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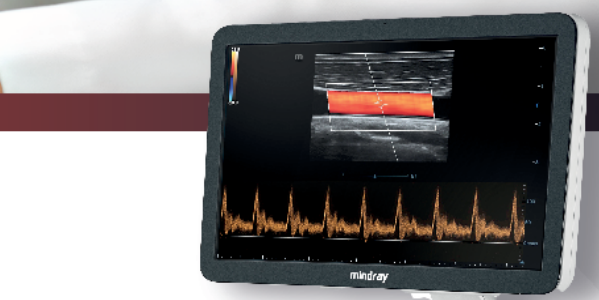

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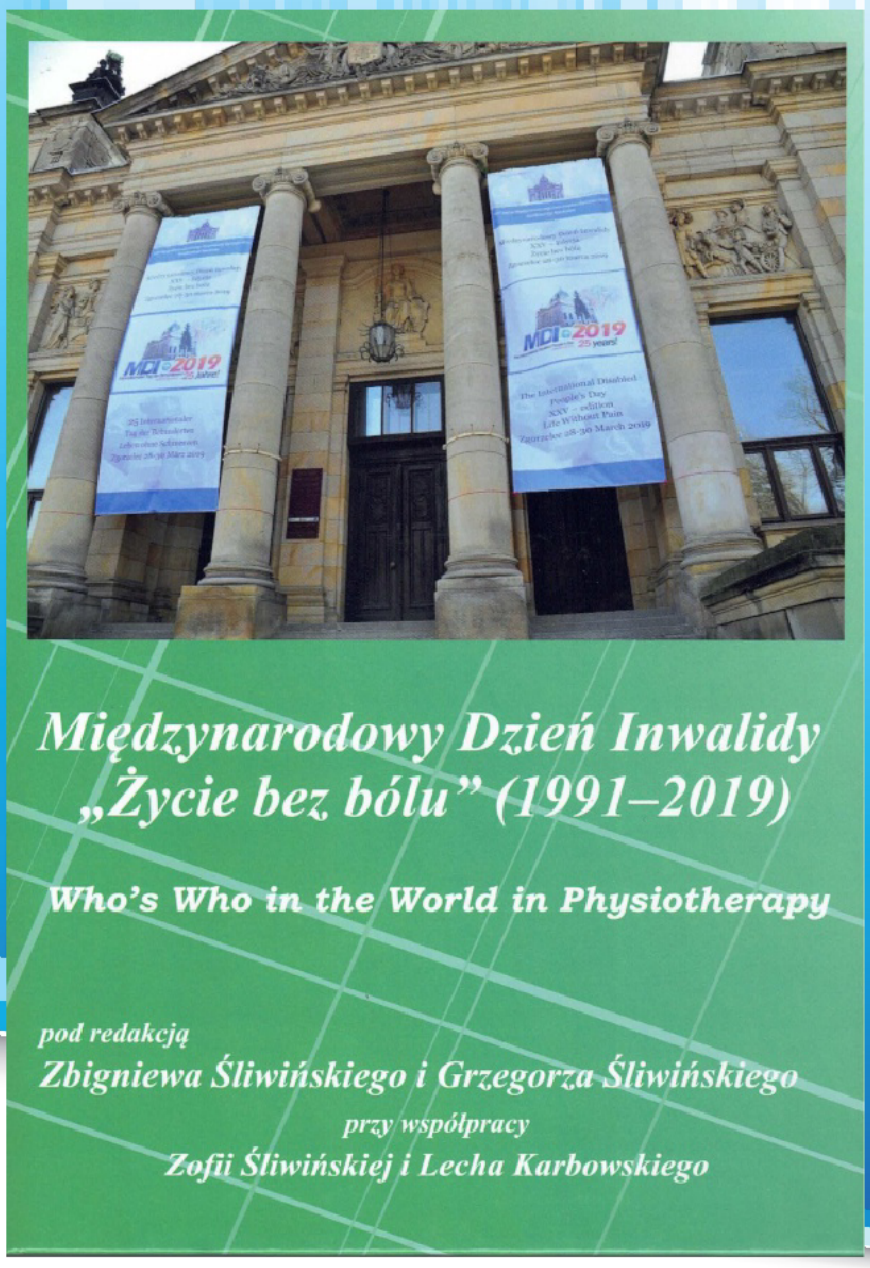

