THE EFFICACY OF PSYCHO-PHYSICAL INTERVENTIONS FOR OBESITY AND ASSOCIATED FACTORS AMONG PAKISTANI WOMEN: A RANDOMIZED CONTROLLED TRIAL STUDY

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ABSTRACT

The study aims to measure the effectiveness of psychological and physical interventions for obesity and associated factors. The psycho-physical interventions are the combination of cognitive behavior therapy (CBT), exercise, and diet management to reduce obesity diagnostic factors such as body weight, body mass index (BMI), waist-to-hip ratio (WHR), and percent body fat (PBF) among Pakistani women. The same interventions targeted obesity associated factors such as eating behavior, sedentary behavior, body image, and self-control. Through a randomized control trial repeated measure design, the study recruited 128 females by employing panel data technique on the basis of inclusion criteria (BMI>25 kg/m^2). The sample were distributed into four equal groups using online permuted block randomization. Experimental group-1 (CBT + Exercise) received weekly sessions for 10 weeks of cognitive behavior therapy along with exercise execution. Experimental group-2 (CBT + Diet) received weekly sessions for 10 weeks of cognitive behavior therapy with diet management plan. Experimental group-3 (CBT + Exercise + Diet) also received weekly sessions for 10 weeks of CBT along with exercise execution and diet plan. Group-4 (control) attended weekly sessions for 10 weeks but were provided information only. The results found that the intervention-3 significantly (treatment effect × time effect $p \leq 0.001$) reduced more body weight, BMI, WHR, and PBF at 10-week and 5-month follow-up as compared to other groups. Likewise, the intervention-3 significantly (treatment effect × time effect $p \leq 0.001$) reduced eating behavior, sedentary behavior, body image, and self-control at 10-week as compared to other groups but in the 5-month follow-up there were no significant changes. Conclusively, the combination of CBT with exercise and diet management is the most effective intervention to reduce obesity and associated factors as compared to CBT with exercise alone or CBT with diet management alone. The study implicated that body weight, obesity, and associated factors can be reduced by using psycho-physical interventions.

KEBERKESANAN INTERVENSI PSIKO-FIZIKAL UNTUK OBESITI DAN FAKTOR-FAKTOR YANG BERKAITAN DALAM KALANGAN WANITA PAKISTAN: SATU KAJIAN PERCUBAAN KAWALAN RAWAK

ABSTRAK

Kajian ini bertujuan untuk mengukur tahap keberkesanan program intervensi psikologi dan fizikal untuk obesiti dan faktor-faktor yang berkaitan. Intervensi psiko-fizikal adalah kombinasi terapi kognitif tingkah laku (CBT), senaman dan pengurusan diet untuk menurunkan faktor-faktor diagnostik obesiti seperti berat badan, indeks jisim tubuh (BMI), nisbah pinggang ke pinggul (WHR), dan peratusan lemak badan (PBF) dalam kalangan wanita Pakistan. Program intervensi ini turut menyasarkan faktor-faktor yang berkaitan dengan obesiti seperti tabiat pemakanan, tingkah laku sedentari, imej tubuh dan kawalan diri. Kajian ini mengunakan reka bentuk kawalan percubaan rawak ukuran berulang, melibatkan seramai 128 orang wanita yang dipilih dengan mengunakan teknik data panel berdasarkan kriteria inklusi (BMI >25kg/m^2). Sampel kajian dibahagikan secara sama rata kepada empat kumpulan dengan mengunakan blok pilih atur rawak. Kumpulan eksperimen 1 (CBT + Senaman) menjalani sesi mingguan terapi kognitif tingkah laku berserta senaman selama 10 minggu. Kumpulan eksperimen 2 (CBT + Diet) menjalani sesi mingguan terapi kognitif tingkah laku berserta pelan pengurusan diet selama 10 minggu. Kumpulan eksperimen 3 (CBT + Senaman + Diet) menjalani sesi mingguan terapi kognitif tingkah laku berserta senaman dan pelan pengurusan diet selama 10 minggu. Kumpulan 4 (kawalan) menghadiri kesemua sesi mingguan selama 10 minggu tetapi hanya menerima maklumat. Dapatan kajian menunjukkan bahawa kumpulan intervensi-3 menunjukkan penurunan signifikan (kesan rawatan x kesan masa $p \leq 0.001$) berat badan, BMI, WHR dan PBF pada minggu ke-10 dan perjumpaan susulan 5 bulan kemudian berbanding kumpulan-kumpulan lain. Begitu juga, kumpulan intervensi-3 menunjukkan penurunan yang signifikan (kesan rawatan x kesan masa $p \leq 0.001$) bagi tabiat pemakanan, tingkah laku sedentari, imej tubuh dan kawalan diri pada minggu ke 10 berbanding kumpulan-kumpulan lain tetapi tidak menunjukkan perbezaan yang signifikan pada perjumpaan susulan 5 bulan kemudian. Sebagai kesimpulan, kombinasi CBT berserta senaman dan pengurusan diet adalah teknik intervensi yang paling efektif untuk mengurangkan obesiti dan faktor-faktor yang berkaitan berbanding CBT berserta senaman ataupun CBT berserta pengurusan diet sahaja. Implikasi kajian ini adalah berat badan, obesiti, dan faktor-faktor yang berkaitan boleh dikurangkan melalui intervensi psiko-fizikal.

