


RESEARCH ARTICLE

Actual experience of the training effect of Baduanjin on patients with hemiplegic limb dysfunctions after cerebral infarction: A qualitative study

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Abstract

Aim: To explore the actual experience of training effect of Baduanjin on patients with hemiplegic limb dysfunctions after cerebral infarction through semistructured interviews and promote Baduanjin training application in clinical and community settings.

Design: This qualitative study was conducted using the conventional content analysis approach.

Methods: Twenty-five patients with hemiplegic limb dysfunctions after cerebral infarction were recruited as participants by applying purposive sampling method between September 2017–December 2020 in the physical therapy department of a rehabilitation hospital affiliated with Fujian University of Traditional Chinese Medicine in China. Semistructured interviews were conducted after patients participated in Baduanjin training for 6 weeks. Data were analysed using qualitative content analysis method of Graneheim and Lundman.

Results: Three major themes were identified after analysis, namely improving functions of hemiplegic limbs, improving the condition of the entire body and the feelings of practice. The participants indicated that Baduanjin could improve the limb functions and general conditions of hemiplegic patients. Their experience in practicing Baduanjin was generally positive, and they were willing to continue practicing.

KEYWORDS

Baduanjin, cerebral infarction, limb functional rehabilitation, semistructured interview

1 | INTRODUCTION

Stroke, a common disease that endangers the lives and health of millions of people worldwide, exhibits high morbidity, mortality, disability and recurrence rates. Stroke has become the second leading cause of death worldwide (WHO, 2020) and the primary cause of global dysfunction and disability (Kuriakose, & Xiao, 2020). The incidence of stroke in China

ranks first in the world, with more than 2 million new cases every year (Wu et al., 2019). Nearly 2 million people die from this disease each year (Wang et al., 2019a). Cerebral infarction, also known as ischaemic stroke, accounts for approximately 70%–80% of strokes and is the major subtype of stroke in China (Wang, 2016; Xu, 2016). Hemiplegia is a typical sequela after cerebral infarction (Shi & Wang, 2021). Limb dysfunction caused by hemiplegia is a common dysfunction and serious sequela of

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stroke. Patients experience imbalanced and uncoordinated muscle tone and spasms of different degrees during recovery (Zhang, Yang, Hao, & Liu, 2016). These conditions affect the generation of movement separation and delay the recovery of limb functions.

2 | BACKGROUND

According to traditional Chinese medicine, “Qi deficiency and blood stasis obstructing collateral” is considered an important pathogenesis of the stroke recovery period (Zhang & Xing, 2019); hence, regulating Qi and blood, dredging channels and activating collaterals are its important treatment principles. According to Western medicine, plasticity of brain nerve is the foundation of stroke dysfunction rehabilitation (Hatem et al., 2016). Baduanjin is a method of physical and mental exercise in traditional Chinese medicine that enables the entire body to stretch and regulates Qi and blood through adjusting breath and pitching, bending and stretching of trunk and limbs (Ge et al., 2017). Practicing Baduanjin can change the activity of the cerebral cortex, activate the metabolic demand of neuron circuit and increase blood flow and oxygen supply of each brain area (Ludyga, Gronwald, & Hottenrott, 2016); It can also act as a modulator of the autonomic nervous system, and thus affects the patient's cognitive and motor functions (Zou et al., 2018; Goldbeck et al., 2021). All of these contribute to the improvement of coordination, balance, symmetry and cognition in patients. The results of a systematic review of Baduanjin for limb function rehabilitation after stroke showed that Baduanjin can improve lower limb motor functions, limb balance function, activity of daily living and neurological function defects; Baduanjin has been suggested to promote the rehabilitation of limb functions among stroke patients (Zheng et al., 2017).

The majority of stroke patients cannot be remained in hospital for long-term rehabilitation treatment and generally undergo late-stage rehabilitation at home or in their community. Baduanjin has been favoured by the older people and patients with chronic diseases as a form of fitness activity because of its simple movements and remarkable effects. Moreover, this type of exercise is not limited by space, equipment, weather and other factors. Baduanjin is also highly suitable for stroke patients undergoing limb function rehabilitation (Zheng et al., 2017). However, studies on the actual attitude of stroke patients towards Baduanjin training are lacking. Therefore, a semi-structured interview was conducted in this study to explore the actual experience of the training effect of Baduanjin on patients with hemiplegic limb dysfunctions after cerebral infarction to promote Baduanjin training application in clinical and community settings.

