

SOUTH BAYLO UNIVERSITY

Effectiveness of Acupuncture for Obesity – A literature Review

by

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**A RESEARCH PROJECT SUBMITTED
IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE**

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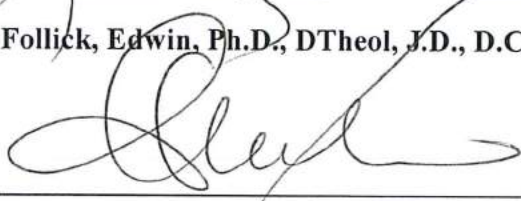
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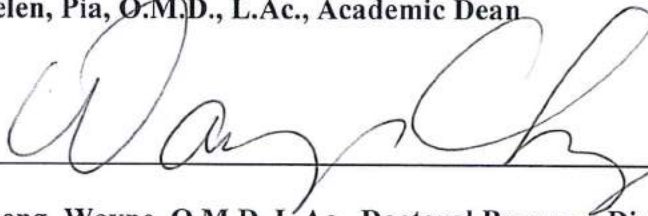
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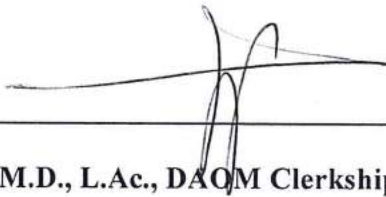
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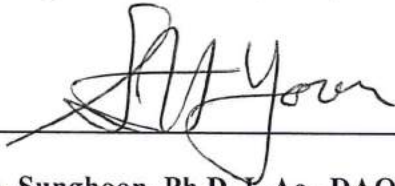
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Effectiveness of Acupuncture for Obesity – A literature Review

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Abstract

Background: Obesity is a condition in which a person has a body mass index (BMI) of 30 or more. The prevalence of obesity has increased steadily in the United States over time, and is currently one of the leading causes of mortality, morbidity, disability, healthcare utilization, and healthcare costs. The most common diseases related to obesity are cardiovascular diseases, diabetes, musculoskeletal disorders, osteoarthritis, dementia, sexual disorders, and cancer, among others. There are many weight reduction programs, including supplements, exercise programs, surgical interventions of the body, and acupuncture. There are many claims that acupuncture has been an effective treatment for obesity, but further valid evidence from clinical studies is needed.

Methods: Google scholar, PubMed and EBSCO databases were searched for articles to review. Articles that has Randomized Control Trial (RCT) or clinical trials with different comparison groups, in English language, using the key words, ‘Acupuncture’, ‘Obesity’, ‘ear’, ‘auricular’, ‘weight’, were used for the search. 47 articles were found.

Results: 19 relevant articles were included for the review after screening for inclusion and exclusion criteria. But out of these only 14 were kept for final review because 5 of the 19 were duplicates, ambiguous statistics, or small pilot study only. All included articles, except one showed significant effectiveness of Acupuncture for obesity

Conclusion: There is enough evidence to support that Acupuncture has some significant effect on reducing obesity. It not only helps reduce weight but it has other added bonus of helping psychological issues, reducing measures such as TG, LDL, waist and hip size, increasing HDL, improving metabolism, reducing appetite, etc. Since the study groups were small, further studies need to be conducted to determine the accuracy of these studies. There is also a lack of sufficient articles on RCT in this area of study.

Key Words: Acupuncture, weight, obesity, ear, auricular, electroacupuncture

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I. Introduction

Obesity is a metabolic disease with many etiologies. It occurs when the amount of calories consumed exceeds the amount used by the body, which leads to an excessive accumulation or abnormal distribution of fat. Lack of physical activity, genetics, hormone imbalance, slow metabolism, hypothyroidism, Cushing's syndrome, and stress can also become the cause of obesity. In today's society stress is inevitable. Comfort food is an ideal 'treatment' for stress.

Currently, the body mass index (BMI) is most commonly used to determine adiposity (Shah N., Braverman E. - 2012). If a person has a BMI of 30 or higher, they are considered obese. The United States Centers for Disease Control and Prevention (CDC) estimates a 20% obesity rate in the 50 states with 12 states having rates of over 30% (Shah N., Braverman E. - 2012). Worldwide obesity has increased more than twice as much as rates in 1980. In 2014, more than 1.9 billion adults (18 years and older) were considered overweight and/or obese (World Health Organization, 2016).

Some of the health risks involved with obesity are Coronary Artery Disease, high blood pressure, cancer, osteoarthritis, sleep apnea, stroke, type 2 diabetes mellitus (DM), gallstones, hernia, and reproductive problems. Obesity appears to augment the incidence of cardiovascular events and is associated with major risk factors for atherosclerosis, metabolic syndrome, and coexisting pathological conditions frequently associated with nonalcoholic fatty liver disease (NAFLD) (Wen & Lee, 2014).

If a solution to obesity is not found, human beings – especially children – will be affected negatively. The problem has increased, and for the first time in almost two centuries, the children of the first decade of the twenty-first century generation in the United States, according to a report may have life expectancies shorter than their parents (Olshansky et al., 2005). The rapid rise in childhood obesity may result in shortening life spans by a maximum of five years if left unchecked. Obesity has been shown to have a substantial negative effect on longevity, reducing the length of life of people who are severely obese by an estimated 5 to 20 years (Olshansky et al., 2005). One of the growing causes of infertility in young people today is obesity (Palmer, Bakos, Fullston, & Lane, 2012).

Causes of Obesity

According to conventional medicine, the cause of obesity is an energy imbalance between calories consumed and calories expended (World Health Organization, 2016). Metabolic disorders such as glucocorticoid hormones or thyroxin deficiency, depression, poor lifestyle and economic inadequacy have also been described as causes of obesity. Too little sleep, eating late at night, or sleeping later than normal hours can all contribute to imbalance in circadian rhythm, which can contribute to obesity. Stress, excessive caffeine and alcohol consumption increases cortisol level, which leads to an increase in the accumulation of abdominal fat. One of the complicating factors in the stress/cortisol/fat relationship is a little enzyme deep within fat cells called HSD (11 beta-hydroxysteroid dehydrogenase-1). HSD functions to convert inactive cortisol (called cortisone) back into active cortisol, which then functions as a potent fat-storage signal within fat cells, especially

abdominal fat cells. Recent research tells us that HSD activity is higher in abdominal fat cells than it is in fat cells in other parts of the body (The Cortisol Connection – Shawn Talbott, Ph.D.)

