beneficial to PWE among a panel of experts. Background of the modified Delphi technique was reported in our previous studies [24,35–38].

2.2. A thorough literature search

The scientific literature was extensively searched to extract knowledge items that physicians in primary healthcare and CAM specialists needed to know on how exercise can be beneficial for PWE. A standard data extraction form was used to collect the knowledge items reported in the literature [8].

2.3. Interviews with key contact experts in the domain

As in our previous studies [24,35–39], we expanded and complemented the list of items collected from the literature by conducting in-depth interviews with key contact experts in the domain. The interviewees were 6 primary healthcare providers, 4 neurologists, 4 exercise and medicine specialists, 4 CAM practitioners, 4 researchers who conducted studies on the benefits of exercise for PWE, and 4 PWE. The PWE possessed scientific background (2 had degrees in the medical fields and 2 in biology). The study participants were identified using key personal contacts in the field. The key contact experts were interviewed on their opinions and views on what knowledge items physicians in primary healthcare and CAM specialists needed to know on how exercise can be beneficial for PWE. Knowledge items provided by the interviewees were recorded and noted.

2.4. Review, rating, and views of researchers and experts in the domain

We used the PubMed database to search for researchers and experts who conducted studies on the benefits of exercise in epilepsy. Researchers and experts were identified using the advanced search options. Medical Subject Headings (MeSH) terms like “epilepsy”, “exercise”, and “outcomes” were combined using the Boolean operator “AND”. Titles and abstracts of the identified articles were reviewed manually to identify relevant articles [24]. Emails were sent to the corresponding authors inviting them to take part in the present study. The aim of this stage of the study was to permit researchers and experts in the domain to review, rate, and comment on the knowledge items extracted from the literature and/or provided by the interviewees. We expected that the feedback from the researchers and experts would enrich the list of knowledge items before using it in the iterative Delphi rounds.

2.5. Piloting the list

The knowledge items extracted from the literature and those provided by the interviews were phrased into statements. The statements were included into a questionnaire. The questionnaire was piloted for clarity and comprehension by 4 physicians in primary healthcare and 4 CAM specialists. Based on the feedback of the participants in the pilot, some items were rephrased to promote understanding and some items were divided into more than one statement.

2.6. The panel of experts

A panel of experts was composed using a purposive sampling technique. Key contacts in the field were used to identify the panelists [24,35–39]. As in qualitative studies in which the Delphi technique was used, the panelists were invited and recruited on the basis of their possession of prior knowledge on the topic being investigated. The inclusion criteria of the panelists in this study were as follows: 1) licensure to practice medicine or CAM, 2) being in practice since at least 5 years, 3) having previous knowledge of the benefits of exercise for PWE, 4) providing healthcare services for more than 5 PWE per month, and 5) willingness to provide an informed consent.

2.7. The Delphi rounds

2.7.1. Delphi round 1

All panel members received copies of the questionnaire that contained 3 different sections. The panelists had to provide their sociodemographic and practice details like age, gender, academic degrees, number of years in practice, employer, and approximate number

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of PWE cared for per month in section 1. In section 2, there were 6 questions exploring the views and opinions of the participants on educating and or training primary healthcare providers and CAM practitioners on the benefits of exercise for PWE.

In section 3, knowledge items that the panelists had to express the degree of their agreement or disagreement on each item using a Likert-scale of 1–9 were included. As in our previous studies [8,24,36,37,39–41], voting 1–3 indicated that the panel member disagreed with the importance of the knowledge item. This meant the panel member was of the opinion that the knowledge item was unimportant and should not be included in the core list of knowledge items of benefits of exercise for PWE. Voting 7–9 indicated that the panel member agreed with the importance of the knowledge item. This meant the panel member was of the opinion that the knowledge item was important and should be included in the core list of knowledge items of benefits of exercise for PWE. Voting 4–6 indicated that the panel member was indecisive and could not decide whether the knowledge item was important or not. The panelists were provided with an open space after each statement and encouraged to include written comments to qualify/justify their votes.

2.7.2. Data analysis

Votes of the panel members were analyzed as previously described [24,35–39]. We used the same definition of consensus previously used in [24,35–39]. We decided *a priori* that equivocal statements will be a subject to a second Delphi round.