3 | METHODS

3.1 | Design and participants

This qualitative study was performed with a conventional content analysis method. The study's reporting followed the unified criteria for reporting qualitative studies (COREQ).

The purposive sampling method was used to recruit patients with hemiplegia and limb dysfunction following cerebral infarction in the physiotherapy department of the Affiliated Rehabilitation Hospital of Fujian University of Traditional Chinese Medicine from September 2017–December 2020. Inclusion criteria are presented as follows: (1) course of the disease with left/right hemiplegia was more than 2 weeks and <3 months in accordance with diagnostic criteria of hemiplegic limb dysfunction after cerebral infarction; (2) Brunnstrom staging of upper and lower limbs was in stage II–VI; (3) muscle strength of upper and lower limbs was \geq level 3; (4) minimal state examination (MMSE) score \geq 24; (5) 40 years old \leq age \leq 65 years old; (6) vital signs are stable, sane and without problems in comprehension and swallowing; (7) first onset and standing balance \geq level 2; and (8) speaks Mandarin and without speech disorders. Exclusion criteria are presented as follows: (1) in addition to limb motor dysfunction caused by stroke, patients with fractures, rheumatoid arthritis or other joint diseases; (2) patients with other major diseases, such as recent myocardial infarction (in 4 weeks), severe heart failure, liver failure, renal failure and poorly controlled diabetes; (3) patients with recent transient ischaemic attack or mixed stroke; (4) patients with agnosia, cognitive impairment and language impairment; (5) patients with any exercise contraindications; and (6) patients with communication disorders, such as dementia and mental disorders.

The clinical research team included rehabilitation therapist, clinical nurses and university researchers. All of them have extensive experience of research and intervention studies. First, a researcher (trainer), who has been trained in Baduanjin by a famous Chinese traditional martial arts master and passed the examination, organized the participants to watch the Baduanjin teaching video, explained the characteristics of Baduanjin combining physical activity, breathing and psychological adjustment, and analysed the main points and precautions of movements. Second, the participants were instructed to learn Baduanjin face-to-face and one-by-one by the trainer, especially the essentials and details of each movement, and their wrong movements were corrected in time. Subsequently, all participants took part in the Baduanjin training programme for 6 weeks twice a day, with two participants in a group, 20 min each time and 7 days a week. For participants who were discharged home during the intervention period, the trainer followed up by telephone once a day or supervised the participants to carry out Baduanjin rehabilitation training in the WeChat group every day, and asked the them to send the video of Baduanjin training process to the WeChat group and encouraged participants to exchange their practice experience. The data collector supervised and inspected the training process of the trainer, and the quality controller supervised and managed the data collection process of the data collector. An interview was conducted after the six-week programme. The purpose of the study and outline of the interview were explained to participants before starting an interview. Participants voluntarily signed the informed consent form and gave basic personal information.

3.2 | Data collection

Researchers with extensive expertise in qualitative research conducted a 20–40 min face-to-face semistructured interview with each participant in a quiet and undisturbed room in the hospital or at the patient's home. The interview guide with seven open-ended questions developed by the researchers was used for data collection. The entire interview process was documented using a digital voice recorder. The interview was then transcribed verbatim in 24 hours, and non-verbal behaviour of participants was recorded in a notebook. Questions were asked flexibly during the interview in accordance with the participants' answers. Based on the obtained data, the sampling process was repeated until data saturation was reached, at which point no new codes from the participants' experiences appeared. Main questions of the interview guide were as follows:

- How did Baduanjin training affect your limb functions?
- How did your injured limb feel after Baduanjin training?
- How did your healthy limb feel after Baduanjin training?
- How did your physical conditions change after Baduanjin training?
- How did you feel each time you underwent Baduanjin training?
- Did Baduanjin training cause you any pain?
- What are the benefits of undergoing Baduanjin training?