Classification of Obesity

Simple obesity

Simple obesity refers to an overweight condition caused by calorie intake that is larger than calorie consumption, which results in an excess accumulation of stored body fat. Visceral fat is toxic, and can interfere with the normal function of the body's hormones (Bouchi et al., 2015). Storing excess fat around the organs increases the production of pro-inflammatory chemicals called cytokines, which cause inflammation. At the same time, excess visceral fat interferes with hormones that regulate appetite, weight, mood, and brain function (Hung et al., 2014).

Secondary Obesity

Secondary obesity means that one has a medical condition that has caused to gain weight. These medical conditions are endocrine disorders, such as hypothyroidism, polycystic ovarian syndrome, Cushing's disease, etc. Taking certain medications for other diseases can also cause obesity as a side effect.

Obesity-TCM perspective

The main cause of obesity is the over consumption and under expenditure of energy. Inefficient transforming and transporting of qi derived from food intake, which results from malfunctioning of organs such as Spleen, Liver and Kidney can add fat to the body.

“Weakness of Spleen and Stomach leads to inefficient digestion, causing a buildup of damp and phlegm in the form of fat in the tissues. Inactivity also weakens the Spleen. It was noted in the Simple Questions (Huang Di Nei Jing Su Wen), Chapter 23, that ‘too much lying down damages the qi and too much sitting damages the flesh’” (Clinical Handbook of Internal Medicine Vol3; Pg. 611– Will Maclean & Jane Lyttleton). Continuous lifestyle of late eating, overeating, and sleeping right after one eats a heavy meal, etc. can compromise the Liver and Spleen. This can cause the food to accumulate, stagnate and produce heat. The heat then increases appetite, which then tempts one to eat more. Eventually the Spleen and Stomach gets weaker and weaker. Eating late and going to bed late can compromise the Liver qi, which can in turn weaken the Spleen also. When the Spleen Yang is weakened, it affects the Kidney Yang (Spleen overacts the Kidney). “A decline in Kidney yin reduces yin fluids and leads to deficient heat, which causes thickening of fluids, accumulation of phlegm and blood stasis” (Clinical Handbook of Internal Medicine Vol3; Pg. 612 – Will Maclean & Jane Lyttleton).

As in Western theory, TCM considers the overconsumption of greasy food as a cause of obesity (Xu, et al., 2012). The overconsumption of greasy food affects the spleen energy, and causes an imbalance within the body due to the malfunction of the spleen and liver. Disharmony of the spleen results in symptoms such as fatigue, slow metabolism, water retention, loose stool, and feelings of heaviness. The lung also plays a role in penetrating the Qi into all the organs internally. When dampness and turbid fat enters the water passages, stagnation occurs. The liver’s job is to keep the flow of the body’s Qi and blood (as well as emotions) running smoothly (Allison et al., 2001). The modern, fast-paced lifestyle and

chronic stress can negatively impact the liver's ability to function properly and smoothly, which, in turn, can cause the spleen and the whole digestive system to function poorly and decrease people's metabolism (Xu et al., 2012). Liver disharmony can also cause some of the triggers that lead to cravings and compulsive eating (He et al., 2015).

TCM consists of several Modalities, such as acupuncture, herbal formula, moxa, cupping, scrapping, tui-na, Qi-gong, and Tai-chi. Acupuncture can be done using body acupuncture and ear acupuncture with electro-stimulation.

In general body acupuncture, certain points are used to move stagnant Qi in the Yangming meridians as well as to regulate the intestines and stomach for promoting their absorbing and discharging ability. ST36 is targeted to guide the Qi of the stomach meridian to direct the spleen Qi upward to increase performance of the ascending and descending functions (Cao et al., 2007). This point can promote absorption of the accumulated lipids inside the body. SP15 regulates the intestine and stomach, move Qi in the organs, and SJ6 regulates Qi, clear heat, descend and reverse flow of Qi and also promotes defecation. ST28 is targeted to promote urination. ST44 can be used to clear fire from the stomach and relieve the symptoms of unbalanced digestion and to ease the hunger. Due to the long time hyperactivity of the stomach fire and consumption of Qi by strong fire, simple obesity could damage the Yang of the spleen and kidney. Ren4 is used to excite the Yang Qi of the human body and ST40 is to disperse phlegm and decrease blood lipids (Cao et al., 2007). These points can also be stimulated using electrical stimulation.

Ear acupuncture is one of the more popular modalities of acupuncture for weight loss. Ear acupuncture, also known as Auricular acupuncture for weight loss, stimulates

points in the ear through the use of little tacks, seeds, or magnets, which are taped to points in the ear to boost the effectiveness of the operation (Darbandi et al., 2014). From the TCM viewpoint, the ears are an important pivot point for the meridians to communicate with each other. When these organs are in disharmony, it will be reflected in the auricles/ear.

The aim of this study is to review how many current successful RCT or other randomized studies have been done on the effect of acupuncture in reducing obesity so as to justify that Acupuncture is effective for reducing obesity. This literature review mainly focuses on the effectiveness of Acupuncture (body and ear acupuncture with/without electro-stimulation) for reducing obesity using RCT or any kind of control study.

II. Materials and Methods

The materials reviewed in this literature study were retrieved using the following databases: Google Scholar, PubMed, and EBSCO.