2.7.3. Delphi round 2

All equivocal items were included into a revised questionnaire and were a subject to a second Delphi round. The panel members were provided with a reminder of their own vote on each item, the median vote of all panel members, interquartile range (IQR), and a summary of the qualitative comments made by other panel members. The panel members were asked if they wished to maintain their voting or change them after considering the votes and comments of other panel members. Votes of the second Delphi round were analyzed using the same definitions of consensus used in the first Delphi round.

2.8. Ethical approval

The study received approval from the Institutional Review Board (IRB) of An-Najah National University. All panel members provided informed consents before they took part in the study.

3. Results

3.1. Researcher and expert key contacts

We invited a total of 30 researchers and experts who did studies on the role of exercise in epilepsy. A total of 3 reminders were sent, and each was 1 week apart. Of the 30 researchers emailed, 12 responded and expressed willingness to take part. The list of items sent to the researchers and experts who expressed willingness to participate was returned by 10 researchers and experts, giving a response rate of 33.3% of those initially invited. Those who responded belonged to both genders, were of different age groups, and possessed different backgrounds and experience in the domain. Researchers and experts suggested adding and removing some items. Suggestions also included modifying some knowledge items to enhance comprehension.

3.2. The Delphi rounds

Questionnaires were returned by all 50 primary healthcare providers and CAM practitioners who took part in the Delphi round 1 as panel members, giving a response rate of 100%. In the Delphi round 2, revised questionnaires were returned by 38 panel members, giving a response rate of 76.0%.

3.2.1. Characteristics of the panel members

The majority of the panel members were males (62%) in gender and were 40 years and older (66%). Of the panelists, 46% were physicians with an MD who worked as primary healthcare providers and 36% were CAM providers. Neurologists were also represented in the panel (8%). Almost half (52%) of the participants were employed by the government sector. The vast majority of the panel members (74%) were in practice for 10 and more years. Again, the vast majority (84%) of the panel members provided healthcare services for 10 and more PWE per month. The characteristics of the study participants are displayed in Table 1.

3.2.2. Opinions and views of the panel members on the benefits of exercise for PWE

When asked for their opinions and views, the vast majority of the panel members agreed that the curricular of primary healthcare providers and CAM practitioners lacks adequate training and skills acquisition of the benefits of exercise for PWE (74%), healthcare providers and CAM practitioners lacked adequate knowledge, education, and/or training on the benefits of exercise for PWE (64%), more efforts were needed to promote knowledge of primary health providers and CAM practitioners on the benefits of exercise for PWE (86%), exercise could improve quality of life of PWE (74%), exercise had significant psychosocial benefits for PWE (84%), and exercise could improve control over seizures in PWE (56%). Responses of the panel members are shown in Table 2.

3.2.3. The core list of knowledge items on which consensus was achieved

Consensus was achieved on 64 items to be included into the final core list of knowledge items in the first and second Delphi rounds. These items are presented in Table 3. Items were grouped into the following categories: 1) general items recommending exercise for PWE, 2) benefits of exercise on the prevention of seizures, 3) benefits of exercise on antiepileptic therapy, 4) benefits of exercise in preventing comorbidities associated with epilepsy, 5) benefits of exercise in

Table 1
Characteristics relevant to the sociodemographic and practice of the panel members ($n = 50$).

Characteristic	n	%
Gender		
Male	31	62.0
Female	19	38.0
Age (years)		
<40	17	34.0
≥40	33	66.0
Academic certificate/specialty		
MD/PhD	2	4.0
MD (primary healthcare provider)	23	46.0
MD/public health	3	6.0
Neurologist	4	8.0
CAM provider	18	36.0
Employment sector		
Government	26	52.0
Private practice	24	48.0
Number of years in practice		
5–9	13	26.0
10–14	19	38.0
≥15	18	36.0
Approximate number of PWE cared for per month		
5–9	8	16.0
10–14	11	22.0
≥15	31	62.0

CAM: Complementary and alternative medicine; MD: Doctor of Medicine; PhD: Doctor of Philosophy.