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LIST OF ABBREVIATIONS AND SYMBOLS

α	Alpha
AE	Appearance Evaluation
ANOVA	Analysis of Variance
AO	Appearance Orientation
APA	America Psychological Association
BAS	Body Areas Satisfaction
BASS	Body Areas Satisfaction Scale
BDD	Body Dysmorphic Disorder
BED	Binge Eating Disorder
BI	Body Image
BID	Body Image Dissatisfaction
BMI	Body Mass Index
BSCS	Brief Self-Control Scale
BVH	Bahawal Victoria Hospital
BWL	Behavioral Weight Loss
CBT	Cognitive Behavioral Therapy
CBT + E + D	Cognitive Behavior Therapy Plus Exercise Plus Diet
CBTEQ	Cognitive Behavior Therapy Effectiveness Questionnaire
CCT	Counteractive Control Theory
CDC	Centers for Disease Control and Prevention
cm	Centimeter

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CR	Cognitive Restraint
CVI	Content Validity Index
EB	Eating Behavior
EE	Emotional Eating
gm	Gram
GSH	Guided Self Help
ICVI	Item Content Validity Index
IUB	Islamia University Bahawalpur
K	Number of Items
kcal	Kilo Calories
kg	Kilo Gram
LEARN	Lifestyle, Exercise, Attitudes, Relationships, and Nutrition
MASO	Malaysian Association of the Study of Obesity
MBSRQ	Multidimensional Body-Self Relations Questionnaire
MBSRQ-AS	Multidimensional Body-Self Relations Questionnaire-Appearance Scale
MI	Motivational Interviewing
NHANES	National Health Examination Survey
NHMS	National Health Morbidity Survey
NIH	National Institute of Health
OWP	Overweight Preoccupation
η^2_p	Partial Eta Square
%	Percent
PBF	Percent Body Fat
PS	Problem Solving
PT	Pilot Study

RCT	Randomized Control Trial
SB	Sedentary Behavior
SBQ	Sedentary Behavior Questionnaire
SC	Self-Control
SCT	Social Cognitive Theory
SCW	Self- Classified Weight
SD	Standard Deviation
SM	Self-Monitoring
SCVI	Scale Content Validity Index
TFEQ	Three Factor Eating Questionnaire
TPB	Theory of Planed Behavior
TS	Terminal Study
UN	Uncontrolled Eating
WHO	World Health Organization
WHR	Waist Hip Ratio
YRBS	Youth Risk Behavior Survey

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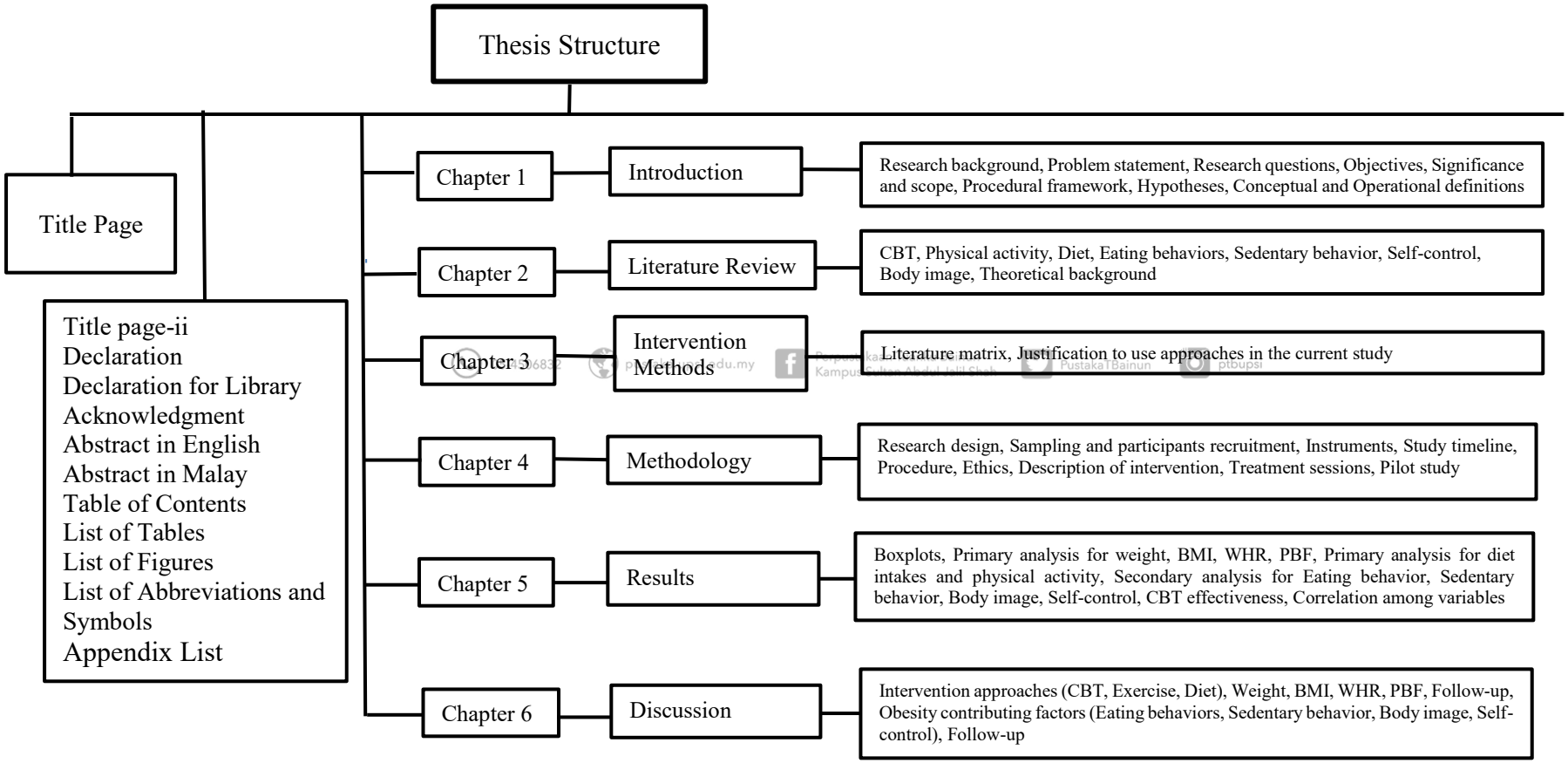
APPENDIX LIST