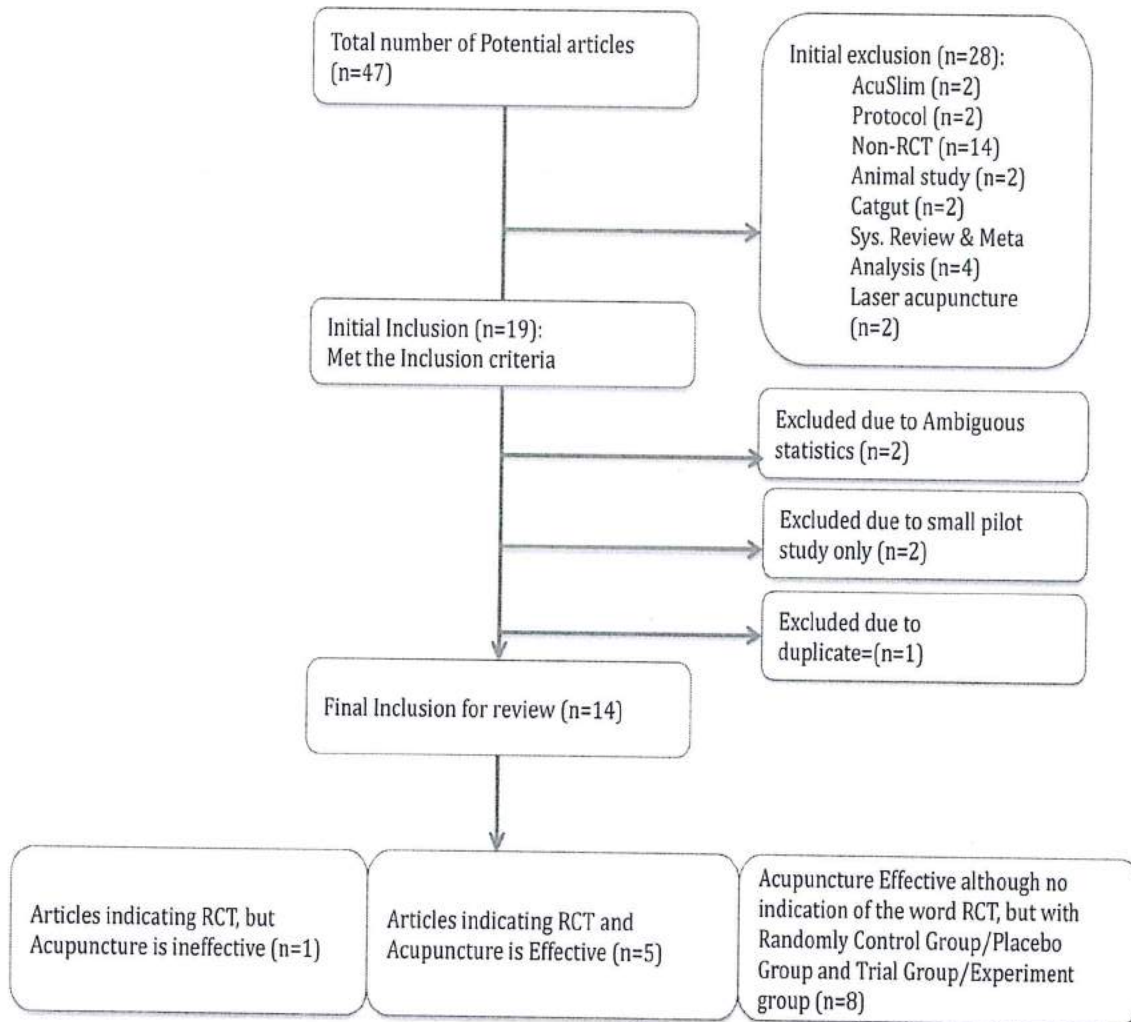


Figure 1- Flow of included/excluded studies

Inclusion Criteria:

- Clinical Studies
- Study type: Randomized control trials, clinical trials with control groups
- English language
- Human studies
- Intervention in the treatment group: Body Acupuncture and Ear Acupuncture
with/without Electro-stimulation
- Intervention in the control group: sham acupuncture, usual care, Western medicine,
no treatment, placebo
- Participants must be diagnosed with either simple or secondary obesity
- Full texts are available

Exclusion Criteria:

- Non-Randomized Control Studies, studies that does not include a comparison group
- Case study, case series, survey, cohort study, clinical trials without
controls, systematic review, and meta-analysis
- Animal Studies
- Language other than English

- Intervention in the treatment group: Acupressure, dry needling, laser acupuncture, acupoint injection, Catgut embedding.

TENS (Transcutaneous Electrical Nerve stimulation, AcuSlim device, Korean 4-needle technique.

- Intervention in the control group: Other modalities within TCM, such as Moxa, cupping, TuiNa, scrapping, herbs.

III. Results

Nineteen studies met the inclusion criteria (details of study flow are given in Figure 1 under Material and Methods section). Out of the nineteen studies, five of them were omitted due to insufficient data, small pilot studies or duplicates. The final review was done using 14 articles. Out of the 14 final articles, only 6 were mentioned as Randomized Control Trials in the title or body of the article. The rest of the 8 articles did have information on comparison between the experiment group and the control group, with satisfactory statistical result documented. Some studies did not specify if they were male or females and the age group was also not consistent. But they were all human studies on adults.

The intervention varied considerably across the studies. The frequency of treatment sessions, points used, sample size, and duration was different across the studies. Although most studies did not indicate the time of treatment, one study was particularly based on the time of treatment (9-11am).

There are 7 tables, each grouped into the type of modalities used.

Key words within the tables: NM= Not Mentioned, EG: Experiment Group, CG= Control Group, EA= Electro Acupuncture, MA= Manual Acupuncture, BW= Body Weight, WL= Waist Line, BMI= Body Mass Index, FMI= Fat Mass Index, BM= Body Mass, BFM= Body Fat Mass, WC= Waist Circumference, HC= Hip Circumference, WHR= Waist Hip Ratio, HL= Hip Line, HDL= High Density Lipoprotein, LDL= Low Density Lipoprotein, TG= Triglyceride, LEP= Leptin, ADI= Adiponectin, ELISA= Enzyme Linked Immunosorbent Essay, VAS= Visual Analogue Scale, GFSR= Gastric Fluid Survival Rate, ER=Effective Rate.

Table 1 has two studies. In the first study (Wang Hongyu – 2002), manual acupuncture was done on the experiment group and the control group was asked to take 2 bags of Kang Er Shou Diet tea everyday, and carbohydrate food was forbidden, with one month as a therapeutic course. Significant difference in the total effectiveness has been noted ($P<0.01$) and in the BWI ($P<0.05$).

In the second study (Luo HL, Li RH – 2007), manual acupuncture, electroacupuncture and a control group was set up. There is not enough information as to what the control group consisted. The acupoints were ST34, SP10, SP4, ST44, etc. once everyday, 27 times altogether for both the manual and electro acupuncture group, with electro stimulation given bilaterally in the electro acupuncture group. When they were compared, electro acupuncture seems to be more effective than manual acupuncture. The outcome measures also included BWI, LEP and ADI, all of which contributes to obesity. Fat cells produce and secrete important biologic substances. One of these substances is called ADI (adiponectin) (see Appendix A). The study indicated that after the treatment, LEP and ADI in both manual and electro acupuncture groups increased considerably ($P<0.05,0.01$). ADI usually increases after weight loss. Although low calorie diet lowers leptin levels, it is shown here that acupuncture also reduces this level and the effect is better than just restricting diet only. Both EA and MA can effectively lower blood Leptin and raise blood Adiponectin, which may contribute to its effect in reducing BW. The effect of EA is superior to MA. How the CG was treated is not mentioned. This trial also indicated that 5%, 15%, and 95% failed in EA, MA, and CG respectively.