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Table 2
Opinions and views of the panel members on the inclusion on the benefits of exercise for PWE.

#	Statement	Disagree		Neutral		Agree	
		n	%	n	%	n	%
1	Curricula of physicians in primary healthcare and CAM specialists lacks adequate training and skills acquisition of the benefits of exercise for PWE	3	6.0	10	20.0	37	74.0
2	The majority of physicians in primary healthcare and CAM specialists lack adequate knowledge, education, and/or training on the benefits of exercise for PWE	5	10.0	13	26.0	32	64.0
3	I think there should be more efforts to promote knowledge of physicians in primary healthcare and CAM specialists on the benefits of exercise for PWE	2	4.0	5	10.0	43	86.0
4	I think exercise can improve control over seizures in PWE	9	18.0	13	26.0	28	56.0
5	I think exercise can improve quality of life of PWE	4	8.0	9	18.0	37	74.0
6	I think exercise has significant psychosocial benefits for PWE	3	6.0	5	10.0	42	84.0

CAM: complementary and alternative medicine, PWE: people with epilepsy.

Table 3
Knowledge items on which consensus was achieved in the Delphi rounds on the benefits of exercise for patients with epilepsy that primary healthcare providers and CAM practitioners might need to know.

#	Item	# of the Delphi round on which consensus was achieved
	1) General items recommending exercise for PWE	
	A. General recommendations	
1	In general, PWE are considered at higher risk of injuries than their matched peers without epilepsy as a result of seizures themselves and secondary injuries from physical activities and exercises. However, the vast majority of PWE reported minor injuries mainly in the soft tissues.	2
2	Generalized tonic–clonic and atonic seizures might be associated with unprotected falls. PWE who suffer seizures that disturb consciousness (absence and complex partial seizures) might lose awareness of the surroundings and could by at a higher risk of losing balance, fall, or being hit during physical activities and exercises.	1
3	A minority of PWE whose seizures are resistant to therapy suffered injuries like head trauma, submersions, and fractures. Fractures could also be attributed to loss of mineralization as a consequence to using certain cytochrome P450-inducing AEDs.	2
4	Some studies have failed to demonstrate increased number of injuries among PWE while participating in physical activities. Paradoxically, injuries were shown to be higher among general population compared with PWE.	2
5	Avoiding possible injuries should not be used as a motive to discourage PWE to participate in physical activities. Instead, PWE should be encouraged to participate in physical activities.	1
6	Studies have shown that the risk of injuries associated with seizures was higher among PWE whose seizures are resistant to therapy, who were experiencing primary or secondarily generalized seizures, with high seizures frequency, and in PWE who suffer comorbid mental retardations or multihandicaps. In those patients, the risk of experiencing seizures was higher either during routine daily activities or during physical activities. However, studies have shown that the majority of injuries as a result of seizures were injuries to soft tissues.	2
7	International organizations like the International League Against Epilepsy (ILAE), the American Academy of Pediatrics (AAP), and the American Medical Association (AMA) have changed their positions on participation of PWE in physical activities and exercises and now encourage PWE to be more physically active.	1
8	Currently available guidelines on physical activities and exercises for PWE are scarce and general.	1
9	In general, PWE including children might participate in physical activities and exercises with caution if 1) their seizures were poorly controlled, 2) in the first months (2–3) after a first untreated seizure, and 3) during first months after initiating AEDs or discontinuing AEDs.	2
10	PWE whose seizures are poorly controlled might undergo individualized assessments before making proper recommendations with regard to their participation in physical activities and exercises in order to protect them from injuring themselves or injuring others.	2
11	Physical activities and exercises with higher risk might be practiced with accompanying persons or under close supervision of a trainer who should be aware that the participant has epilepsy and knows how to help in case of a seizure.	2
	B. Recommendations with regard to aerobic physical activities and exercises	
12	Generally, participation of PWE in aerobic physical activities and exercises like running, football, basketball, stationary bike, aerobics, and gymnastics not involving heights are without restrictions. However, the use of appropriate safety equipment is generally advised.	2
	C. Recommendations with regard to water activities	
13	Swimming and water activities should always be practiced in supersized facilities in which the supervisors are trained on cardiopulmonary resuscitation and are aware of the conditions of the participants.	2
14	PWE should be advised not to swim in unsupervised open waters or practice scuba diving.	1
15	PWE should be advised to wear life vests when in boats, practicing water-skiing, or other similar activities. PWE should be recommended not to practice these activities alone.	1
	D. Recommendations with regard to “at height” activities	
16	Parachuting, sky-diving, and aviation are not recommended for PWE, especially those with uncontrolled seizures.	2
17	Horseback riding might be permitted for controlled PWE under supervision and with safety equipment.	2
18	PWE might be allowed to participate in bicycling, gymnastics, and rock climbing after assessment for risk of seizures and wearing necessary safety equipment.	2
	E. Recommendations with regard to motor activities	
19	Motor activities might be permitted for PWE after assessment for risk of seizures, risks to the patient and others, and considering the country's driving regulations for PWE.	2
	F. Recommendations with regard to contact activities	
20	In general, contact sports might be recommended for PWE after assessment for risk of seizures, type of seizures, and risks to the patient.	2
21	Boxing, martial arts, activities involving blows to the head, and activities with no general consensus on the risks and benefits to PWE are generally not recommended for PWE.	2