CHAPTER ORGANIZATIONS



CHAPTER 1

INTRODUCTION

The first introduction chapter covers overall research background related to study topic including all variables generally and specifically region wise. Further problem statement, research questions and objectives, scope and significance, research framework and theoretical background were also discussed as well as conceptual and operational definitions. To conceive the whole chapter contents, flow chart 1.1 is presented on the following page.

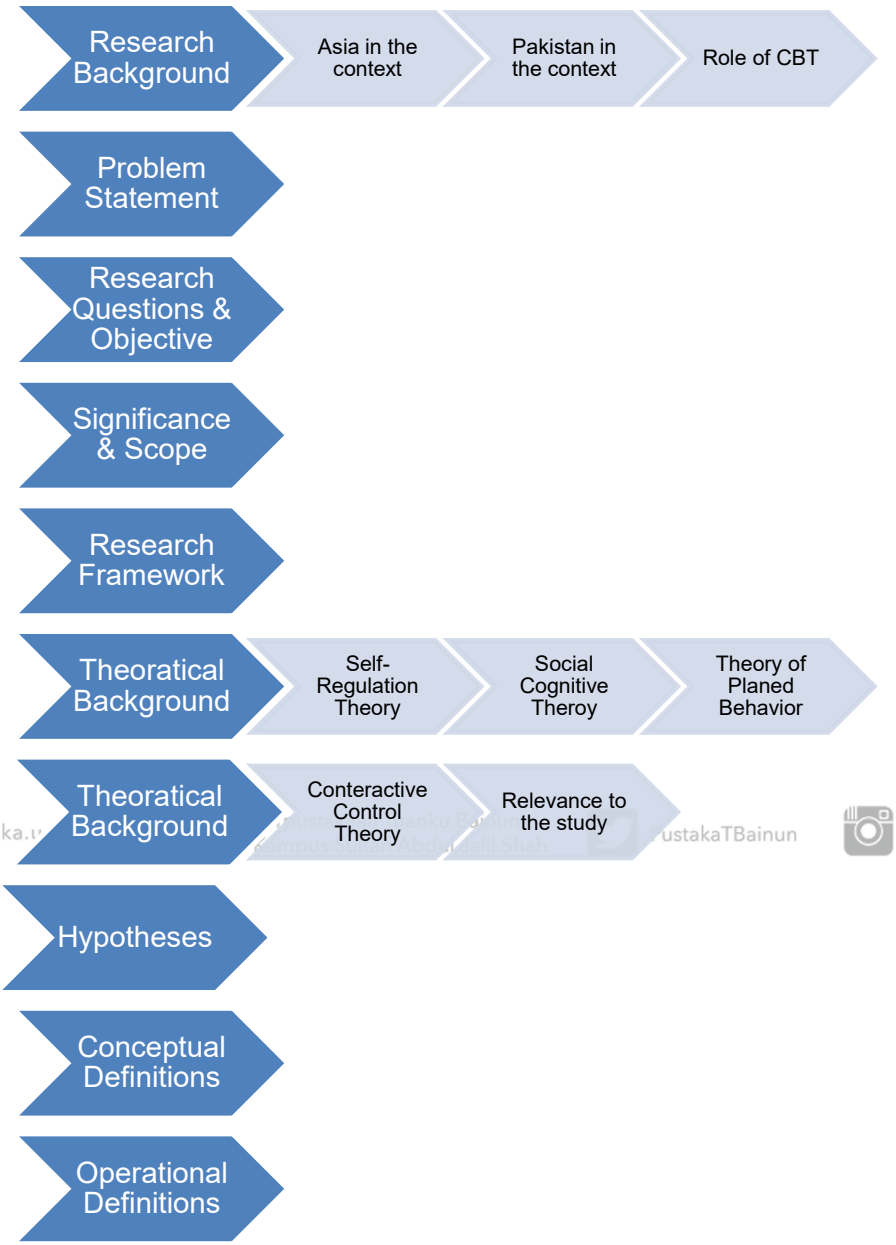


Figure 1.1. Contents Flow Chart of First Introduction Chapter

1.1 Research Background

Obesity, illustrates as accretion of excessive body fat, is found presently among more than the one-fifth of overall western adult population (Seidell, 2005). Derivative from the "obesus", a combination of two Latin words, "ob" and "edere", which mean

overwhelm and to eat away respectively. Obesity is identified as the disproportionate fat deposition within the body and conferred a bulky look. Actually, it is the increased sum of fat, muscles and water in the body. Obesity takes place when the mean weight is greater than the mean height (Haslam, & James, 2005). Excessive fat, in terms of various recognized and unrecognized factors, results in a mutilation of physical health is coupled with multiple threats to psychological wellbeing and quality of life at the same time.

Obesity has become the global public health issue and not only prevailing to well-developed western societies but also left its devastating effects on under developing countries without any distinction. According to Brener and colleagues, (2004), the CDC (Centers for Disease Control and Prevention), the last two decades witnessed the reality of despite of all efforts to reduce obesity ratio, the situation is worsened rather than any notable improvement.

National Health Examination Survey (NHANES), 1999-2000 predicted about 64.5% over weight adults possess body mass index (BMI) more than 25 cleared as kg/m^2 and 30.5%, BMI more than 30 and considered obese. In the United States, currently, 34.9 percent is obesity rate of all individuals, and about 33 percent of the population categorized as overweight (Flegal, Carroll, Ogden, & Johnson, 2002; Ogden, Carrol, Kit, & Flegal, 2014). Worldwide, men asserted with a body mass index (BMI)$\geqslant$25 kg/m^2 and in 1980, it was 28.8% which amplified to the percentage of 36.9% in the year of 2013, while the women affirmed with increased percentage from 29.8 to 38.0% during the similar era. In the same way, the number of obese natives has reached to 2.1 billion in 2013 which was 857 million in the year of 1980 (Fleming et al., 2014).