Table 1 – Acupuncture, MA & EA

Author - Year	Type of Intervention	Sex	Sample size	Tx Frequency & Duration	Outcome Measures	Result – BW changes or % of effective rate in each group	Result- (P-value)	Conclusion
Wang Hongyu - 2002	MA	Sex: M&F Age: NM	EG: n=5M, 55F. CG: n=7M, 53F.	EG: 1 tx every other day; 15 tx total. CG: 1 month diet	BWI difference TE	• TE EG: 90% CG: 56.7% • BWI difference EG: 2.45 ± 0.53kg CG: 1.04 ± 0.47kg	Significant difference in: • TE: (P<0.01) • BWI: (P < 0.05)	Shows very significant difference between the two groups in therapeutic effect and significant difference between the two groups in BWI

Table 1 – Acupuncture, MA & EA – continued

Author - Year	Type of Intervention	Sex Age	Sample size	Tx Frequency & Duration	Outcome Measures	Result – BW changes or % of effective rate in each group	Result- (P-value)	Conclusion
Luo HL, Li RH – 2007	EA & MA.	Sex: NM Age: NM	EA: n=20 MA: n=20 CG: n=20	1 tx, all days; 27 times	BW, LEP, ADI, ELISA	TE: EA=95% MA=85% CG=5%	<ul style="list-style-type: none"> • Significant difference in the TE of both EA & MA vs. CG (p<0.01). • The LEP & ADI of EA & MA decreased significantly • The ADI increased with (P< 0.05, 0.01). • The effect of EA markedly better than MA & CG (P<0.05). • No significant changes found in LEP & ADI in CG (P>0.05) 	<ul style="list-style-type: none"> • Both EA and MA can effectively lower blood Leptin and raise blood Adiponectin, which may contribute to its effect in reducing BW. • The effect of EA is superior to MA. • How the CG was treated is not mentioned. • This trial also indicated that 5%, 15%, and 95% failed in EA, MA, and CG respectively.

Table 2 - Acupuncture at specific time

Author -Year	Type of Intervention	Sex Age	Sample size	Tx Frequency & Duration	Outcome Measures	Result – BW changes or % of effective rate in each group	Result- (P-value)	Conclusion
Jie Wu, et. al – 2014	MA during Spleen time: 9-11. MA Acupuncture done at time other than 9-11am	Female adults with SP deficiency and excess dampness EG: All Female Age (19-38) CG: Age (20-36)	EG: Acupuncture during Spleen time 9-11am (n=33) CG: Acupuncture during a time other than 9-11am (n=32)	Daily for 30 days	BW, WL, HL, BMI	<ul style="list-style-type: none"> • Curative effect between EG & CG: EG= 87.5% CG= 78.8%. • Reduction of BW noted: EG: 4.5±1.3 kg CG: 3.2±0.9 kg 	<ul style="list-style-type: none"> • There was no statistical difference in obesity-related indexes before and after treatment in either group (P>0.05). • There was a statistical difference in BW, BMI, WL, HL (P<0.01). 	<p>The statistics mentioned in the article is confusing and contradicting.</p> <p>But at the end it says Acupuncture done during SP time and other times both had curative effects; but SP time acupuncture seems to be more effective.</p> <p>So it can be concluded that Acupuncture is not only effective, but doing it during the Spleen time has a greater benefit when you have SP deficiency and excess dampness, which are great causes for obesity.</p>

In Table 2, the study (Jie Wu, et al. – 2014) is looking at the effect of acupuncture, done during the specific time of Spleen (from 9-11am) compared to such treatment done during other times. The sample is specific to female adults with Spleen deficiency and damp excess. 9-11am is when Qi and blood in the spleen channel are most exuberant and therefore can produce a coordinating effect between selected points and corresponding time to obtain the best curative effect (Jie Wu, et. al. – 2014). This study indicates that Acupuncture is not only effective, but doing it during the Spleen time has a greater benefit when you have SP deficiency and excess dampness, which are great causes for obesity. Therefore, this study not only indicates the effectiveness of acupuncture to reduce obesity but also that if done during a specific time for that particular organ deficiency, it can have even better results. The number of participants, outcome measure, and other data that are available are tabulated in the above table.

Table 3 - Body Acupuncture and Ear Acupuncture

Author - Year	Type of Intervention	Sex Age	Sample size	Tx Frequency & Duration	Outcome Measures	Result – BW changes or % of effective rate in each group	Result- (P-value)	Conclusion
Yasemin C, Turan S, Zahide K - 2017	Body & Ear Acupuncture	Female (n=38) Age: for BA: 32.7 Age for EarA: 39.1	BA: (n=17) EarA: (n=21) No other control group	BA: 24 sessions EarA: 6 sessions every 15 days	BW, BMI, BFP, WC, HC	<ul style="list-style-type: none"> • Change in BW for BA: 2.6±2.4kg • Change in BW for EarA: 4.2±3.4kg 	<ul style="list-style-type: none"> • Significant difference in BW: (P<0.05) • Significant difference in BMI, BF %, WC, HC were : (P<0.05) 	In this study Acupuncture in general is effective; but auricular Acupuncture is more effective than body Acupuncture

In Table 3, it is a comparison of body and ear acupuncture. Even though the study in this table does not have the name 'control group' specified, the comparison is made between body acupuncture and ear acupuncture to see which is more effective. It is concluded that even though acupuncture in general is effective, the ear acupuncture is more effective than body acupuncture. The significant difference in body weight is ($P < 0.05$) and BMI, BF%, WC, and HC were ($P < 0.05$).

In Table 4 body and ear acupuncture is done in a condition of dyslipidemia. The same main author has done two studies; one study using body acupuncture and the other study using ear acupuncture. The sample size for each study is different and it is unknown if he used the same people in each group at different time periods. Acupuncture with diet seems to be more effective for obesity than sham acupuncture with low-calorie diet (did not indicate what type of low-calorie diet); but the P-value seems to be better for ear acupuncture with diet, than for body acupuncture with diet. This also indicates that ear acupuncture is more effective than body acupuncture.

Table 4 - Body and Ear Acupuncture done for Obesity with dyslipidemia

Author - Year	Type of Intervention	Sex Age	Sample size	Tx Frequency & Duration	Outcome Measures	Result - BW changes or % of effective rate in each group	Result- (P-value)	Conclusion
Hamid Abdi, et.al, - 2012	Body Acu. + Diet EG received real body acupuncture. CG received sham acupuncture.	M&F: (n=169 total). Age: 18-55	EG: (n=98) CG: (n=98)	6 wks Acu; another 6 weeks diet only. Total of 12 weeks	Anthropometric & Biochemical characteristics. BW, BF, BMI, WC, HC, TC, TG, HDL, LDL, Anti-HSP	• BW reduction: EG: 4.15 ± 0.37 Kg CG: 2.40 ± 0.60 Kg	In general EG vs CG has Significant difference (P < 0.012)	Body Acu + Diet is more effective for wt loss and reduction of other obesity-associated risks factors such as dyslipidemia. Individual results for each of the outcome measures are not given.