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Table 3 (*continued*)

#	Item	# of the Delphi round on which consensus was achieved
	2) Benefits of exercise on prevention of seizures	
	A. Risk of seizures during exercise	
22	In general, PWE who practiced physical activities and exercises on regular basis tended to report less frequent seizures.	1
23	Studies have shown that aerobic activities and exercises for 4 and 12 weeks did not increase the frequency of seizures in PWE.	2
24	Observational studies have shown that vast majority of physically active PWE did not experience seizures during physical activities and exercises.	2
25	Physical activities and exercises were not reported as triggers of seizures by the vast majority of PWE.	2
26	In general, PWE reported experiencing fewer seizures while performing mental and/or physical activities compared with periods of rest.	1
27	Postexercise fatigue seemed not to be associated with increased frequency of seizures.	2
28	A minority of PWE experienced "genuine" exercise-induced seizures.	2
	B. Reduction of seizures as a result of physical activities and exercises	
29	A considerable percentage of PWE reported improved control over seizures with regular physical activities and exercises.	1
30	Physical activities and exercises have been shown to reduce frequency of seizures among PWE.	2
31	Interictal epileptiform activities recorded by EEGs during or after physical activities and exercises decreased or remained unchanged in the majority of PWE.	2
32	In women with refractory epilepsy, aerobic exercises were shown to decrease frequency of seizures.	2
33	In animal models, studies using metabolic, electrophysiology, and immunohistochemistry have shown that physical activities and exercises reduced spontaneous seizures in animal models.	2
34	Studies have suggested that activation of hypothalamic corticotrophin-releasing hormone might stimulate deoxycorticosterone release. Deoxycorticosterone might in turn increase tetrahydrodeoxycorticosterone synthesis by the liver and brain. Increased tetrahydrodeoxycorticosterone levels could activate GABAA receptors in some regions of the brain, thus, might reduce susceptibility of PWE to seizures.	2
35	Studies have suggested that hyperventilation at rest can trigger absence seizures in PWE. However, hyperventilation during physical activities and exercises occurred in response to acidosis, which was shown to suppress interictal epileptiform abnormalities and reduced susceptibility to seizures.	2
36	PWE are more alerted during mental and physical activities and hence less susceptible to seizures.	1
37	Studies have suggested that physical activities can increase levels of β-endorphins that might decrease interictal epileptiform abnormalities and seizures.	2
38	Animal studies have shown that physical activities and exercises could reduce loss of neurons and damage to neurons secondary to insults.	2
39	Animal studies have shown that onset of and intensity of pilocarpine-induced motor symptoms were reduced by physical activity and exercise.	2
40	In an animal model of temporal lobe epilepsy (amygdala kindling), more stimuli were needed to provoke seizures in animals subjected to acute and chronic physical activities and exercises.	2
41	In animal models, noradrenaline was shown to be increased in animals subjected to physical activities and exercises. Noradrenaline was shown to exert inhibitory activity on the development of kindling. Depletion of noradrenaline was shown to propagate epileptiform discharges.	2
42	People with low cardiovascular fitness at the age of 18 have increased risk of developing epilepsy later in life. Physical activities and exercises might help develop neural reserves, which in turn might protect from developing epilepsy.	1
43	Animal studies showed that spontaneous seizures were lower in frequency in animals with pilocarpine, penicillin, pentylenetetrazol, and kainic acid-induced seizures that were submitted to physical exercise.	2
44	Physical activities and exercises were reported to decrease frequency of seizures in women with pharmacologically intractable epilepsy.	2
45	Exhaustive physical activities and exercises did not precipitate seizures in patients with temporal lobe epilepsy.	2
46	Epileptiform discharges decreased in number in patients with juvenile myoclonic epilepsy submitted to cardiopulmonary exercises during exercise compared with those occurring at rest.	2
	3) Benefits of exercise on antiepileptic therapy	
47	Serum levels of AEDs were not decreased to clinically important levels as a result of physical activities and exercises.	2
48	Physical activities and exercises were suggested to improve the effectiveness of AEDs.	2
49	Physical activities and exercises were suggested to reduce adverse effects of AEDs.	2
	4) Benefits of exercise in preventing comorbidities associated with epilepsy	
50	PWE are more vulnerable to mental disorders like psychoses, mood, personality, and behavioral disorders and psychological problems like anxiety, stress, depression, and suicidal ideation. Regular physical activities and exercises are known to improve emotional well-being.	1
51	Physical activities and exercises are known to improve regulation of neurotransmitters like serotonin, noradrenalin, dopamine, glutamate, and GABA.	2
52	In general, PWE who practiced physical activities and exercises on regular basis tended to report less frequent depression. This improvement was independent from age, gender, frequency of seizures, and stressful life events	2
53	Physical activities and exercises were reported to improve mental health state, mood, self-esteem, quality of life, and social integration of PWE.	1
54	Physical activities and exercises reduced overall health complaints such as fatigue and sleep problems in women with pharmacologically intractable epilepsy.	2
55	Obesity and overweight are common among PWE because of AEDs and lack of exercise. Physical activities and exercises can reduce obesity and overweight among PWE.	1
56	Like in healthy people, physical activities and exercises can reduce body fats as well as other modifiable risk factors of diabetes, hypertension, and coronary heart diseases among PWE.	1
57	Physical activities and exercises have the potential to improve cardiovascular fitness of PWE.	1
58	Physical activities and exercises have the potential to increase maximal aerobic and work capacity of PWE.	1
59	PWE are at higher risk of fractures than the general population because of AEDs and sedentary life style. Physical activities and exercises can induce osteoprotection and reduce risk of fractures by improving bone growth and mineral contents in PWE including postmenopausal women.	1
	5) Benefits of exercise in improving quality of life of PWE	
60	In general, physical activities and exercises can promote general health and well-being of PWE.	1
61	PWE who were prohibited from participation in physical activities and exercise reported emotional distress.	1
	6) Psychosocial benefits of exercise for PWE	
62	Exercise and physical activity can improve psychological health of PWE.	1
63	Physical activities and exercises might help PWE cope better with stressful life events. This might reduce the frequency of seizures induced by psychological stress.	2
64	Physical activities and exercises were reported to improve social integration of PWE.	1

AEDs: antiepileptic drugs, EEG: electroencephalogram, GABA: gamma aminobutyric acid, PWE: patients with epilepsy.

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improving quality of life of PWE, and 6) psychosocial benefits of exercise for PWE. Details of these items are shown in Table 3.

4. Discussion

In this study, consensus on a core list of knowledge items that physicians in primary healthcare and CAM specialists need to know on the benefits of exercise for PWE was sought using a formal consensus technique. The literature reported little on what knowledge physicians in primary healthcare and CAM specialists needed to know on the benefits of exercise for PWE. This study reports for the first time a consensus-based list of knowledge items that educators, trainers, and authorities can consult at the time of designing educational and/or training courses or continuing educational interventions to promote knowledge of physicians in primary healthcare and CAM specialists with regard to the benefits of exercise for PWE. This consensus-based core list can be beneficial and might serve as follows: 1) a guide for educators, trainers, or authorities at the time of designing educational or training courses to increase knowledge of physicians in primary healthcare and CAM specialists with regard to the benefits of exercise for PWE, 2) improve provision of healthcare services and support of PWE cared for by physicians in primary healthcare and CAM specialists, 3) expand the role of primary healthcare providers and CAM practitioners in supporting and caring for PWE, and 4) promote congruence in healthcare provision and support while caring for PWE in primary healthcare facilities.

In this study, knowledge items were collected from the scientific literature and supplemented with additional items that were provided by key experts in the domain following in-depth interviews. Interviews were conducted with neurologists, primary healthcare providers, CAM practitioners, exercise and medicine specialists, researchers who conducted studies on the benefits of exercise for PWE, and PWE. The interviewees represented all stakeholders. The initial list of items was sent for review, rating, and feedback from experts and researchers who conducted studies on the benefits of exercise in PWE. This step might have added rigor, relevance, and validity to the knowledge items included in this study.

All key contacts invited for in-depth interviews responded and took part in the study. Moreover, all panel members vote in the first Delphi round. Again, this might have added rigor and validity to our findings. Interviewees, expert researchers, and panel members were of both genders, from different backgrounds, and had long experience in the domain. Again, this diversity might have added validity, strength, and relevance to our findings.

In the present study, the panel members agreed that the majority of physicians in primary healthcare and CAM specialists lacked adequate knowledge and training on the benefits of exercise for PWE. Furthermore, the panel members generally agreed that exercise can be beneficial for PWE in terms of seizure control, improving comorbidities associated with epilepsy, general health of PWE, their reported quality of life, and other psychosocial benefits. Our findings were consistent with those reported elsewhere.

Medical and health school might need to consider educating future physicians and CAM practitioners on the benefits of exercise for PWE. It has been argued that training sessions, scientific conferences and meetings, and training workshops can offer avenues for disseminating the latest findings on the benefits of exercise for PWE [42,43]. Physicians in primary healthcare and CAM specialists might need to consider attending such meetings to share knowledge with other participants and experts in the domain.

Although this manuscript reports findings of a qualitative study, it is noteworthy mentioning that gold standards of adequate knowledge on the benefits of exercise for PWE do not exist. Therefore, formal consensus techniques might offer alternative ways to guide educators, trainers, or authorities on what knowledge items physicians in primary healthcare and CAM specialists might need to know relevant to recommending exercise for PWE, benefits of exercise on prevention of seizures, benefits of exercise on antiepileptic therapy, benefits of exercise in preventing comorbidities associated with epilepsy, benefits of exercise in improving quality of life of PWE, and other psychosocial benefits of exercise for PWE. Probably, using consensus-based core lists might minimize bias, increase transparency, and add relevant, strength and validity to judgmental methods [35].

Probably, physicians in primary healthcare and CAM specialists might need to know the items on which consensus was achieved to include them into the final core list of knowledge items (Table 3). Possession of such items might help physicians in primary healthcare and CAM specialists expand their roles in caring for PWE and providing support to them and their families.

4.1. Limitations of the study

This study has a number of limitations that need to be considered. First, this was a qualitative study using a formal consensus technique. Therefore, findings reported in this study represent the opinions of the panel members who took part in the study. Second, PWE were not included in the panel who voted on the final core list of knowledge items. However, PWE were interviewed in the in-depth interviews, and their opinions and views were exposed. Finally, the size of the panel was not very large. However, it is noteworthy mentioning that there is no agreement on the size of a panel to be used in the Delphi technique [24,35–39,44].

5. Conclusion

In the present study, consensus-based core list of knowledge items that physicians in primary healthcare and CAM specialists need to know on the benefits of exercise for PWE was developed. This consensus-based core list might guide educators, trainers, or authorities while designing educational or training courses to increase knowledge of physicians in primary healthcare and CAM specialists with regard to the benefits of exercise for PWE. Further studies are needed to determine if such consensus-based core list might improve care and well-being of PWE.

Conflict of interest statement

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