3.3 | Data analysis

Data were examined using the qualitative content analysis method of Graneheim and Lundman (Graneheim & Lundman, 2004; Lämås, Graneheim, & Jacobsson, 2012), which includes manifest and latent content analyses. We regarded each interview text as an "analysis unit" and read the text several times to obtain the full meaning. Sentences that express a specific meaning (i.e. related to the recovery effect of Baduanjin on limb dysfunctions) were searched in "analysis units" to form "meaning units", which were further condensed to form "compressed meaning units." These "compressed meaning units" were subsequently extracted into codes. Similarities and differences of all codes were compared and those with commonality were sorted into categories to form the manifest content. Lastly, we fully considered the sociocultural context of the interview content, repeatedly discussed codes and categories and linked underlying meanings in categories to form themes and establish the latent content.

3.4 | Trustworthiness

In order to strengthening the trustworthiness in this study, the criteria of credibility, dependability, confirmability and transferability were used according to (Graneheim, Lindgren, & Lundman, 2017). All members of the research team had previous experience with Baduanjin exercise, stroke rehabilitation studies and/or qualitative

studies. All research activities were conducted in collaboration with researchers who critically reflected on the data and verified the results from the data to the participants. The final themes were discussed by all of the authors. To enhance the transferability and confirmability, the background of the research was described in detail, and the process and logical trajectory of the abstraction and interpretation of categories and themes were shown through tables in the analytical process.

3.5 | Ethics

All participants gave written informed consent and agreed to take part in the interview after undergoing Baduanjin training. Participants were allowed to withdraw from the study at any time during the course of the study without any negative repercussions. The personal information of participants will remain confidential in any public report on the results of this study. Ethical permission was obtained from the Ethics Committee of the Affiliated Rehabilitation Hospital of Fujian University of Traditional Chinese Medicine where the study was conducted (approval number: 2015KY-020-02).

4 | RESULTS

Twenty-five (14 men and 11 women) participants aged 40–65 years with infarcted hemiplegia and limb dysfunction were interviewed. These participants with different educational levels presented the following occupational statuses: 12 maintained regular jobs, eight were retirees and five were unemployed. Thirteen participants exhibited left hemiplegia, whereas the remaining 12 showed right hemiplegia (Table 1). Three major themes were identified after the analysis, namely improving functions of hemiplegic limbs, improving the condition of the entire body and feelings of practice.

4.1 | Improving functions of hemiplegic limbs

The first theme consists of four categories including improving limb muscle strength, improving limb coordination function, improving balance function and improving joint range of motion (Table 2). Whatever with left or right hemiplegia, participants said that Baduanjin training could enhance the muscle strength of upper and lower limbs and improved their gait. They believed that Baduanjin training could help them stand and walk steadily and walk up and down the stairs smoothly. One participant stated, "I was afraid of the stairs 2 months ago. Although I could go up and down the stairs by holding the handrail, my movement was not very stable, and I was tottering. Now, I basically don't need help, I just do it by myself." (Patient 2). In addition, several participants thought that the rotation function of elbow joint was improved; several participants thought the suppleness and control of the joint became better than before through Baduanjin training.

TABLE 1 Characteristics of participants (n = 25)^a

Variable	Value
Age, year	54 (40–65)
Gender	
Male	14 (56)
Female	11 (44)
Occupation	
National civil servant	1 (4)
Staff	8 (32)
Freelance/self-employed	3 (12)
Retired	8 (32)
Unemployed	5 (20)
Educational level	
Elementary school or below	4 (16)
Junior high school	6 (24)
Senior high school	3 (12)
College and above	12 (48)
Hemiplegic side	
Left	13 (52)
Right	12 (48)
MMSE score	18 (26–30)
Upper limb muscle strength	
Level 3	9 (36)
Level 4	12 (48)
Level 5	4 (16)
Lower limb muscle strength	
Level 3	7 (28)
Level 4	16 (64)
Level 5	2 (8)

^aValues are given as median (range) or number (percentage).

4.2 | Improving the condition of the entire body

Improving the condition of the entire body including increasing physical strength and improving physical functions (Table 3). Participants said that their physical strength recovered slowly, their backs became straight again and their speech became coherent after Baduanjin training. One participant said, “I feel that my physical strength is coming back slowly. My back become straight again.” (Patient 7). Participants also said that Baduanjin training can reduce the incidence of the common cold and dizziness, improve sleep quality and even eyesight. That participant said, “My eyes also see much better than before...Seems eye focus speed is faster than before.” (Patient 13).

4.3 | Feelings of practices

The third theme presented the following feelings regarding the practice of Baduanjin: difficult to practice in the beginning, relaxing

and enjoyable after training and easy to continue (Table 4). The participants indicated that they experienced some difficulty during the initial stage of practicing Baduanjin due to the lack of strength of the affected limbs and the limited range of motion of joints. The affected limbs were painful and easier to be tired than the healthy limbs. However, they soon felt relaxed and enjoyed the exercise after continuously practicing Baduanjin 1–2 weeks. One participant mentioned, “I really like to continue practice. I felt as if my mental outlook was different... Seems a feeling of spiritual renewal...” (Patient 4). In addition, the participants believed that Baduanjin was easy to follow. They were willing to continue because they felt the health benefits of practicing. They described Baduanjin as simple, convenient, easy to follow and remember, better effects than slow walking, and unlimited by site.

5 | DISCUSSION

Limb dysfunction is a common functional disorder that increases the difficulty in daily living, reduces the quality of life of patients and poses a heavy burden on patients, their family and the society. Therefore, effectively improving limb functions of stroke patients is particularly important. Participants of this study believed that Baduanjin training can improve limb muscle strength, limb coordination function, balance function and joint range of motion and consequently enhance hemiplegic limb functions and promote the rehabilitation of limb dysfunctions in patients with cerebral infarction and hemiplegia.

This finding is consistent with the results in the literature, thereby indicating that regular Baduanjin training can improve limb motor, balance and neurological function defects of stroke patients whilst enhancing their daily lives (Zheng et al., 2017). Studies have shown that Baduanjin is a safe auxiliary rehabilitation method with significant advantages of improving the balance function of stroke patients; Baduanjin exercise can effectively improve the motor function of upper and lower limbs and strength of legs; symmetrical posture and coordinated movements involved in the Baduanjin routine requires the practitioner to consider the waist as the axis and change the centre of gravity by moving arms, legs and torso to maintain sustainable balance (Cui, Wang, & Yang, 2018; Yuen, Ouyang, Miller, & Pang, 2021; Zou, Wang, Chen, & Wang, 2018). In addition, Baduanjin exercise includes activities for joints and ligaments of the body. Regular exercise can promote the generation and transportation of Qi in the body, dredge meridians and smooth joints, enhance the limb mobility of the body, promote blood circulation, nourish the entire body and increase muscle strength (Xiong, 2018). Studies have shown that long-term aerobic exercise may weaken brain tissue atrophy in areas related to motor control through brain synaptic plasticity and neurogenesis (Tseng et al., 2013). Baduanjin is a kind of aerobic exercise that can remarkably enhance the response ability of the nervous system and coordination between neuromuscles after exercise

TABLE 2 Categories, codes and meaning units included in the first theme (improving functions of hemiplegic limbs)

Theme	Category	Code	Meaning unit
Improving functions of hemiplegic limbs	Improve limb muscle strength	Increase the strength of upper limbs	"By practicing Baduanjin, I can hold a cup of tea using the affected hand (smile)." (Patient 14)
		Enhance the strength of lower limbs	"In the past, when I performed the second step of Baduanjin, my legs had to be dragged back like this... but now, they can be lifted, they are basically no longer dragging on the floor." (Patient 3)
	Improve limb coordination function	Improve gait	"This month, I felt that my arms and legs were working well together, so I could walk continuously and stably." (Patient 7)
	Improve balance function	Can stand stably	"I used to sit when I was nursed and washed in the hospital because of the fear of falling down. Now, I can stand for a shower and even rub my back with a towel." (Patient 9)
		Can go up and down stairs	"I was afraid of the stairs 2 months ago. Although I could go up and down the stairs by holding the handrail, my movement was not very stable, and I was tottering. Now, I basically do not need help, I just do it by myself." (Patient 2)
	Improve joint range of motion	Improve the rotation function of the elbow joint	"I can rotate my forearm after practicing Baduanjin." (Patient 13)
		Improve joint control ability	"With practice, my fingers became more flexible, they are no longer stiff." (Patient 24)
		Improve joint suppleness	"In the past, I could not touch the floor when I bended over, but now, I can do it after Baduanjin practice." (Patient 18)

TABLE 3 Categories, codes and meaning units included in the second theme (improving the condition of the entire body)

Theme	Category	Code	Meaning unit
Improving the condition of the entire body	Increase physical strength	Physical strength regression	"I feel that my physical strength is coming back slowly. My back become straight again." (Patient 7)
		Speech becomes coherent	"In the past, I had to breathe in when saying a long sentence. Now, my talking is close to normal." (Patient 15)
	Improve physical function	Reduce incidents of the common cold	"I practiced Baduanjin when I felt comfortable. Then I found it's not easy to catch a cold after 2 months." (Patient 4)
		Improve eyesight	"My eyes also see much better than before... Seems eye focus speed is faster than before." (Patient 13)
		Improve sleep quality	"Through Baduanjin exercise, I feel that I sleep more comfortably during this period." (Patient 9)
Reduce dizziness	"After practicing Baduanjin, my <i>qi</i> and blood have improved and dizziness was reduced." (Patient 17)		

(Zhou, 2003). Therefore, Baduanjin exercise can improve the limb function of stroke patients with hemiplegia.

The majority of survivors after cerebral infarction suffer from different degrees of functional impairments and complications that seriously affect their daily physical functions and activities and reduce their quality of life (Jiang, 2017). Participants in this study believed that practicing Baduanjin can improve their general condition by improving their physical strength, function, vision and sleep quality as well as reducing the occurrence of the common cold and dizziness. This finding is similar to the results of Zheng (Zheng et al., 2015), which suggested that Baduanjin qigong can improve the

general state of the older people in the community by promoting the function of multiple systems or organs, enhancing their immunity, relaxing their bodies and improving their confidence. Many quantitative studies have also shown that practicing Baduanjin can improve the physical function of adults (Li et al., 2014; Zhao, Sun, Xiong, & Zheng, 2019), sleep quality (Wei & Zhang, 2019; Xiong et al., 2018; Zheng et al., 2019), human immunity and blood circulation in the neck and brain (Cao, 2020) as well as prevent vision loss. Although Baduanjin only involves eight different postures, the emphasis of each move is different to ensure that viscera of the body are conditioned accordingly and all parts are exercised (Zheng et al., 2015).

TABLE 4 Categories, codes and meaning units included in the third theme (feeling of practice)

Theme	Category	Code	Meaning unit
Feelings of practice	Difficult to practice in the beginning	Tiredness	"My left foot had little strength due to hemiplegia. I felt more tired at the beginning of practicing." (Patient 8)
		Pain on the injured side	"When I started practicing Baduanjin, the injured hand on this side was more painful." (Patient 16)
	Relaxing and enjoyable after training 1–2 weeks	Feel body relaxed after practice 1–2 weeks	"I become easier to sweat I am practicing after practicing 1–2 weeks. Usually I took a cup of tea and then took a shower after training. At that time I felt more relaxed and more energetic." (Patient 8)
		Enjoy the training	"I do enjoy the training. I feel the effect is more obvious than slow walking. My injured hand soon gets heat up when practicing 2 weeks." (Patient 16)
	Easy to continue	Willing to continue practice	"I really like to continue practice. I felt as if my mental outlook was different... Seems a feeling of spiritual renewal..." (Patient 4)
		Easy to follow and remember	"A total of eight movements... and forgetting one of them is unlikely because you will continue with the second move after you play, and then the entire action will be completed." (Patient 11)
	Unlimited by site	"Baduanjin does not need too much space. It can be done indoors and outdoors." (Patient 11)	

Actions in Baduanjin can increase the range of movement of the neck and activate eye muscles (Cao, 2020) whilst stretching muscles and tendons of the entire body to dredge channels and collaterals and regulate the qi and blood (Xiong, 2018) given that they stimulate corresponding acupoints and the cervical vertebrae involved. Baduanjin combined with sports and psychological regulation can dredge meridians and collaterals of the entire body, enhance physiological functions of soft tissues in each part of the body and improve neurohumoral regulation, human immunity and sleep quality (Cao, 2020; Xiong et al., 2018). Therefore, Baduanjin exercise can improve the physical function and strength of patients according to its physiological function.

Pain is a common problem after a stroke. Patients in a qualitative study reported that shoulder pain after stroke seriously affects their mood, activities and participation in daily life (Lindgren, Gard, & Brogårdh, 2018). Therefore, stroke has caused adverse effects on the physiology, psychology, daily life and social participation of patients. Correct and effective exercise methods are needed to improve the quality of life and promote functional rehabilitation and psychological adjustment of patients with cerebral infarction. Participants of this study believed that although some difficulties, such as feeling tired and suffering from side pain, exist in the initial stage of practicing Baduanjin, they feel relaxed and happy and can easily persist after performing the exercise. The pain felt on the injured side of participants at the beginning of practicing Baduanjin may be related to the limitation of body movement and decreased activity ability caused by poststroke pain, joint contracture and dysfunction. Stroke survivors easily feel tired at the beginning of training given that they generally demonstrate symptoms of fatigue (Cumming, Packer, Kramer, & English, 2016).

In addition, various functional disorders caused by stroke can easily lead to negative emotions, such as anxiety, depression and frustration (Wang et al., 2019b; Xue, Lu, & Xue, 2021). Zheng (Zheng et al., 2015) demonstrated that Baduanjin qigong can relax the body

of the older people in the community and improve their mood and confidence whilst most respondents believed that 1 hr of Baduanjin training is a suitable and enjoyable daily exercise for the older people. Quantitative studies have also shown that Baduanjin exercise can promote not only the physiological function of the older people but also improve their mood, self-confidence and self-esteem (Yang, Li, Fang, & Wu, 2019; Zheng et al., 2019). All movements involved in Baduanjin are gentle and relaxing and require practitioners to maintain a calm heart and mind whilst breathing harmoniously during the exercise to achieve the optimal state of physical and mental relaxation; Baduanjin helps reduce the tension of the sympathetic nervous system and improve the mood of patients (Chen, 2015; Xiong et al., 2018). Metabolism activities of the body tend to be flat and fatigue gradually reduces under the state of mental relaxation (Chen, 2015). In addition, Baduanjin exercise is easy to follow because Baduanjin presents advantages of easy to learn, moderate intensity, wide range of people and absence of economic cost and site restrictions (Xiong et al., 2018) and participants in this study can feel its health benefits. Furthermore, a big advantage in terms of costs of Baduanjin is that the training can be monitored through telemedicine and telerehabilitation for the patients in the long term after an intensive training (Ferraris et al., 2021). In order to more comprehensively and objectively reflect the short-term and long-term effects of Baduanjin exercise on stroke patients, experimental studies with instrumental analysis and telemedicine monitoring to evaluate Baduanjin efficacy can be carried out in the future (Bigoni et al., 2021).

5.1 | Limitation

The stroke patients in this study only practiced for 6 weeks, so the long-term effects and long-term training feelings of Baduanjin practicing should be followed up. Moreover, the results of this

investigation could not reflect the overall view and experience of Chinese stroke hemiplegic patients on the effect of Baduanjin training because all interviewees were recruited from the same hospital.

6 | CONCLUSION

This study revealed the real experience of the training effect of Baduanjin in patients with hemiplegic limb dysfunction after cerebral infarction in a third-class hospital in Fuzhou. Interviewees believed that Baduanjin can improve limb functions and general conditions of hemiplegic patients. Participants generally demonstrated a positive response towards the practice of Baduanjin. Although difficult in the beginning, participants feel relaxed and happy after practicing Baduanjin and indicate their willingness to continue because of its positive effect on the body and ease of learning. Therefore, Baduanjin training is a potential and feasible physical and mental exercise method for promoting the physical and mental health of hemiplegic patients with cerebral infarction and a very suitable rehabilitation exercise project for patients after hospital discharge. Baduanjin can be widely used in clinical and community settings to promote the recovery of patients with hemiplegic limb dysfunctions after cerebral infarction.

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CONFLICT OF INTEREST

Authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data available on request from the authors. The data that support the findings of this study are available from the corresponding author upon reasonable request.

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