Table 4 – Body and Ear Acupuncture done for Obesity with dyslipidemia – continued

Author - Year	Type of Intervention	Sex Age	Sample size	Tx Frequency & Duration	Outcome Measures	Result – BW changes or % of effective rate in each group	Result- (P-value)	Conclusion
Hamid A, et. al. -2012	Ear Acu. + Diet EG (treatment group) received real ear acupuncture.	M&F: (n=20 4 total). Age: 18-55	EG: (n=102) CG: (n=102)	6 wks Acu; another 6 weeks diet only. Total of 12 weeks	Anthropometric & Biochemical characteristics. BW, BF, BMI, WC, HC, TC, TG, HDL, LDL, Anti-HSP	• BW change: EG: 3.66±0.32 kg CG: 2.27±0.33kg	EG vs CG had significant difference in 1. BW (P=0.004) 2. BMI (P=0.010) 3. TG (P=0.0435)	Ear Acu + Diet is more effective for wt loss and reduction of other obesity-associated risks factors such as dyslipidemia.
	CG (control group) received sham - Placebo needle acupuncture.							

Table 5 - Acupuncture and Diet and Exercise #1

Author - Year	Type of Intervention	Sex Age	Sample size	Tx Frequency & Duration	Outcome Measures	Result – BW changes or % of effective rate in each group	Result- (P-value)	Conclusion
Mehmet T.C., Neyhan E. – 2005	EA, ear, diet. Maintain 1425 Kcal diet	Female (n=55) total. Age: EG: 39 CG: 43 Diet: 42	EG (EA at ear): (n=22) CG: (n=12) Diet: (n=21)	20 days	BW, LDL, HDL, TG	• BW reduction EG: 4.8% Diet: 2.9% CG: about 0.5%	• EA vs CG & Diet was significant: (P<0.05). • Diet vs CG were significant: (P<0.05). • Significant decreases in total cholesterol and TG in EA and diet vs CG (P<0.05). • Decrease in LDL in EA vs CG (P<0.05). • No significant changes found in HDL among the 3 groups.	Application of ear acupuncture seems to increase the fullness feeling. In this study wt. loss more in EA group may be a result of that fullness feeling, which makes them to eat less.

Table 5 - Acupuncture and Diet and Exercise - Continued #2

Author - Year	Type of Intervention	Sex Age	Sample size	Tx Frequency & Duration	Outcome Measures	Result – BW changes or % rate in each group	Result- (P-value)	Conclusion
Mehmet TC, Neyhan E, Uner T - 2007	EA & Diet.	Female (n=165) Age: EG: 35.7	EG: (n=105) Diet: (n=30)	20 days	BW, Psychological symptoms	• Reduction in BW: EG: 4.8% Diet: 2.7% CG: 2.5%	Significant Reduction in BW: (P < .001)	EA tx for obesity not only helps in reduction of weight but also helps in psychological symptoms. It is a vicious cycle: Obesity, especially in women, can cause Psychological effects, which in turn can add to obesity factor. But treating one with acupuncture can affect the other as well.

Table 5 - Acupuncture and Diet and Exercise - Continued #3

Author - Year	Type of Intervention	Sex Age	Sample size	Tx Frequency & Duration	Outcome Measures	Result - BW changes or % of effective rate in each group	Result- (P-value)	Conclusion
Darbandi S, et. al - 2013	Body Acu + low calorie diet (500 Kcal)	Male (n=24) Female (n=70), Age: 18-65	EG: (n=42) CG: (n=44)	6 weeks -2tx per week=12tx	BW, BMI, BFM, Leptin	<ul style="list-style-type: none"> Reduction in BW: EG: 3.15 % CG: 1.82%. 	<p>Significant difference in:</p> <ul style="list-style-type: none"> BW reduction (P<.001) Leptin reduction (P<0.001) BFM (P<0.001) 	<p>This study is mainly looking at the effect of Acupuncture on Plasma Leptin concentration.</p> <p>When this is reduced, appetite will be controlled and hence weight loss.</p>

Table 5 - Acupuncture and Diet and Exercise - Continued #4

Author - Year	Type of Intervention	Sex Age	Sample size	Tx Frequency & Duration	Outcome Measures	Result - BW changes or % of effective rate in each group	Result- (P-value)	Conclusion
Yao H, et. al - 2012	Acu + Diet. EG: True Acupuncture needle. CG: Placebo Acupuncture needle.	Age and sex not indicated	EG: (n=76) CG: (n=42)	1/every other day for 12 times total.	BMI, VAS, GFSR	NM	<ul style="list-style-type: none"> • Significant difference in BMI declined in EG vs CG: (P<0.01) • The VAS scores of eating-desire, hunger feeling & food consumption decreased in EG: (P<0.05). 	Acupuncture can significantly decrease BMI, delay digesting time, control appetite in obesity, which may contribute to weight reduction.

Table 5 - Acupuncture and Diet and Exercise - Continued #5

Author - Year	Type of Intervention	Sex Age	Sample size	Tx Frequency & Duration	Outcome Measures	Result – BW changes or % of effective rate in each group	Result- (P-value)	Conclusion
Cabioglu MT, Ergene N – 2006	EA+Diet vs. Diet Diet consisted of 1425Kcal	Female: (n=40) total. Age: EG: 41.45±4.7 kg CG: 42.30±4.3 kg	EG: EA+Diet: (n=20) CG: Diet: (n=20)	NM	BW, Leptin, Beta Endorphine (BE)	• BW reduced EG: 4.5%	• Significant difference in BW (p<0.000) • Reduction in Leptin (P<0.000) • Increase in Beta Endorphin (P<0.05)	Leptin decrease (p<0.000) and BE increase (p<0.05) was also noticed in EG. This enhances the lipolytic activity, which may have caused weight loss in obese people by mobilizing energy stores. Therefore EA with Diet is more effective than Diet alone.