The Global Experts Conference was conducted by World Health Organization (WHO) in June 1997 to recognize the risks involving obesity and weight gain all over the world (WHO, 2000). The occurrence of obesity is rising worldwide alarmingly (WHO, 2000a). The miscellaneous states signify attended the conference such as United Kingdome (UK), United States America (USA), Thailand, Canada, China, Switzerland, Australia, Netherlands, Ireland and Japan. Other countries were also joined the respective conference, among those countries were; Egypt, Malaysia, Nigeria, India and Pakistan. Consultants related to food and agriculture departments and organizations also joined and focus of the discussion was a sole point about the drastic prevalence of obesity in Asian and Western cultures during prior last few decades. (Kumanyika et al., 2002; WHO, 2004). Furthermore, the attitude toward active life style, food patterns and socio-economic status of Asian and Western states was also analyzed to resolve the global issue of obesity (Kuh, Karunananthan, Bergman, & Cooper, 2014). Further, 8% higher prevalence was found more than which was acquired from NHANES III, [NHANES III, 1988-1994 (Crespo, Smit, Carter-Pokras, & Andersen, 2001)]. The remarkable obesity related overwhelming situation is considered the consequence of vulnerability to consume fast food and avoiding physically active life style (Hill, Wyatt, & Melanson, 2000).

The physiological and psychological health outcomes of obesity are extensive. As per each year 300,000 deaths happened as the subsequent of obesity and overweight (Allison, Fontaine, Manson, Stevens, & VanItallie, 1999). The conditions related to obesity included gallbladder disease, cardiovascular disease, stroke, hyperlipidemia, hypertension, osteoarthritis, sleep related disturbances and mental disturbance such as depressive mood and eating disorders as well. Moreover, the quality of life and

wellbeing also fluctuate as per level of Body Mass Index (BMI). Specifically, at that time when body mass index is more than 30 percent, it enhances the threats of ultimate death to 30% and if body mass index arrives at 40, it increases the risks of death 100 percent as compare to non-obese and normal weight people. It was also identified that obese individuals call their death by victimizing the cardiovascular problems and diabetes (Manson et al., 1995; Panel, 1998). Obese people were also discriminated at workplaces and thus, they developed mood disturbances, and a decreased self-worth due to this stigmatization (Kumanyika, Jeffery, Morabia, Ritenbaugh, & Antipatis, 2002). Similarly, body image dissatisfaction is a strong predictor of other negative psychological consequences, including eating disorders, exclusively linked to binge eating disorder (BED) in obese individuals (Schwartz & Brownell, 2004).