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Impact of modified qigong breathing exercise on acylated ghrelin hormone in obese patients: A randomized controlled trial

Wpływ zmodyfikowanych ćwiczeń oddechowych qigong na acylowany hormon greliny u pacjentów otyłych: randomizowane badanie kontrolowane

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Abstract

Purpose. Controlling one's appetite is an important factor in assisting obese patients to stick to their diet plan. The study's goal was to look into the effect of a modified qigong breathing exercise on acylated ghrelin (AG) and hunger perception. Methods. Sixty obese patients with class I obesity (BMI 30–34.9 kg/m^2) of both sexes (thirty males and thirty females) participated in the study. They were selected from outpatient clinic of Faculty of Physical Therapy, Cairo University. All patients were randomly distributed into two groups of equal numbers: A and B. Group A received supervised modified qigong breathing exercise three times per week for twelve weeks and controlled diet. Group B received controlled diet only (1000–1500 kcal/day). Perception of hunger, plasma acylated ghrelin, body weight and BMI were measured before and after the study. Results. Statistical analysis showed a significance decrease in body weight and BMI of both groups A and B. Percentage of improvement of body weight was 7.76%, 2.49% and that of BMI was 7.71%, 2.34% for both groups respectively. There was a significance difference in AG and hunger perception in favor of group A with percentage of decrease in AG in group A was 23.62% while percentage of increase in group B was 4.61%. Conclusion. It was concluded that modified qigong breathing exercise leads to reduction of body weight during diet regimen.

Key words:

modified qigong breathing exercise, acylated ghrelin, body weight

Streszczenie

Cel. Kontrolowanie apetytu jest ważnym czynnikiem pomagającym otyłym pacjentom trzymać się planu diety. Celem badania było zbadanie wpływu zmodyfikowanego ćwiczenia oddechowego qigong na poziom acylowanej greliny (AG) i odczuwanie głodu. Metody. W badaniu wzięło udział 60 otyłych pacjentów z otyłością I stopnia (BMI 30–34,9 kg/m^2) obu płci (trzydziestu mężczyzn i trzydzieści kobiet). Zostali wybrani z ambulatorium Wydziału Fizjoterapii Uniwersytetu w Kairze. Wszyscy pacjenci zostali losowo przydzieleni do dwóch równych grup: A i B. Grupa A wykonywała nadzorowane zmodyfikowane ćwiczenia oddechowe qigong trzy razy w tygodniu przez dwanaście tygodni i prowadziła kontrolowaną dietę. Grupa B prowadziła wyłącznie dietę kontrolowaną (1000–1500 kcal/dzień). Percepcję głodu, acylowaną grelinę w osoczu, masę ciała i BMI mierzono przed i po badaniu. Wyniki. Analiza statystyczna wykazała istotny spadek masy ciała i BMI w obu grupach A i B. Odsetek poprawy masy ciała wyniósł odpowiednio 7,76%, 2,49%, a BMI 7,71%, 2,34% dla obu grup. Wystąpiła istotna różnica w poziomie AG i odczuwaniu głodu na korzyść grupy A, przy czym procent spadku AG w grupie A wyniósł 23,62%, podczas gdy procent wzrostu w grupie B wyniósł 4,61%. Wniosek. Stwierdzono, że zmodyfikowane ćwiczenia oddechowe qigong prowadzą do redukcji masy ciała podczas stosowania diety.