Table 5 - Acupuncture and Diet and Exercise - Continued #6

Author - Year	Type of Intervention	Sex Age	Sample size	Tx Frequency & Duration	Outcome Measures	Result - BW changes or % of effective rate in each group	Result- (P-value)	Conclusion
Yang JJ, et. al. - 2010	Acu + Diet + Exercise	Age and Sex NM.	EG: Acu+Diet+Exc: (n=31)	45 days (15 days= 1 course)	BW, WHR	NM	<ul style="list-style-type: none"> • After 1 course: BW & WHR in EG lower than CG (p<0.05) • After 2nd course: no significant change in both groups (p>0.05) • After 3rd course: BW & WHR decreased in both groups (p<0.01) 	<p>While the effect of Acu+ Diet+ Exercise is more obvious in the early stage of treatment, both treatments can decrease the BW & WHR.</p> <p>In any case Acupuncture is effective in wt loss.</p>
	Diet program not mentioned		CG: Diet+Exc: (n=30)					

Table 5 has more outcomes in the comparison of acupuncture, diet and exercise. There are 6 studies within this table. In #1 and #5 studies, the control group is on a diet of 1425 Kcal. But the other studies did not indicate the specification of the diet in the control group. In #2 and #3 studies, the control group was given placebo and sham acupuncture. The studies are done as follows:

- #1 EA vs CG+Diet
- #2 EA+diet vs Placebo+Diet
- #3 Acu+diet vs Sham+diet
- #4 Acu+diet vs Diet only
- #5 EA+diet vs Diet only
- #6 Acu+diet vs Diet+exercise

Even though the studies vary in type, method used, duration of study, and outcome measure used, the end result shows that Acupuncture is more effective than just diet or diet and exercise. In the second study (Mehmet TC & Neyhan E – 2007), involving Psychological symptoms in obese patients, electro acupuncture has not only helped obesity but also the psychological symptoms. In another study (Cabioglu MT & Ergene N – 2006), where the study is looking at the Leptin level, acupuncture has helped to reduce the Leptin level concentration, which in turn can reduce appetite. Reducing appetite is one of the ways to lose weight. Therefore, this study indicates that acupuncture is effective for weight loss by working on reducing the Leptin levels. Actually, two of the studies (Darbandi S, et. al, - 2013 and Cabioglu MT & Ergene N – 2006) done with Leptin as one of the outcome

measure shows the P-value for decrease of Leptin to be ($P < 0.001$) and ($P < 0.000$) respectively.

Table 6- Acupuncture – Ear and Body Acupuncture and Metformin

Author - Year	Type of Intervention	Sex Age	Sample size	Tx Frequency & Duration	Outcome Measures	Result – BW changes or % of effective rate in each group	Result- (P-value)	Conclusion
A. Firouzjael, et. al. - 2016	EA - body & ear Acupuncture with and without use of Met (Metformin).	<ul style="list-style-type: none"> • M&F: (n=39) • Age: EG: 42.2 CG: 40.5 	<ul style="list-style-type: none"> • Acu+Met: EG: (n=19) • Met only: CG: (n=20) 	10 times every other day, 3 weeks total	BW and clinical and biochemica l index (TG, LDL, HDL)	<ul style="list-style-type: none"> • BW in EG: 82.6±6Kg before and 78.4±6Kg after • BW in CG: 83.5±5Kg before and 82.0±5 Kg after. • BW in TG: From 2.59 to 2.24 • LDL decreased: From 4.05 to 3.68 • HDL increased: From 1.08 to 1.29 	All BW, TG, LDL, HDL, had Significant difference (p<0.001)	Combination of Acu and Metformin has better effect than Metformin alone. This shows that Acu is effective in lowering weight. The added benefit is that glucose also was lowered from 6.65 to 6.12, a (P<0.001) value.

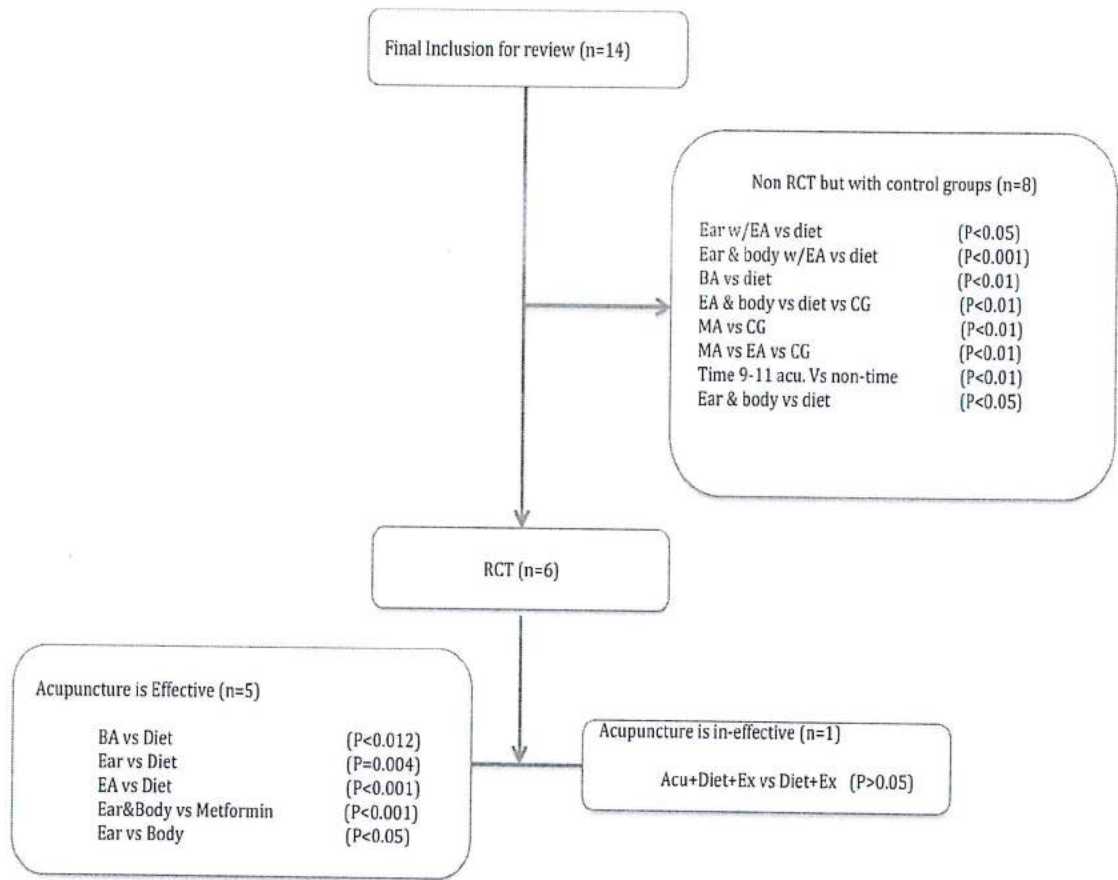
Table 6 is a comparison of ear and body acupuncture with the use of Metformin in obese patients. The combination of acupuncture along with Metformin has significant effectiveness in reducing weight. It also reduced TG and LDL and increased HDL, and worked better than using Metformin alone. The P-value of body weight, TG, LDL, HDL all had significant difference of ($P < 0.001$).