Evidences relating obesity in the medical literature argued about the lower reliability of BMI in context of measuring fatness (Gallagher et al., 1996; McCarthy, Cole, Fry, Jebb, Prentice 2006; Smalley, Knerr, Kendrick, Colliver, & Owen, 1990; Yusuf et al., 2005). Recent trend to measure body fat composition such as waist to hip ratio (WHR), and the percent body fat (PBF) that's why current study measures all diagnosis components of obesity. Weight stigmatization significantly mediated the relationships between body mass index and body dissatisfaction (Stevens, Herbozo, Morrell, Schaefer, & Thompson, 2016). For assessing the intervention-based programs to prevent obesity, sedentary behavior evaluation is an important measure to observe and estimate the changes throughout the therapeutic course and measures of sedentary behaviors are lacking for adults (Rosenberg et al., 2010). A wide range of epidemiological studies considered sedentary life style as the notifying causal factor of weight gain (Brown, Miller, & Miller, 2003; Hu, Li, Colditz, Willett, & Manson, 2003).

1.2 Asia In the Context of Obesity

Although, over the world is facing the obesity problem, yet, the Asian countries and specifically developing countries are badly suffering obesity from two to three decades. In the Asia Pacific site, Malaysia is a country where from prior few years, modernization improved the industry and provides facilities to lives, which has decreased physical activity and causing obesity and weight gain (Khambalia & Seen, 2010). Pervasiveness of obesity and the subsequent adverse cost across multiple age groups was also detected by various investigators in Malaysia (Cheong, Kandiah, Chinna, Chan, & Saad, 2010; Gopalakrishnan, Ganeshkumar, Prakash, & Amalraj, 2012; Ismail et al., 2002; Kee et al., 2008; Khambalia & Seen, 2010; Lekhraj Rampal et al., 2007; Mohamad, Mokhtar, Mafauzy, Mustaffa, & Musalmah, 1996; Wafa et al., 2011; Wan Mohamud et al., 2011). Among other Asian developing countries, India and Srilanka has also dramatically developing obesity at the same time, as well as Pakistan is one of them drastically facing the physiological and psychological problems sprouted from obesity (Aslam, Saeed, Pasha, & Altaf, 2010).

According to World Health Organization, (2000) and Choo, (2002) Asian population has more susceptibility to weight gain and obesity as compare to European population. The pervasiveness of overweight percentage of Malaysian adults was 34.4 (Male=30.6, Female=38.1) and increased in the year 2014 prevalence 38.5 (Male=33.1, Female=44.1) (WHO, 2013). In 1994, MASO (Malaysian Association of the Study of Obesity), apprehensive due to increasing obesity and other relevant medical problems. Malaysia asserted with higher obesity rate in the NHMS III (according to National Health Morbidity Survey) in the year of 2006 as compare to other Asian countries (Kee

et al., 2008). It was identified that Body Mass Index (BMI) has bumped from 16.6% to the percentage of 28.6, and the increase rate of overweight is increased from 4.5 to 14.2 percent (Suzana et al., 2012).

In Malaysia, the globalization of eating patterns such as a large consumption of junk food and another feature behind obesity promotion is the lacking of physical work and increased inactive life style contribute to weight gain and transformation of people to obese or overweight (Noor, 2002; Poulain et al., 2015; WHO, 2000). Wardle, and Marsland (1990) suggested to conduct obesity related studies in Asian countries on urgent basis and also conducted an investigation upon the population belonged to various locations but, basically belong to Asia (Bakhshi, 2011). Asian women also often report parallel intensity regarding eating instability, and more concerns regarding gaining weight, dietary habits and food restrictions as contrasting white female participants (Cummins & Lehman, 2007; Wildes et al., 2001). Another study conducted by Gluck and Geliebter (2002) found that preceding to overcome body mass index western female population was detected with higher level of bodily incongruity amid the real and desired body shape as compare to Asian population, yet, the white and Asian populations were seemed to be equal when compare to the African female population. Dolan and colleagues (1990) detected more disordered eating attitudes among British Asian women as compare to Western women. The evaluation consisting the comparative study by Jennings, Hulse McDermott and Forbes, (2006) on the sample of Asian and Western female population detected Asian's were highly concerned with eating disturbances and psychopathology rather than Whites.

Astrup (2008) reviewed 13 papers concluded the optimal diet intake for avoidance and treatment in context of weight gain and obesity, the particular diet focused on fat-reduction and lower-energy density carbohydrates. As the other fields of Malaysia accepted the effects of westernization, at the same time, eating patterns also accepted transitions inspiring from modernized eating behaviors (Lin, Cobiac, & Skrzypiec, 2002). Transitions in lifestyle such as food production, food preferences, dietary habits, and other factors related to food are associated with risks to health and disease pattern of Malaysians (Zainal-Badri et al., 2012). The main causal factor of the disease was found to be overweight that develops obesity which simply associated with unhealthy food ingestion, poor dietetic habits and sedentary lifestyles (A-Karim et al., 2008; He & Evans 2007; Kee et al. 2008; Lam & Khor 1997; Norlaila 2008; Williams 2004).

Striegel-Moore and Franko, (2002) conducted a study among multiple Asian ethnic groups and the higher tendency of deteriorated eating pattern and the lower level of self-esteem was detected among each population group who was basically from Asia. Another study conducted by Mintz and Kashubeck's (1999) stated that Asian American females were more concerned with their facial features, the size of their breast, their height and their arm shapes were usually related to their self-esteem and self-image as well as bodily dissatisfaction at the same time. While, 25 % female in a comparative study in which the comparison was made among Californian and Asian, and comparison among Hispanic and Asian female reported considerably higher levels of bodily dissatisfaction of body areas as compared to Caucasian female participants (Robinson, Killen, & Litt, 1996). Asian and Hispanic female did not indicate any difference from Caucasian female according level of body dissatisfaction with their

body shape (Levine & Smolak, 2002). Researchers postulated that thin body shape received much attention in Hispanic and Asian cultures especially in terms of femininity characteristics and self-worth (Dworkin & Kerr, 1987). Conclusively, literature supported that there is dire need to conduct intervention study for weight reduction particular for Asian overweight or obese population, because of the current study target is Pakistani population therefore following paragraph discussed obesity problems particularly in Pakistani context.

1.3 Pakistan In the Context of Obesity

Pakistan is the 9th highest ranking country out of 188 in terms of the global burden of obesity (Ng et al., 2014). The higher occurrence is probably due to using the lower threshold for categorization of obese and overweight people in the whole population and the rapidly developing epidemic of obesity in Pakistan. The overwhelming situation of obesity can be estimated through facts about its prevalence increased 25% and adults asserted with increased from 2 to 10% from past two decades (Hossain et al., 2007), while people with weight troubles predominantly in urban region is 22% for and 37% women overall in Pakistan (Aslam, Saeed, Pasha, & Altaf, 2010). Khyber Medical University conducted a survey to measure percentage of overweight and obese particularly from medical department, the study results found 16.2% as obese and the percentage of overweight was 15% (Jaffar, Chutervedi, & Pappas, 2006). These results indicated harmful risks of developing obesity is increasing in Pakistani population particularly among female (Bahadur et al., 2013), and it has appeared with more serious

threats due to insufficient health related awareness and health related facilities (Majeed, Iqbal, Masood, Malik, Rehman, Ullah, & Nadir, 2015).

1.3.1 Weight and Obesity Reduction

It is crucial to develop awareness among overweight adults about their body weight and its medically threatening outcomes (Hossain, Khawar, & Nahas, 2007). The basic element of weight reduction is not only to be aware of being overweight but also developing awareness how to reduce weight or at least guidance about the dietary and exercise habits in context of weight reduction. In Pakistan, it is important to highlight the behaviors that contribute to obesity are needed on urgent basis (Bhanji, Khuwaja, Siddiqui, Azam, & Kazmi, 2011). There are multiple indicators of obesity expansion which predict obesity levels and chances to promote obesity. These factors are commonly recognized as excessive Waist to Hip Ratio (WHR), higher levels of Body Mass Index (BMI), and uncontrolled Percent Body Fat (PBF) (Fatima, Rehman, & Chaudhry, 2014; Hower, 2003). BMI is indicator of present obesity and percentage of Body Fat and Waist Hip Ratio (WHR) identified as indicators of the intensity of obesity in present as well as in future (Amin, Fatima, Islam, & Gillani, 2015).

1.3.2 Body Mass Index (BMI)

Body Mass Index (BMI) is identified as a boosting factor of enhancing risks to harmful health outcomes stated by World Health Organization (WHO). Multiple intervention studies established a direct association between physical health risks, transience and BMI. National Institute of Health (NIH) and World Health Organization (WHO) classified levels of obesity based on I index. BMI greater than or equal to ≥30 kg/m^2 among adult is interpreted as obesity and commonly threats to physical health as compared to overweight adult with BMI less than 25 and normal weight or thin with BMI between 18.5 and 24.9 (Nishter, 2007).

The Body Mass Index (BMI) is not bound to age and sex. However, it should be noted that there are ethnic differences in the level of body fat and BMI, as well as sex and age differences, which determined the link between higher levels of BMI and risks to health outcomes (World Health Organization, 2000). BMI of ≥25 kg/m^2 is considered as overweight by the described criteria of World Health Organization. BMI 25.0-29.9 indicated the severe overweight, class I obesity composed of BMI 30.0-34.9; class II obesity was categorized as BMI 35.0-39.9 obesity and class III obesity is followed by BMI ≥40.0. For maximum health, BMI ranging 21-23 is satisfactory for an adult population. To maintain the healthy body weight and physical health, the basic 18.5 to 24.9. The risk of several diseases maximizes when BMI is in the range of 25.0-29.9, and the risk increases from moderate to high risk of when BMI is increased 30 or more than this range.

1.3.3 Waist to Hip Ratio (WHR)

Another most important indicator of obesity, Waist to Hip Ratio is a specific indicator to predict risk of obesity in future and considered as a central factor to identify. Studies showed WHR is significantly correlated with abdominal fat. The location of body fat also considered important in context of obesity and BMI. Farida and colleagues (2012) found a significant relationship of BMI and WHR.

1.3.4 Sociocultural Factors Contributing to Obesity Among Pakistani Population

Obesity is predisposed by social and cultural factors such as gender, marital status, occupation, income, being a parent, education and age (Sobal, 2001). Gender differences exist in Pakistan in terms of body size and it was found that female showed more risks to develop cardiovascular disease as compared to male participants because of higher body weight (Jafar, 2006). Among the population of every age group, women showed more tendency to obesity than men. Studies from Norway also show that Pakistani women have more obesity and a remarkable diabetic prevalence was detected in women than men (Jenum et al., 2005; Kumar et al., 2006). It is of the greatest importance to get to know more about the Pakistani women's lifestyle. Not only because of their higher risk for disease, but also because of the impact a mother has on children, both in nursing and during the pregnancy. Women are also most often in charge for cooking at home.

1.3.5 Diet in Pakistan

Samir, Muhammad, and Khuwaja, (2011) identified unhealthy dietary habits as a significant predictor of overweight in Pakistani population. Pakistani nutritional diet comprises of highly caloric, accompanied of energy and fats, which causes disproportion of body fats. Despite of excessive energy intake, the energy consumption is very low which develop metabolic disturbances and causes obesity in Pakistani population. Furthermore, it is also recognized that due to modernization, the fast food trend has become much popular among which is also determined as a major contributor to obesity among Pakistani youth.

In Pakistani tradition, the first meal typically comprised of chapatti from whole wheat flour, oil fried eggs, and cold yogurt drink (Lassi) in salted or sweetened form. In urban areas, the breakfast trend is changed to white bread, jam with tea or sweet carbonated beverages. The afternoon meal comprises of salen which is prepared with onion, garlic, ginger and other spices gravy with the vegetables, meat, fish or lentils. The third meal called dinner is the time when whole family gather and it consists of salen, chapatti or sometimes rice. Sweet dishes and especially mithai with tea is also taken after dinner. Mithai is Pakistani sweets made of milk, sugar and ghee. Snacks are also taken from time to time which are fruits or sweet items which are consumed usually between the meal times or after taking meals.

Vegetables such as, tomatoes, cauliflower, onions, potatoes, cucumbers, spinach, carrots, okra, pumpkin, and reddish are commonly used for preparing different salads and salens. In the rural areas, vegetables are more consumed as well as the use

of various lentils and beans are also common. The specific dish using lentils, is called Dhal and these lentils may also consume as snakes while making them fried with spiced. Another commonly consumed snack is fruit which is taken as snack or sweet dish as well. Meat is also another important element in Pakistani diet, such as chicken, beef and mutton, which are prepared in form of gravy, fried or kebabs. People living near rivers, or other areas near coasts, usually take fish as their food, and boiled or fried eggs. Each type of food in Pakistan is cooked in Ghee or oil and at the countryside, butter is also used as an alternative of ghee (Jafar, 2006).

In addition, other forms of bread also recognized to be use in Pakistani communities such as pratha or oily chappati made by fat and wheat flour. Rice are also essential element in Pakistani food and eaten in boiled or cooked form with meat and spices. Rice are also taken as sweet when cooked with sugar and ghee. Urban and country side areas usually eat rice in lunch and dinner time.

1.3.6 Physical Activity in Pakistan

Pakistan is an agriculture sector to play a central role in Pakistan's economy, and most of Pakistani live in rural areas (Statistics Norway, 2007). Pakistani rural areas have basic earning source of agriculture, so, normally agriculture occupation is adopted by countryside people. As agriculture requires physical activity, thus, the lot of physical activity decreases the risks of cardiovascular disease and obesity among rural population (Jafar et al., 2006). In contrast, risks of obesity and cardiovascular disease are significantly found among urban population, and the important management

technique for resolving obesity issue is to adopt proper physical activity and exercise-based life style which surely leads to weight and obesity reduction.

1.4 Role of Cognitive Behavioral Therapy (CBT)

Among the most effective and popular therapeutic approaches, Cognitive Behavioral is Therapy (CBT) which bringing about multiple changes in negative emotions and thoughts which cause positive effects on disturbed functioning (Painot, Jotterand, Kammer, Fossati, & Golay, 2001). Cognitive Behavioral Therapy (CBT) is not only used in individual sessions but, it also used in group and family. Psychological problems such as depression, anxiety, aggressive behavior, shame and guilt feelings are treated via CBT. Moreover, as CBT is an approach to reconstruct thought pattern on positive basis, it may be successfully used to treat negative undesired behavioral outcomes such as obesity and its associated factors as well. Cognitive behavioral therapy also showed substantial effects for overcome eating problems, eating disorders symptoms, and food intake abnormalities, which considered major contributors to obesity (Cooper & Fairburn, 2001).

People facing with obesity or overweight problems; usually possess negative beliefs about self and their appearance. They perceive at themselves as less popular and less attractive, and thus, causes lower level of self-esteem. Moreover, they lose their motivation to do any productive work even being much pessimistic and highly demotivated for weight reduction. Here, Cognitive Behavioral Therapy (CBT) works as motivating agent to weight loss and at the same time reducing negative thoughts

about being overweight. Cognitive Behavioral Therapy reconstructs erroneous thoughts related to bodily weight perception and enhances the courage for weight reduction (Rapoport, Clark, & Wardle, 2000).

So, cognitive behavioral therapy is the major element of the study which is helpful in motivating obese individuals for weight reduction and work-related activities. Most of the time, obese people want to lose weight, yet, they don't want to do any potential effort for the purpose. Cognitive Behavioral Therapy (CBT) helped people not only for motivation but also building positive self-image and self-control relevant to overcome negative body image as well.

1.5 Problem Statement

Worldwide prevalence of obesity has risen as burning issue for few decades. Specifically, last two decades, are more important in the context of obesity, because, despite of researchers and health care practitioner's efforts, obesity is still an uncontrollable phenomenon and situation becomes worsen rather than being improved (Brener et al., 2004). In male adult with BMI $\geqslant$25 kg m^2 body mass index extended from 28.8% to 36.9% during the years of 1980-2013, yet, at the same time, the drastic changes to female BMI was detected which was an extension to 29.8-38.0% (Fleming et al., 2014).

Like other Asian countries, Pakistan has also been facing burden of obesity which has been asserting as health-related issue in Pakistan. The National Health

Survey of Pakistan during the period of 1990-94, showed prevalence of obesity (BMI≥25) (according to the WHO classification of Asian's obesity) in rural natives of age ranging 25 to 44 was 9% and 14% for male and female respectively; and was 22% for male in urban locations and 37% significantly for urban females' natives (National Health Survey Pakistan, 1990-1994).

Due to globalization and overwhelmed effects of modernization, the eating patterns in developing countries are transforming to fast food trends (Noor, 2002). Junk food and sedentary life style are considered as the most important contributing factor to obesity all over the world (World Health Organization, 2000). Pakistani population has a bit different concept of diet and eating which is commonly composed of higher vigor and fats consumption and sweets intake. On some especial event (wedding ceremony, national festivals or religious festivals) the concept of especial food consists of meat and sweets and commonly overly eaten at such occasions. As the various healthy diets such as cereals, pulses, vegetables and fruits, are costly so, mostly people in rural areas choose cheaper forms of energy such as fats and sugar. But, in urban areas of Pakistan, junk foods and beverages have become the part of life style especially among young population and the rapid transforming of society to the modern life style and food trends lead the young people specially to adopt western eating pattern composed of junk food as compare to low fat and simple nutrition (Sherin, 2014).

Moreover, in Pakistan, despite of such excessive energy intake, the energy consumption is very low which develop metabolic disturbances and causes obesity in Pakistani population. Furthermore, it was also recognized that due to urbanization, the

fast food trend has become much popular among Pakistani youth which is also a significant contributor to obesity (Samir, Muhammad, & Khuwaja, 2011).

Life style has a pivotal role in maintaining health related issues and when lifestyle is discussed in terms of eating preferences and food behaviors, dietary habits, it becomes more significant in context of obesity and overweight (Khor et al. 1998). Further, it was recognized that unhealthy life style and obesity have a causative relation to diseases and health related problems (He & Evans 2007; Kee et al. 2008; Lam & Khor 1997; Norlaila 2008; Williams 2004).

Role of sedentary life style or behavior is associated with risk factor of poor health (Marshall & Ramirez, 2011). Too much spent time in sedentary behavior leads to detrimental to health (Mitchell & Byun, 2014). More risk factors of obesity and health related issues were identified as the subsequent of inactive life style and sedentary behavior (Brown, Miller, & Miller, 2003; Hu, Li, Colditz, Willett, & Manson, 2003; Larsson, 2004; Zoeller, 2009). Although not an immediate cause of death, sedentary behavior is linked to many chronic health issues such as overweight and adult obesity, cardio vascular disease, diabetes and cancer (Haas, Lee, Kaplan, Sonnebom, Phillips & Lang, 2003; Neumark-Sztainer, Story, Hannan & Croll, 2002; Neumark-Sztaineretal., 2003). It is an important marker to track because levels of sedentary behavior, especially television watching and video viewing, is positively associated with increased BMI in children and adults (Bowman, 2006; Dietz, 1998; Dietz & Gortmaker, 2001). Adults spent majority of the time in sedentary activities and they are generally sedentary (Poh et al., 2010). Moreover, people in Pakistan have lower trend to cycling and exercise. Such a life style comprised of less physical activity and

spending more time while engaging with computers has increased the chances to adopt sedentary life styles (Jafar, Chaturved, & Pappas, 2006). A lack of measures regarding sedentary behavior and lack of physical activity was identified and need to assess and change resulting from intervention programs (Rosenberg et al., 2010). Interventions to reduce sedentary behavior are urgently needed (Fitzsimons et al., 2013).

Eating behavior has a statistically significant effect on obesity prevalence (Azagba & Sharaf, 2012), and its types play significant role as a moderator for food overconsumption lead toward obesity, both emotional and restrained eating predicted high BMI (Van Strien, Herman, & