

Comparative Effectiveness of Yoga and Exercise on Subjective Well-Being and Emotional Regulation for Elderly in China: A Randomized Controlled Trial

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ABSTRACT

This research aimed to compare the mental effects of yoga and exercise on retired elders: a 3-arm randomized controlled trial (baseline, 12-week-interventions, and 24-week- intervention) on subjective well-being and emotional regulation of Chinese retired elders. Outcomes were Subjective Well-Being Scale (SWBS) to measure subjective well-being, and Emotional Regulation Self-Efficacy Scale (ERSES) to measure emotional regulation. The findings evaluated at baseline, baseline, 12-week, and 24-week. As the result, compared with exercise, yoga exercise can improve more emotional regulation and the subjective well-being of Chinese retired elders. Yoga can accelerate the transformation of specific physical meaning into more profound mental experience, such as the subjective well-being and emotional regulation in Chinese retired elders. This study provides empirical evidence that yoga is an effective practice for the retired elderly to enhance their subjective well-being and emotional regulation. Such method can recommend for the elderly in China where the population of the elderly is growing currently.

Keywords: *Mental effects of Yoga, Retired elderly, Subjective well-being, Emotional regulation, Yoga intervention, Exercise intervention*

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Highlights of this paper:

- This study provides empirical evidence that yoga is an effective practice for the retired elderly to enhance their subjective well-being and emotional regulation.
- Such practice can be recommended for elderly in China where the population of elderly is growing currently.

1. INTRODUCTION

1.1. Chinese Elderly and Yoga

As the demographics of the Chinese population shifts to an increase in the number of retired elders. The resulting mental health problems of Chinese elderly have also received more and more attention. Yoga has been recommended as a good way to exercise for elderly, which is beneficial for the elder's psychical health (Galantino et al., 2012; Melville, Chang, Colagiuri, Marshall, & Cheema, 2012).

Besides, yoga is good for elder's psychological health, which can not only restore harmony within the mind-body (Benedek, Petra, Leneemanue, & Ferenckö, 2016; Galantino et al., 2012; Greendale et al., 2012; Schweig, 2007) but could also engage the mind by bringing an increased awareness to thought and feeling (Gruver, Hudson, & Sempowski, 2007; Milte & Crotty, 2014; Patel, Newstead, & Ferrer, 2012). In parallel with the growing popularity of yoga, a growing body study on the behavioral and neurophysiological effects of yoga has begun to explore whether yoga can improve mood, decrease stress, and affect various cognitive function in both youth and retired older adult population groups (Loudon, Barnett, Piller, Immink, & Williams, 2014; Sodhi, Singh, & Bery, 2014; Sproda, Fernandez, Janelsins, Pepponec, & Atkinsd, 2015).

The researches on elders' yoga practice effect mainly focused on physical health, such as strength and flexibility (Gonçalves, de Souza Vale, Barata, Varejão, & Dantas, 2011; Patel et al., 2012) as well as mental health like depression and anxiety (Satyapriya, Nagarathna, Padmalatha, & Nagendra, 2013; Stathokostas, Little, Vandervoort, & Paterson, 2012).

1.2. Subjective Well-Being

Subjective well-being (SWB) is composed of people's evaluations of their lives, including pleasant effect, infrequent unpleasant affect and life satisfaction (Daniels, 2000; Diener, Oishi, & Lucas, 2003; Diener & Lucas, 2000). There has found a strong connection between yoga practice and subjective well-being (Balasubramaniam, Telles, & Doraiswamy, 2012; Benedek et al., 2016; Hariprasad et al., 2013; Shahidi et al., 2011). Some empirical studies have shown that with regular practice of yoga, the level of subjective well-being is higher, which can find in many cross-sectional and longitudinal studies (Hadi & Hadi, 2007; Hartfiel, Havenhand, Khalsa, Clarke, & Krayner, 2011; Ross & Thomas, 2010).

In research, Benedek et al. chose healthy adults practicing yoga, while in the yoga practice invention, all participants would complete scales about subjective well-being in different period. And the result showed that the weekly frequency of yoga practice enhances subjective well-being (Benedek et al., 2016).

In detail, the positive mental effects of yoga on healthy adults is mainly by increasing their positive emotion (like calmness, enthusiasm, mental harmony and so on), decreasing their negative emotion, such as anxiety and depression (Benedek et al., 2016; Hartfiel et al., 2011). That is vital for improving one's subjective well-being (Daniels, 2000).

However, if the weekly frequency of yoga practice enhances subjective well-being on Chinese retired elderly remained unanswered. How to improve the subjective well-being is a heated discussion among the Chinese retired

elderly, that why we chose yoga as an invention to text if subjective well-being could be enhanced like a healthy adult (Benedek et al., 2016).

1.3. Emotional Regulation

Emotion Regulation efficacy can be explained from three aspects: the ability to manage positive emotions and negative emotions, the ability of individuals to recognize the emotional state of others and the ability to understand others feelings about themselves (Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003).

Later, Caprara et al. proposed the concept of emotional regulation of self-efficacy, that is, whether an individual can effectively regulate the self-confidence of their emotional state (Caprara et al., 2008).

There is some research on Chinese elderly emotional regulation. Emotional status of the community empty-nest elderly in NanChang (China) was not good, and depression rate was higher than the rate of anxiety significantly (Sun, 2015). Sun (2015) reported using Multidimensional psychological nursing intervention (such as Reminiscence Therapy, Narrative Therapy) on the emotional condition of the community empty-nest elderly in NanChang could improve emotional status.

Meanwhile, research on Chinese disabled elderly suggested that cognitive reappraisal group counseling can effectively improve emotion regulation strategy of nursing assistants caring (Feng, Shen, & Ren, 2018). The research on Chinese retired elderly's emotional regulation is few. As we know, yoga improving symptoms of depression, anxiety and emotional regulation (Shapiro et al., 2007) so we choose yoga as an invention to improve Chinese retired elder's emotional regulation.

1.4. Research Questions

This study conducts a randomized controlled trial to investigate the comparative effectiveness of yoga and exercise on subjective well-being and emotional regulation for Chinese retired elderly.

1.5. Objectives

(1) Testing the independent outcomes of yoga and exercise on subjective well-being and emotional regulation for Chinese retired elderly.

(2) Comparing the similar and different efficacy of yoga and exercise interventions on subjective well-being and emotional regulation for Chinese retired elderly.

1.6. Hypotheses

(1) Yoga group is more efficient than the no-intervention control group in improving subjective well-being and emotion regulation.

(2) Exercise group is more productive than the no-intervention control group in improving subjective well-being and emotion regulation.

(3) Yoga group is more productive than the exercise group in improving subjective well-being and emotion regulation.

(4) Subjective well-being and emotion regulation levels of yoga and exercise groups at 12-week will be higher than that at baseline, and levels at 24-week are higher than that at 12-week.

2. RESEARCH METHODOLOGY: STUDY DESIGN

This study will perform 3 (yoga, exercise, control group) × 2 (time: at baseline, at 12-week, at 24-week) analyses. A non-blind, 3-arm randomized controlled trial with wait-list control design will be used. Eligible participants will be randomized into (a) yoga, (b) exercise or, (c) wait-list control groups, on a 1:1:1 basis. The sample size was estimated at 60 participants (20 elderly in each group). Three assessment phases will be carried out for all groups at three-time points: (a) baseline (T₀), (b) 12th week (post-intervention time-point, T₁), and (c) 24th week (maintenance time-point, T₂). Figure 1 illustrates the research process.

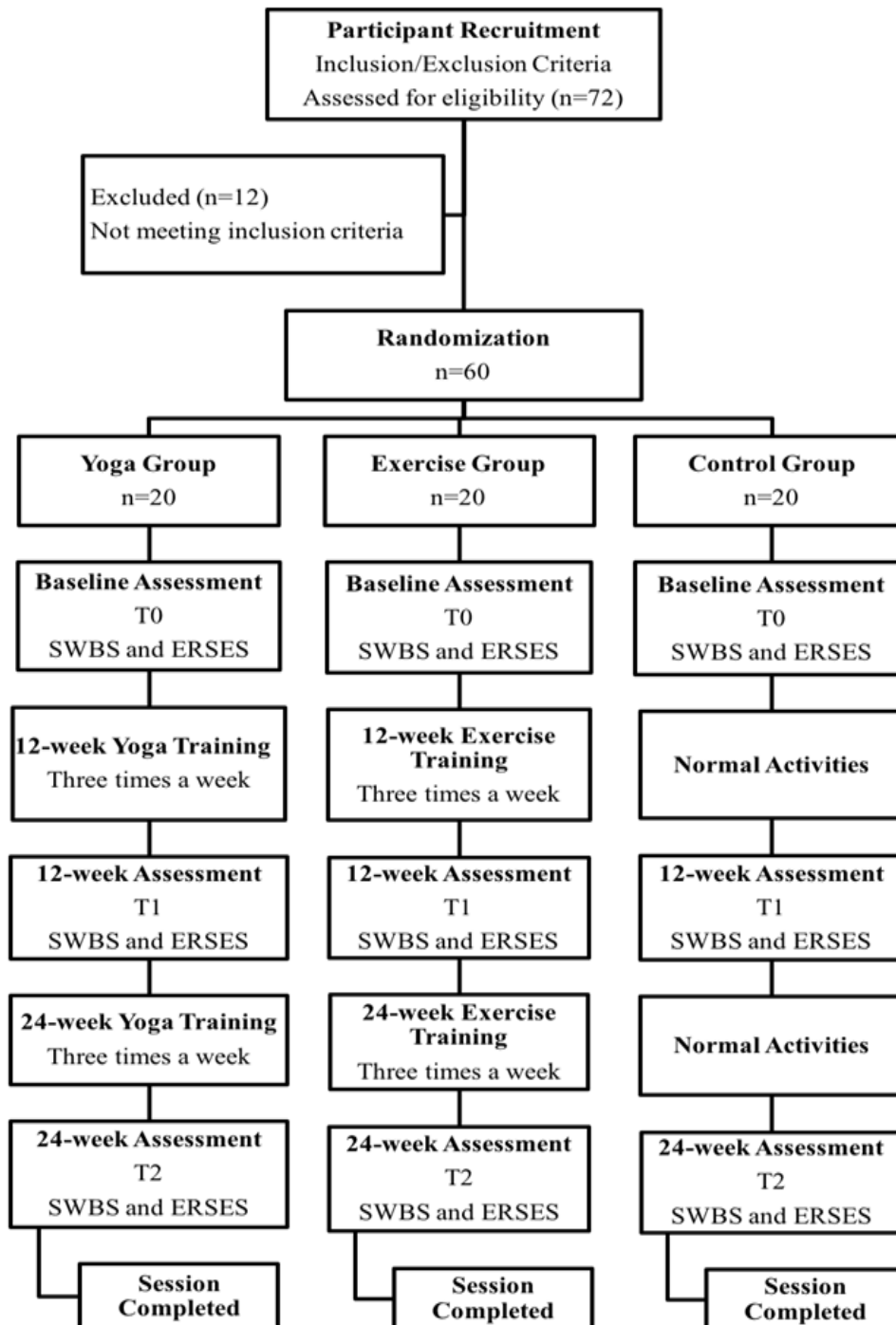


Figure-1. Flow diagram of randomized controlled trial

2.1. Intervention

One researcher (the primary investigator) is a certified registered yoga instructor with six years of international yoga teaching experience acquiring extensive accreditation. The principal investigator is also an instructor in Yoga Studio for four years, teaching yoga class including Hatha yoga, Yin yoga, and Flow yoga.

The instructor offered specialized yoga program for retired elderly to the intervention group three times per week, in their dancing rooms. The duration of yoga class is 50-min, as can be seen in Figure 2.

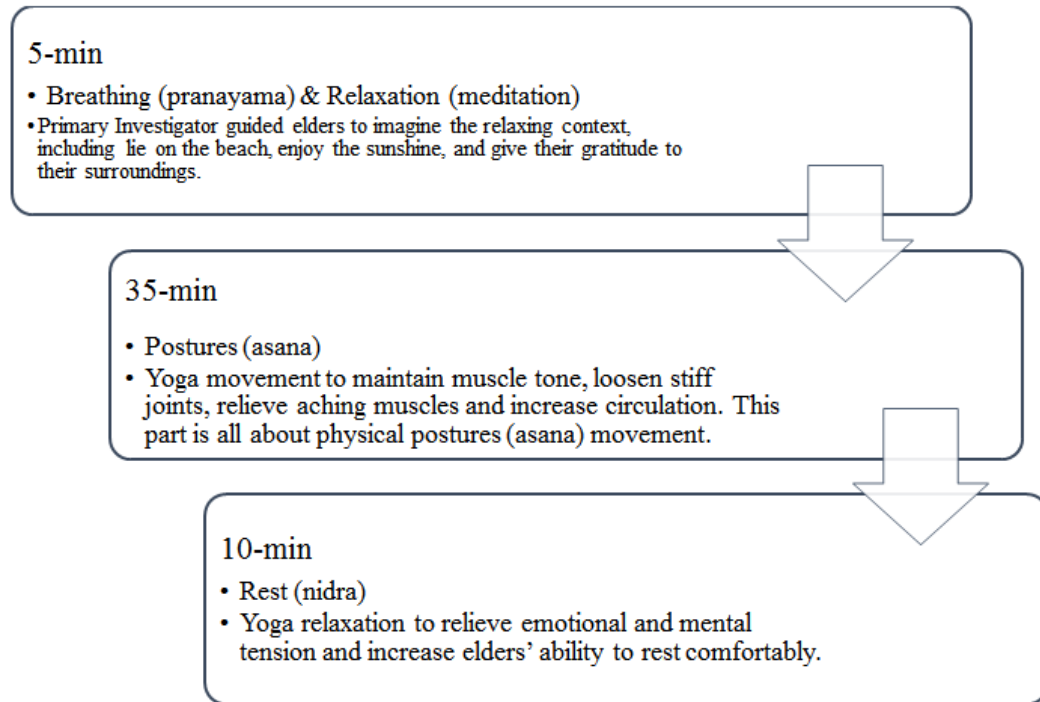


Figure-2. The step yoga class.

In both yoga and exercise groups, a 50-min exercise class would be held three times per week for 24 consecutive. The wait-list control group received standard care and activities with no yoga instruction, and did not have access to the other exercise either.

2.2. Participant

At the 1982 “World Congress on Aging” in Vienna, because of the increasing aging of the population in the world, the standard for dividing the elderly population was adjusted from the original 65 years old to 60 years old and above (thus forming 60 and 65 years old Statistical caliber) (Chen, Jin, & Wang, 2008). China’s basic policy for the formulation of old age policy is that women are over 55 years old, and men are over 60 years old (Wu, 2010). At the same time, whether they can retire is determined based on this age limit. Therefore, in this study, the research object is the urban retired young people around 60 years old. The elderly surveyed by this institute are all retired elderly who have worked in government departments. After retirement, there is a certain pension and social security.

The researchers have worked a relationship with the key staff at the Retirement Center in the city of Urumqi in XinJiang province (China). One researcher is working in the Yoga Studio for years. The Retirement Center not only provides administrative support, but also space for exercise and yoga classes. Yoga classes took in Retirement Center’s dancing rooms.

Researcher will screen the eligibility of interested elderly. Eligibility criteria will include: (1) Chinese-speaking

elderly aged over 55-year-old; (2) stable medical conditions, participation permission from care providers; (3) no serious bone, joint or other health conditions that restrict movement practices; (4) no current or prior diagnosis of any neurological or mental health issue in the past three months; (5) able to provide written informed consent. Before the start of the study, all participants gave their informed consent and required to sign consent and formed they were free to remove themselves from the study without any negative repercussions.

After all informed consent was received, eligible participants will then be randomized into one of the three treatment conditions, and baseline data collection will be arranged at least one week before the commencement of group programs. The demographic characteristics of the participants were presented in Table 1.

Table-1. Demographic Characteristic of Participants ($M \pm SD$).

	Yoga (N=20)	Exercise (N=20)	Control (N=20)
Age	62 (3.43)	62.5 (3.65)	62(3.25)
Gender	16 females	14 females	15 females
	4 male	6 males	5 males
Education (Year)	15.25 (0.75)	15.15 (0.63)	15.11 (0.55)

2.3. Outcome Measurement

2.3.1. Subjective Well-Being Scale (SWBS) (20-item)

In this study, we choose The Subjective Well-being Scale (SWBS) Chinese version, which was made by Kammann & Flet and revised by Wong (2010). Subjective well-being scale consists of 20 items and three factors, which are namely life satisfaction, positive emotion and negative emotion. Likert's 5 points (from "1 = very inconsistent" to "5 = very consistent") were used in the scale. The measured α coefficients are: life satisfaction 0.76, positive emotion 0.79, negative emotion 0.78, total table 0.72. The total score is the sum of the scores of the items. A higher total score indicates subjective.

2.4. Emotional Regulation Self-Efficacy Scale (ERSES) (17-item)

The Chinese scale of self-efficacy in emotion regulation of Caprara et al. (2008) was revised by Wang, Dou, and Liu (2013). The revised scale consists of 17 items, which are respectively management happiness / excitement emotion efficacy, expression pride emotion efficacy, management anger / anger emotion efficacy, management depression / pain emotion efficacy and management guilt / shame emotion efficacy. The first two factors constitute the high-level factor "expressing positive emotional efficacy", and the last three factors constitute the high-level factor "managing negative emotional efficacy". Likert's 5 points (from "1 = very inconsistent" to "5 = very consistent") were used in the scale. The higher the score was, the higher the self-efficacy of emotion regulation was.

The scale's internal consistency reliability goes between 0.653 and 0.864, the split-half reliability ranges from 0.

602 to 0.740, and the construct reliability ranges from 0.709 to 0.772. All item- total correlations indicate the

statistical significance, and the CR values are up to the significant levels, and the confirmative factor analysis

supports the second order five factors model (Wang et al., 2013).

3. RESULTS

To compare every factor defined above by time, pair sample t-test was performed in this study Table 2. The result showed that Subjective Well-Being was significantly difference in both Yoga and Exercise groups overtime at

0.001 levels. It indicated that yoga can improve Subjective Well-Being from T0 to T1 (t=14.42, p<.001, Mean: 14.05, SD: 4.36), from T1 to T2 (t=16.69, p<.001, Mean: 15.20, SD: 4.07), and from T0 to T2 (t=25.77, p<.001, Mean: 29.25, SD: 5.08). Exercise also can improve Subjective Well-Being from T0 to T1 (t=11.93, p<.001, Mean: 10.85, SD: 4.07), from T1 to T2 (t=15.03, p<.001, Mean: 6.25, SD: 1.86), and from T0 to T2 (t=16.88, p<.001, Mean: 17.10, SD: 4.53). It also indicated that yoga can improve the higher level of Subjective Well-Being than exercise during the same period from the data. The result displayed that Emotional Regulation was significantly difference in both Yoga and Exercise groups overtime at 0.001 levels. It can see that yoga can increase Emotional Regulation from T0 to T1 (t=12.92, p<.001, Mean: 19.15, SD: 6.63), from T1 to T2 (t=40.90, p<.001, Mean: 4.30, SD: .47), and from T0 to T2 (t=16.30, p<.001, Mean: 23.45, SD: 6.44). Exercise can improve Emotional Regulation from T0 to T1 (t=11.97, p<.001, Mean: 17.70, SD: 6.61), from T1 to T2 (t=30.25, p<.001, Mean: 3.40, SD: .50), and from T0 to T2 (t=14.92, p<.001, Mean: 21.10, SD: 6.32). It also implied that yoga can increase the higher level of Emotional Regulation than exercise during the same period from the data.

Table-2. Paired-samples test result by time.

Scale	Group	Time	Mean	SD	t
Subjective Well-Being	Yoga	T1-T0	14.05	4.36	14.42***
		T2-T1	15.20	4.07	16.69***
		T2-T0	29.25	5.08	25.77***
	Exercise	T1-T0	10.85	4.07	11.93***
		T2-T1	6.25	1.86	15.03***
		T2-T0	17.10	4.53	16.88***
	Control	T1-T0	.90	2.67	1.51
		T2-T1	.60	1.67	1.61
		T2-T0	1.50	3.47	1.93
Emotional Regulation	Yoga	T1-T0	19.15	6.63	12.92***
		T2-T1	4.30	.47	40.90***
		T2-T0	23.45	6.44	16.30***
	Exercise	T1-T0	17.70	6.61	11.97***
		T2-T1	3.40	.50	30.25***
		T2-T0	21.10	6.32	14.92***
	Control	T1-T0	.05	1.10	.20
		T2-T1	.85	2.98	1.28
		T2-T0	.90	2.25	1.79

Note: *p < 0.05, **p < 0.01, ***p < 0.001.

It can conclude that both yoga and exercise can improve Subjective Well-Being and Emotional Regulation on Chinese elderly over time, and the longer practice time, the higher scale scores. However, there was no significant difference in the Control group, implying that the score of Subjective Well-Being and Emotional Regulation on Chinese elderly will not increase over time. Details of descriptive statistics for Subjective Well-Being and Emotional Regulation of participants in different groups at T0, T1, and T2 have been depicted in Figure 3 & 4 respectively.

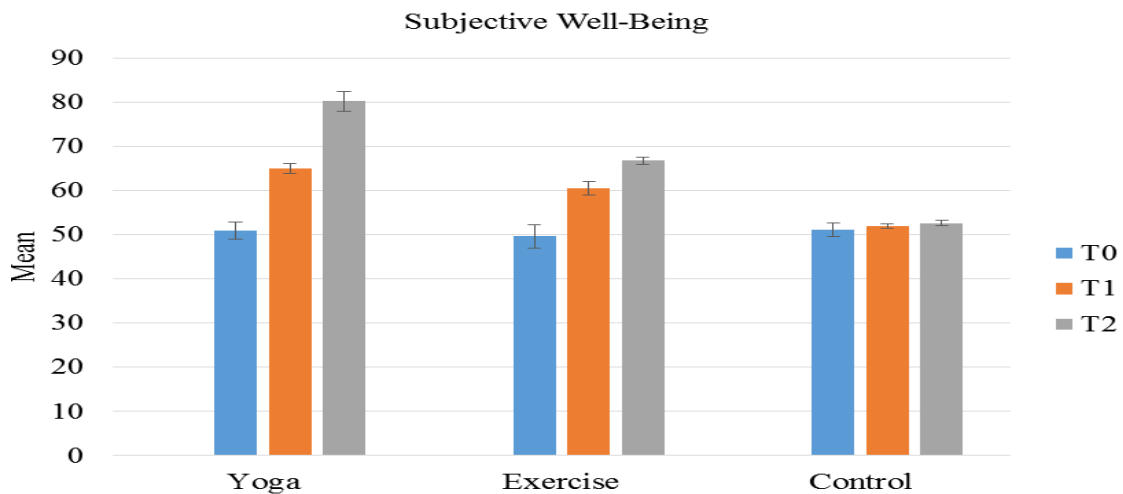
One-way ANOVA with PostHoc was performed in this study Table 3 to compare every factor defined above by

group. The Subjective Well-Being ($F=0.65, p > .05$) and Emotional Regulation ($F=0.00, p > .05$) of three groups have no significant difference at T0. The result showed that Subjective Well-Being of T1 ($F=146.56, p < .001$) and T2 ($F=424.32, p < .001$) was significant different in different groups at 0.001 level. It indicated that Chinese elderly in Yoga group had higher level of Subjective Well-Being than that in both Exercise group and Control group at T1 (Mean: 65.00 vs 60.50 vs 52.00, SD: 2.45 vs 3.28 vs 1.03) and T2 (Mean: 80.20 vs 66.75 vs 52.60, SD: 4.76 vs 1.62 vs 1.27). The result showed that Emotional Regulation of T1 ($F=140.37, p < .001$) and T2 ($F=138.33, p < .001$) was significantly difference in different groups at 0.001 level. It indicated that Chinese elderly in Yoga group had higher level of Emotional Regulation than that in both Exercise group and Control group at T1 (Mean: 121.30 vs 119.95 vs 102.15, SD: .47 vs .39 vs 6.96) and T2 (Mean: 125.60 vs 123.35 vs 103.00, SD: .60 vs .59 vs 8.16).

Table-3. ANOVA-test result of scales by group.

Scale	Time	Group	Mean	SD	F-test
Subjective Well-Being	T0	Yoga	50.95	4.08	0.65
		Exercise	49.65	5.72	
		Control	51.10	3.09	
	T1	Yoga	65.00	2.45	146.56***
		Exercise	60.50	3.28	
		Control	52.00	1.03	
	T2	Yoga	80.20	4.76	424.32***
		Exercise	66.75	1.62	
		Control	52.60	1.27	
Emotional Regulation	T0	Yoga	102.15	6.96	0.00
		Exercise	102.25	6.83	
		Control	102.10	7.06	
	T1	Yoga	121.30	.47	140.37***
		Exercise	119.95	.39	
		Control	102.15	6.96	
	T2	Yoga	125.60	.60	138.33***
		Exercise	123.35	.59	
		Control	103.00	8.16	

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.



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Figure-3. Mean differences for Subjective Well-Being in different groups. The error bars represent the standard deviation.

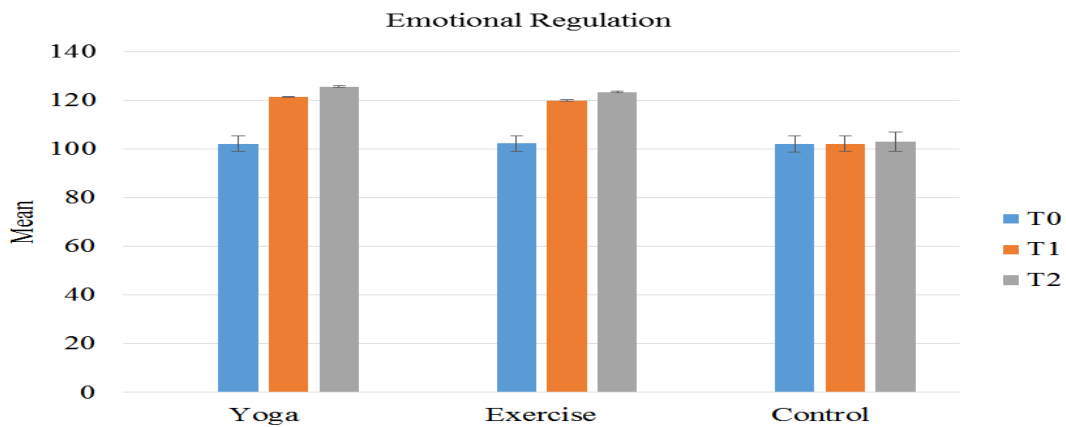


Figure-4. Mean differences for Emotional Regulation in different groups. The error bars represent the standard deviation.

4. DISCUSSION

4.1. The Effect of Yoga on Subjective Well-Being

The findings of this study show that the retired elderly in China who practiced yoga and exercise had significantly increased Subjective Well-being when compared with elders who were in the control group, yoga group improve more Subjective Well-being of Chinese elderly than exercise group.

The results of this study are consistent with those of Shirley et al. (2019) who randomly divided 419 patients with chronic diseases into a yoga practice intervention group and a non-yoga practice control group. Their results found that yoga can improve the patient's subjective well-being.

There are three factors of yoga interconnected with the effect of people's subjective well-being, which are pranayama, asana and nidra (Butzer, Bury, Telles, & Khalsa, 2016).

On yoga class, participants took yoga breathing, postures, relaxation and meditation; these influence mind-body awareness, self-regulation, and physical fitness (Butzer et al., 2016).

There are some reasons that yoga can enhance subjective well-being of the elderly. Firstly, as an essential part of yoga, breathing (pranayama) can control one's mind (Muktibodhananda, 2002; Ramdev, 2007).

The regulation of yoga breathing result in psychological changes by enhancing the vagus nerve, while the function of the vagus nerve is regulating psychological health as it mentioned in a model named the Genomics Environmental vagus Nerve Social Interaction Allostatic regulation Longevity (GENIAL) (Kemp, 2017; Telles & Raghavendra, 2011). Kemp suggested that vagus nerve is a method to regulate multisystem pathways. That explains yoga breathing can influence mental health.

Pranayama enhances the elderly's ability to activate the vagus nerve (Telles & Raghavendra, 2011) the vagus nerve is a method that can influence mental health (Kemp, 2017). Therefore, yoga pranayama increased levels of subjective well-being, on the retired elderly who practiced yoga compared with exercise and control group, mainly via activate the connection between breathing and vagus nerve.

Secondly, the practice of yoga has been shown to improve the sense of the internal control of the body and mind (Impett, Daubemier, & Hirschman, 2006). Self-Determination theory developed by Deci and Ryan (2008)

suggested that feeling of self-control could motivate an individual's achievement, fulfillment and enhance one's subjective well-being.

They emphasize that internal sources of control and motivation for oneself could enhance one's wellbeing in their life. Yoga, like yoga breathing, yoga postures and yoga meditation is a way to increase one's awareness and the control ability of one's body (Muktibodhananda, 2002; Ramdev, 2007). That could explain yoga practice increase subjective well-being by increase the elder's control ability in both mind and body.

The factors that yoga practice positively influence one's subjective well-being include the aspects of hedonic (Clarke et al., 2011). Hedonic and eudemonic are aspects of psychological well-being (Clarke et al., 2011). In yoga practicing, the feeling of contentment, joy and happiness is necessary for yoga postures (asanas), yoga breathing (pranayama) and meditation (Ramdev, 2007) while contentment, joy and happiness are elements of the hedonic (Clarke et al., 2011).

As it is mentioned in the traditional yoga practice description, participants could reach the balance of physical and mental while practicing yoga and enhance their perfect bliss feeling (Ramdev, 2007). Meanwhile, examples from traditional texts can be correlated with scientific findings based on contemporary research (Gupta, Singh, & Singh, 2016).

4.2. The Effect of Yoga on Emotional Regulation

In this research, the result that yoga can improve the higher level of emotional regulation than exercise during the same period from the data. Meanwhile, yoga is significantly higher than the control group in the improvement of the emotional regulation on retired elderly in China. This results in line with other studies which have demonstrated that yoga practicing raises regulatory skills for modulating pessimistic emotion intervention more practically (Khalsa, Hickey-Schultz, Cohen, Steiner, & Cope, 2012; Natalia, Nalu, & Alcy, 2015; Rocha et al., 2012). The reasons are as follows.

First of all, yoga may help improve self-regulatory skills and lower anxiety (Natalia et al., 2015). The researchers compared yoga practitioners and matched control participants, and they found that yoga intervention group showed lower emotion interference than control group.

Besides, a study showed that compare with non-yoga practitioners; advanced practitioners indicate in emotion interference the low attentional condition (Natalia et al., 2015). Yoga may help advance the technical ability of self-regulatory and reduce pessimistic emotion (Natalia et al., 2015). Another study also found that state and trait anxiety scores were significantly lower in the yoga group relative to the control group following longitudinal investigations (Rocha et al., 2012).

Meanwhile, as can be seen in a research, participants who took yoga practice more than twice a week indicate significantly lower state of anxiety. Study illustrate an strong connection between yoga practice and shrink mood disturbance (Khalsa et al., 2012). From that we can see yoga can reduce anxiety, which is part of emotion regulation. The practice of yoga also increases emotional resilience (Hartfiel et al., 2011) and self-esteem (Telles, Singh, & Bhardwaj, 2013) which could conduce to enhance feelings of self-control.

What's more, the ventrolateral prefrontal cortex has a strong relationship with emotional distractions cognitive control, while yoga practice makes the ventrolateral prefrontal cortex active (Froeliger, Garland, Modlin, & McClernon, 2012). Therefore, the emotional regulation of yoga group showed the highest advance compare to exercise and control group in our research.

Moreover, an individual's behaviors to reach social expectation in constant situational adaptive way can be defined as emotional regulation (Nagarathna, Nagendra, & Monro, 1990). In yoga practicing, the interventions frequently include attention to mindfulness, or moment-to-moment awareness through the development of adaptive techniques to face difficult situations (Nagarathna et al., 1990) which is a part of emotional regulation.

5. CONCLUSION

In conclusion, the study discussed herein illustrates that yoga can accelerate the transformation of specific physical meaning into deeper mental experience, such as the subjective well-being and emotional regulation in Chinese retired elders. Therefore, we propose that elderly agencies and community centers can recruit more experienced yoga teachers to ensure the quality of practice effects.

6. CONTRIBUTION & RECOMMENDATIONS

This study provides empirical evidence that yoga is an effective practice for the retired elderly to enhance their subjective well-being and emotional regulation. Such practice can be recommended for the elderly in China where the population of the elderly is growing currently.

Thus, this research presents the following recommendations: (1) It can be suggested that the agencies for elderly and community centers can provide yoga as for the elderly to learn and practice because yoga has long-term beneficial effects on elderly well-being and emotion. (2) It can be recommended that more empirical research of pre- and post-intervention can study other mental or physical effects of yoga for Chinese elderly. (3) It is important to develop a theoretical framework on the elderly well-being and emotion to adequate self-regulation processes which can create a better theoretical understanding of the potential effects of yoga. (4) Elderly agencies and community centers can recruit more experienced yoga teachers to ensure the quality of practice effects.

7. LIMITATION & FUTURE RESEARCH

Some limitations should be discussed. Small sample size in this study may reduce the representative, so larger samples will be needed in future studies. Given that the present study was conducted on just one sample of 20 participants, we must be cautious in determining the generalizability of the present findings. There is no follow-up study, so it is difficult to observe the long-term effects of exercising yoga on Chinese elderly, so future study can consider adding follow-up investigate.

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