Table 7, showed Acupuncture does not show any difference when compared with diet and exercise. Of the reviews done so far, this is the only one where acupuncture is shown as ineffective for obesity. EG1 is Diet+Exercise, EG2 is Acupuncture+Diet+Exercise, and CG is the control group, which did not indicate any particular treatment. Although there is significant difference between EG1 and EG2 vs. CG, there is no difference between EG1 vs EG2, showing that the effect of acupuncture did not make any difference in reducing weight.

Table 7 - Acupuncture and Diet and Exercise - Ineffective

Author - Year	Type of Intervention	Sex Age	Sample size	Tx Frequency & Duration	Outcome Measures	Result - BW changes or % of effective rate in each group	Result- (P-value)	Conclusion
M. Nourshahi, et. al - 2009	Acu (A) - EG1 Diet (D) - EG2 Exercise (E) - CG. (Diet = low calorie diet of 500 Kcal)	All female (n=27). Age: EG1: 41 EG2: 40 CG: 37.	EG1: D+E EG2: D+E +A CG: none (# in each group not specified. 27 total)	8 weeks	BMI, FMI NM		<ul style="list-style-type: none"> • Significant difference in EG1, EG2 vs. CG: (p<0.05) • EG1 vs. EG2 had no difference 	Acupuncture does not show any difference in the effectiveness.

IV. Discussion



KEY: BA = Body Acupuncture, EA = Electro Acupuncture, MA= Manual Acupuncture, CG= Control Group, Ex= Exercise, RCT= Random Clinic Trial

Even though there were only 6 articles, indicating ‘Randomized Control Trials’ in the Title, the other eight articles did use some kind of Controls as comparison, to come up with the results. In the non-RCT group, there are more EAR acupuncture with/without electro stimulations. They were all effective with a significant P-value to justify that

acupuncture is effective for obesity. There was only 1 non-effective article among 14 articles included.

Ear with EA has better result for reducing obesity. It is easier and has no risks. If acupuncture along with diet is followed, it has better results. But most of them had few sample sizes, some did not show duration or any follow up and different variables combinations are used throughout different articles. Therefore, it is very hard to really compare them, although there is evidence or hope that acupuncture is effective for reducing obesity and also controlling other obesity related factors such as BMI, TG, LDL, HDL, Leptin, etc.

Although the studies reviewed have shown some positive results, there are shortcomings in the studies that need to be resolved. All studies reviewed did not conform to a standard way of evaluating and measuring the samples. For example the outcome measures were different, the acupuncture points were different, the timing was not considered, etc. Studies need to be improved with proper data and documentation. The comparable studies must have the same criteria, such as same acupuncture point, type of stimulation, measurements used, before and after readings, etc. Lack of uniform criteria for inclusion and therapeutic effects and lack of indices for estimation of effects are causing differences in reported effects. Long term effects and rebound reported by periodic follow-up are seldom seen. If such studies have to be conducted, they have to be done in a closed and controlled environment, like a clinic, where patients have to be kept under observation all through the study. Their daily life style, eating habit, treatment method, treatment period, type of other physical ailments, etc. should all be monitored during the treatment. A follow

up has to be set up to see how the treatment affected or was sustained. Trying to use RCT using acupuncture is like trying to measure a ball using a straight ruler.

If the studies are viewed individually, they do show that acupuncture has some positive effect on reducing obesity. In some of the studies, in addition to reducing obesity, it also improved psychological problems and helped to reduce HDL, LDL, TG in hyperlipidemia. Acupuncture treatment done during a specific Spleen time (9-11am) has a curative effect when compared to acupuncture treatment done during a time other than the Spleen time for Spleen deficiency and excess dampness in patients. Midnight-noon ebb-flow, a theory in acupuncture and point selection and a time medicine mainly used to direct acupuncture point selection, is mainly based on the concept of “correspondence between man and universe” in the Internal Classic (Jie Wu, et. al -2014). This is a good example of why timing is one of the many factors that need to be considered in order to reap the benefit of acupuncture treatment. This is also a good example to show why individual types need to be taken into consideration while selecting samples. One treatment that was effective for someone with Spleen deficiency may not be affective for a different person with Stomach heat.

Table 6 shows the effect of acupuncture along with use of Metformin. Combination of acupuncture and Metformin has a better effect than using Metformin alone; a significant difference of ($P < 0.001$). This particular study would be even better if there is a third group with acupuncture only so that we can really see if acupuncture alone can bring the same benefit without the use of Metformin.

Table 7, where the ineffectiveness of acupuncture is shown, does not clarify how the control group was handled. This is another problem within this kind of study where all data are not specified uniformly.

The review also showed evidence of how acupuncture can benefit the reduction of TG, HDL, LDL and Hsps (Heat Shock Proteins), which are highly conserved proteins expressed by several cell types following exposure to environmental stresses. Since stress can create obesity, reduction of TG, HDL, LDL, etc. can be beneficial for preventing further health problems by reducing obesity.

Body acupuncture in combination with diet restriction was found to be effective for weight loss and also reduction of the obesity-associated risks factors, such as dyslipidemia.

Trial Quality

Figure 2 below shows a quality assessment of the 14 included studies. A score of '1' was given for each parameter fulfilled in the specified column. A score of '10' is the highest possible score. The following is a tally of how the articles scored in quality, based on these values specified in each column:

8 of them scored a perfect 10 out of 10 (100%)

2 of them scored 9 out of 10 (90%)

2 of them scored 8 out of 10 (80%)

1 scored 7 out of 10 (70%)

1 scored 6 out of 10 (60%)

Therefore, out of 14 articles, only 1 scored poorly. This is mainly due to poor description to details. Due to the nature of the intervention, variation in the method, insufficient details on intervention of the control group and number of treatment, etc. it is difficult to tell if the intervention was distinguishable from the control treatment or not.

Weakness:

The comparable studies retrieved have few sample sizes, inconsistent or no treatment period and no follow up most of the time. It is hard to tell how long the treatment result lasted. Due to cost, the search databases were limited, thus including only few RCT studies for review. Availability of studies with free full text, articles in English and only one person to assess and evaluate the quality of the study, also were weakness in the study.

Reviewed Articles: Author & Year	Clear description	RCT	Control/ Placebo group	Has two different treatment groups	Intervention	Sample size	Sex	Age	Frequency & Duration	Comparable Outcome	Effectiveness in % or weight	Result- P - Value	Total
Wang Hongyu 2002	1	0	1	n/a	1	1	1	0	1	1	1	1	9
Luo HL, Li RH 2007	1	0	n/a	1	1	1	0	0	1	1	1	1	8
Jie Wu, et. al. 2014	1	0	1	n/a	1	1	1	1	1	1	1	1	10
Yasemin C, Turan S., Zahide K. 2017	1	1	n/a	n/a	1	1	1	1	1	1	1	1	10
Hamid A, et. al. 2012	1	1	0	n/a	1	1	1	1	1	1	1	1	10
Hamid A, et. al., 2012	1	1	0	n/a	1	1	1	1	1	1	1	1	10
Mehmet TC, Neyhan E 2005	1	0	1	n/a	1	1	1	1	1	1	1	1	10
Mehmet TC, Neyhan E, Uner T 2007	1	0	1	n/a	1	1	1	1	1	1	1	1	10
Darbandi S, et. al 2013	1	1	0	n/a	1	1	1	1	1	1	1	1	10
Yao H, et. al 2012	0	0	1	n/a	1	1	0	1	1	1	0	1	7
Cabioglu MT, Ergene N 2006	1	0	1	n/a	1	1	1	1	0	1	1	1	9
Yang JJ, et. al, 2010	0	0	1	n/a	1	1	0	0	1	1	0	1	6
A. Frouzjael, et. al. 2016	1	1	0	n/a	1	1	1	1	1	1	1	1	10
M. Nourshahi, et. al. 2009 *	0	1	0	n/a	1	1	1	1	1	1	0	1	8

Figure 2. Quality Assessment of the studies. * Ineffective

V. Conclusion

So far, most reviews that have been done are descriptive in nature, of short duration and designed using nonstandard treatment protocols. Most of these studies are done outside US, in China, and it does not fully comply with the RCT requirements of the US and to satisfy the demands of the scientific world. Sometimes the meaning seems to have been lost in the translation. In conclusion, there is an urgent need for well-planned, long-term studies to show the effectiveness of acupuncture for treating obesity; especially to address the scientific English speaking community.

The studies reviewed does give some effective data that acupuncture is effective in reducing obesity. Some data suggest that electro-acupuncture may be more effective than manual acupuncture; however, a satisfactory effectiveness remains controversial due to lack of enough RCT. Combination of different forms of acupuncture with diet and exercise seems to be more effective in achieving and maintaining weight loss. This review suggests that further prospective clinical trials are needed to establish the effectiveness of this alternative method for obesity treatment.

Due to the cost of extracting more articles and language barrier to investigate studies in other languages, the sample studies in this review are limited. Yet from this small sample, all except one study showed that Acupuncture has significant effect for reducing obesity. It also has added benefit in psychological problems and controlling Anthropometric value, the increase of which can cause further complication in health, such as diabetes, heart problems, etc. Acupuncture is also a safe way to treat without any adverse effect. Larger sample size

needs to be organized in order to conduct such trials. Time of treatment, body types, health factors, lifestyles, etc. need to be taken into considerations for such trials to be seen as more reliable. This can be a very cumbersome task and it can be a long journey. Acupuncture is a treatment prescription, based on Traditional Chinese Philosophy. It may be very difficult to set up an environment for testing the efficacy of Acupuncture using random control.

Future Research

No treatment, including acupuncture, will work unless people conform to their healthy lifestyle. There is no one solution and no one tiny pill that one can swallow and make all that fat just go away. Although it is desirable to conduct studies that can meet the gold standard, in TCM, according to clinical experience, individualized treatment with lifestyle changes is better than a standardized treatment for reducing obesity. The different methods extracted from the review of all these literatures can be very helpful to be used again in the future to do more extensive studies on this subject with more data collections and other details such as number of cases involved, the gender of the cases, their vital science, the symptom differentiations, the lifestyle, etc., which will make it even more interesting and valuable to the future of humanity since obesity is a very critical disease. Setting up an environment for RCT using acupuncture can be challenging.

TCM philosophy is different than Western scientific pharmaceuticals. Treatment of acupuncture is based on individual body types such as excess or deficient, heat or cold, emotional disturbances of various kinds like stress, depression, sadness, sex and age (hormone levels vary as you age as well as in different sex), lifestyle, etc. Based on these

alone, all individuals are different and may respond differently to the same treatment. Besides these, consistency in treatment, point accuracy, point depth, and treatment time are some of the other factors that will contribute to the treatment results.

Sham acupuncture is meaningless since it is not real acupuncture. The individuals in the control group must have very similar conditions as the treatment group. These individuals also must be kept under close observation to make sure that nothing changes during the trial.

This study was done to see how much of RCT has been attempted in this field and what is the success rate in the effectiveness of acupuncture in reducing obesity. It can be concluded that more RCT studies need to be conducted in a more controlled environment with larger sample size and a follow up must also be done. It is also beneficial to educate the public on how acupuncture works and even if RCT cannot be set up, group studies can be conducted to show the efficacy of acupuncture for reducing obesity. For example:

1. The trial group can be treated with acupuncture and a control group with no acupuncture but treated with pharmaceutical drugs only.
2. The trial group can be treated with Acupuncture, a second trial group with Acupuncture and diet, and a third control group treated with diet only.

Hopefully more and more practitioners will publish the results of such trials so as to educate the public on the effectiveness of acupuncture on obesity.

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Appendix -A

Adiponectin

Adipose tissue is an endocrine organ that produces biologically active molecules defined “adipocytokines,” protein hormones with pleiotropic functions involved in the regulation of energy metabolism as well as in appetite, insulin sensitivity, inflammation, atherosclerosis, cell proliferation, and so forth. In obesity, fat accumulation causes deregulation of adipokine production that strongly contributes to the onset of obesity-related diseases. Among the adipokines, adiponectin shows protective activity in various processes such as energy metabolism, inflammation, and cell proliferation. Adiponectin, exhibiting antihyperglycemic, antiatherogenic, and anti-inflammatory properties, could have important clinical benefits in terms of development of therapies for the prevention and/or for the treatment of obesity and obesity-related diseases (Nigro E, et. al. 2014).

Leptin

Leptin is a hormone that is produced by the body’s fat cells. It is often referred to as the “satiety hormone” or the “starvation hormone”. Leptin’s primary target is in the brain, particularly an area called the hypothalamus. It is supposed to tell the brain that we have enough fat stores, that we don’t need to eat, and that we can burn calories at a normal rate. Leptin’s main role is long-term regulation of energy balance; the amount of calories we eat and expend, and how much fat we store on our bodies (Kris Gunnars. 2017). The stimulation of leptin receptors in hypothalamic nuclei decreases fat storage through several

mechanisms. Levels of plasma leptin increase with increased BFM (Darbandi S, et. al - 2013).