Słowa kluczowe

zmodyfikowane ćwiczenia oddechowe qigong, acylowana grelina, masa ciała

Introduction

Obesity, which broadly refers to excess body fat, has emerged as a major public health issue. Its prevalence is increasing globally [1]. Obesity-related diseases, such as type 2 diabetes (T2DM), cardiovascular disease, musculoskeletal disorders, certain cancers, and liver disease, have a negative impact on health and shorten people's lives. It is predicted that by 2025, the global obesity prevalence will be 18% in men and 21% in women [2].
According to the World Health Organization (WHO), the "basic cause of obesity and overweight is an energy imbalance between calories consumed and calories expended." This concept is widely accepted as the primary cause of overweight and obesity. Most public health strategies aimed at combating obesity are based on this concept: reduce caloric intake while increasing caloric consumption [3].
As a result, it appears reasonable to consider appetite as a promising target in the progression toward more effective means of obesity prevention and treatment [4]. Ghrelin is a potent appetite stimulator that is produced by the stomach and duodenum and is responsible for mail initiation [5]. Although only 10–20 percent of circulating ghrelin is acylated, it is believed that this form is solely responsible for appetite stimulation. Given the importance of acylated ghrelin in appetite regulation, it is not surprising that the interaction between exercise and acylated ghrelin continues to pique the interest of scientists [6]. Even when body weight was reduced, exercise training studies produced inconclusive results in terms of acylated ghrelin responses. Fasting ghrelin concentrations have been found to be higher, lower, or unchanged. These contradictory findings could be attributed to the specific exercise regimen used [7].
Qigong, a traditional Chinese practice that includes slow movements, breathing exercises, and meditation, has been shown to benefit a variety of medical conditions, including tumor and cancer, hypertension, diabetes mellitus, obesity, and chronic heart disease [8]. Previous research on mindfulness and weight loss found that the majority of included studies reported significant weight loss; however, methodological issues make it difficult to draw firm conclusions. Many of these potential body composition mediators have not been directly evaluated in the context of reducing obesity levels, but there is growing evidence that qigong may have a positive effect on weight and other body composition markers [9]. As a result, it was critical to detect changes in plasma acylated ghrelin levels and hunger perception levels in obese patients after performing a modified qigong breathing exercise that may be beneficial to them during their diet regimen.

Materials and methods

Design of the study

The study was designed as a prospective, randomized, pre-post-test, controlled trial.

Participants

Sixty obese patients with class I obesity (BMI 30–34.9 kg/m^2) of both sexes (thirty males and thirty females). Their ages ranged between 35 to 45 years. They were chosen from the outpatient clinic of Cairo University's Faculty of Physical Therapy as relatives or caregivers of patients in the outpatient clinic. The patients were divided into two groups of equal size at random. Group A received modified qigong breathing exercise three sessions per week and controlled diet for twelve weeks. Group B received controlled diet only. The study had been conducted from May 2019 to March 2020.

Randomization

Using a computer-based randomization program, all patients were randomly assigned to one of two equal groups. As shown in the Figure 1., no subject dropped out of the study after randomization.

Ethical consideration

Patients signed a written consent form prior to participation, in accordance with the principles of the Helsinki Declaration. The study was registered with Cairo University's Physical Therapy Ethical Committee and approved with the registration number P.T.REC/012/002290.

Interventions

Modified qigong breathing exercise

Exercise was to be done three times per week and as a home program when feeling hungry. The workout lasted 20-30 minutes and consisted of 8-12 sets. Each set consisted of five repetitions with rest in between. Patients were instructed to stand with their feet shoulder-width apart, hands down or palms on their abdomen, and take a deep breath while squaring their shoulders and pulling their abdomen in. Hold your breath for 3 to 4 seconds while retracting your abdomen and contracting your abdominal muscles maximally, then return your shoulders to the starting position while relaxing your chest and abdominal muscles [10]. The patients' compliance to exercise at home was ensured through a Whatsapp group.

Controlled diet

Each patient's diet was individually calculated to provide a 500–kcal per day reduction in energy intake below the energy requirements, with total calories ranging from 1000 to 1500 kcal/day. The prescribed diet was balanced and high in fiber (minimum 20 g/day). The dietary plan included 45–60% carbohydrate, 15–20% protein, and 20–30% fat [11]. Every patient was given a piece of paper with the quantity and examples of food for each meal. Dietary changes were sometimes made to improve compliance. Every two weeks, the body weight was measured.

Evaluation procedures

Body mass index

Each patient's weight and height were measured using a standard weight and height scale (floor type, health scale), and their BMI was calculated using the formula below:
BMI = weight (kg) / height (m^2) [12]

Resting energy expenditure (REE)

Resting energy expenditure was measured using the following formula [13]:
(males) = 10 × weight (kg) + 6.25 × height (cm) – 5 × age (y) + 5,
(females) = 10 × weight (kg) + 6.25 × height (cm) – 5 × age (y) – 161.

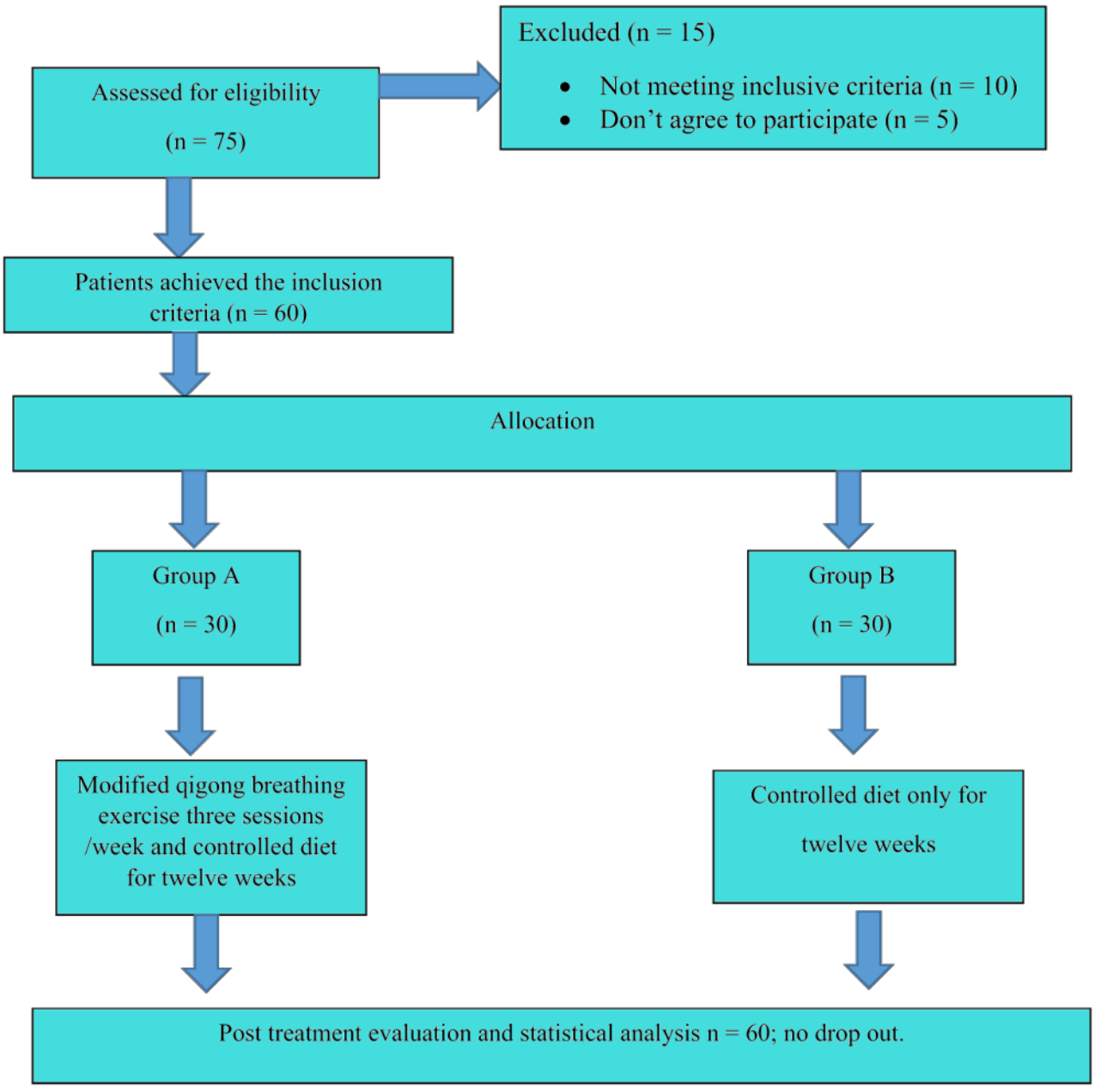

Figure 1. Flow chart of the study

Blood analysis
Five millimeters of venous blood were drawn from antecubital vein of each patient at morning from 9-10 am after 12 hours of fasting for measuring acylated ghrelin (ELIZA Biovendor kit).

Hunger evaluation
Patients were asked to draw a vertical line on a 100 mm visual hunger analogue scale that best matched their hunger sensation at the time. They were asked how hungry they were (not at all-extremely hungry). The distance from the left side of the line to the mark was used to calculate the score. The sensation of hunger was assessed before and 30 minutes after the exercise. [14]

Statistical analysis
Body weight, Body Mass Index (BMI), Hunger visual analogue scale (Hunger VAS), and Acylated ghrelin were all measured (AG). The demographic data was subjected to descriptive analysis. The paired "t" test was used within each group to assess the significance of changes in pre and post treatment mean values, while the unpaired "t" test was used between the two groups to detect significant differences between variables. The level of significance for all statistical tests was set at $p < 0.05$.

Results

The present study was conducted on sixty obese patients who were equally dived into two intervention groups: group A (diet and modified qigong breathing exercise) and group B (diet only). Both groups were homogonous at baseline. The demographic data of patients of both groups are represented in Table 1.

Table 1. Demonstrate demographic data of participants

Characteristics	Group A Mean ± SD	Group B Mean ± SD	Comparison t-value	Comparison P-value	Significance
Age [years]	39.07 ± 2.76	39.35 ± 2.8	0.376	0.708	NS
Height [cm]	168.24 ± 7.5	168.83 ± 6.8	0.3116	0.7565	NS

NS: P > 0.05 = non-significant, P = Probability

Anthropometric measures

Both diet plus modified qigong breathing group (group A) and diet group (group B) showed significance decrease in body weight and BMI. Comparing post treatment values revealed extremely significant difference in favor of group A with (p value = 0.0039) for body weight and (0.001) for BMI as shown in (table 2)

Acylated ghrelin level

There was difference in the effect of both interventions on acylated ghrelin concentration. Group A revealed significance decrease in AG between pretreatment and post treatment while there was significance increase in Acylated ghrelin in the control group (B) with (p value = 0.0001) as shown in (table 2).

Hunger sensation

After modified qigong breathing exercise, there was decrease in the hunger sensation and this decrease was significance comparing with group B (p value = 0.0001) as shown in (table 2).

Table 2. represents pre and post treatment values of group A and group B

		Group (A) n = 30	Group (B) n = 30	Group A Vs. Group B p- value*
Body weight [kg]	Pre-treatment	91.03 ± 6.99	91.21 ± 6.97	0.9254NS
	Post-treatment	83.97 ± 6.56	88.93 ± 5.98	0.0039S
	P value**	0.0001S	0.0093S	
BMI [kg/m²]	Pre-treatment	32.15 ± 1.13	31.98 ± 16	0.5718NS
	Post-treatment	29.67 ± 1.61	31.21.82	0.001S
Acylated ghrelin [pg/ml]	Pre-treatment	114.932 ± 8.34	114.65 ± 23.3	0.1671NS
	Post-treatment	88 ± 25.64	119.93 ± 25.77	0.0001S
	P value**	0.0001S	0.0001S	
Hunger VAS (mm)	Pre-treatment	75.69 ± 5.71	75.21 ± 5.66	0.7476NS
	Post-treatment	58.69 ± 6.57	77.03 ± 7.78	0.0001S
	P value**	0.0001S	0.0628NS	

** Inter-group comparison; ** intra-group comparison of the results pre- and post-treatment; NS: P > 0.05 = non-significant, S: P < 0.05 = significant, P: Probability; BMI: body mass index, VAS: visual analog scale*

Discussion

The current study found that qigong breathing exercise reduced appetite and hunger sensations. The effect of qigong breathing on the stomach is responsible for this decrease. Qigong practice may increase the range of diaphragmatic movement, which causes mechanical stimulation of the stomach and influences digestive fluid secretion. Qigong practice has a positive effect on the secretory volume of gastric fluids as well as the acidity of the stomach [15].

The current study's findings showed a 23.62 percent decrease in acylated ghrelin levels, which is consistent with another study that found that after modified qigong breathing, intestinal pressure decreased and the duration of the negative pressure phase was slightly longer than during normal breathing. The exercise caused a decrease in appetite that lasted several hours. Changes in hydrostatic pressure on the borders of the ileocecal and gastroduodenal valves, as determined by the position of the bowel loops, may be one of the causes of decreased hunger. The acidity level in the stomach decreased as the pH increased. This change in stomach acidity is common following a meal. [16] Formal paraphrase Ghrelin is a hormone that plays an important role in short-term appetite regulation, with higher levels before meals and lower levels after meals [17].

On the other hand, the diet group showed a 4.61 percent increase in acylated ghrelin levels. Recent research suggests that increased AG concentrations observed in obese subjects

following diet-induced weight loss are associated with lower energy reserves, primarily adipose tissue. Increased AG concentrations may also be linked to reports of increased hunger during treatment, as well as difficulty reducing food intake and losing weight [18].

In the current study, there was a 7.76% decrease in body weight and a 7.71% decrease in BMI in group A and a 2.49%, 2.34 percent decrease in group B. These findings support the role of acylated ghrelin in weight loss. A previous study concluded that qigong exercise improved insulin resistance, body weight, waist circumference, and leg strength, which supports the current findings. The only significant mediator of the intervention effect on insulin resistance was body weight. It was concluded that qi-gong mind–body therapy may have caused dietary changes, resulting in weight loss [19].

Qigong breathing has an added benefit during a weight loss program by decreasing appetite and hunger sensations. Similar results were obtained by Xiongwen et al. [20], who reported that individuals with central obesity who performed qigong exercise combined with caloric restriction for 7 days showed a decrease in body weight, BMI, so they concluded that caloric restriction combined with qigong exercise might effectively help individuals to relieve obesity and control body weight and could be a feasible therapy.

Similarly, Zhang et al. [21] reported that Qigong breathing practices provided statistically improved body mass index (BMI) and vital capacity (VC), as demonstrated by time-resolved quantitative analysis of diaphragm motion with dynamic chest radiography in a cohort of 174 patients. These exercises also have a positive effect on clinical parameters associated with type II Diabetes Mellitus, such as blood glucose, triglycerides, total cholesterol, weight, BMI, and insulin resistance.

Another discovery is that the decrease in acylated ghrelin is due to the relaxing effect of exercise. This is consistent with Hamasaki H., 2020 finding that breathing is closely related to autonomic nervous system function. The phrenic nerve, which controls diaphragm movement, is linked to the vagus (parasympathetic) nerve. By lowering the respiratory rate (RR), DB activates the parasympathetic nervous system while suppressing the sympathetic nervous system, lowering stress and anxiety [22].

The current findings are consistent with those reported by Camilleri et al. [23], who concluded that practicing mind-body techniques such as yoga, tai chi, qigong, or others was associated with a lower risk of being overweight or obese, as well as a lower BMI. Regular users, in particular, were less likely to be overweight or obese when compared to never users. These techniques may act directly on the hypothalamic pituitary adrenal axis or the sympathetic adrenal system, or they may stimulate the vagus nerve, resulting in positive physiological changes such as decreased stress hormone secretion. More broadly, these brain influences may result in more adaptive, flexible, and long-term psycho-physiologic responses to food intake.

In terms of acylated ghrelin, there is feed-forward and feed-back circuitry between stress and food reward that is mediated in part by ghrelin. It should be noted that the majority of previous studies reported total ghrelin levels. Acylated ghrelin is associated with obesity and may be more responsive and active in response to food intake and motivational factors. The development of therapies that target the ghrelin system may benefit people who have food cravings [24].

Because stress reduction is a natural result of using mind–body methods, better-managed stress through the use of these techniques (breathing exercises, breathwork, yoga, qigong, and others) may allow individuals to have greater clarity in articulating and implementing therapeutic strategies for weight loss, as cortisol influences other appetite-regulating hormones. [25].

In contrast to the current findings, Elder et al. found that 12 weeks of qigong exercise failed to maintain weight loss in people with BMIs of 25–35 kg/m^2. Although these patients found the technique promising, particularly in terms of effects on overall well-being, qualitative data indicated that there were numerous barriers to successful implementation [26].

The high compliance of patients until the end of the study is an important finding in this study. This is due to the participants' ability to perform the qigong breathing exercise with little effort. We have confirmed that including obese patients in a weight loss program that includes this exercise will be beneficial because it does not require any equipment, is suitable for all ages, and can be done at home.

This study may be the first to look into the effect of a modified qigong breathing exercise on acylated ghrelin. Incorporating this exercise into weight loss programs will be beneficial and will encourage obese patients to stick to their diet plan.

However, the number of patients in this study was limited, as were the parameters for measuring hunger perception for several hours after the exercise in order to detect the long-term effect of the exercise. Furthermore, more research is needed to compare the effects of qigong breathing exercise to other types of exercise, such as aerobic exercise.

Conclusion

It was concluded that modified qigong breathing exercise leads to reduction of body weight during diet regimen.

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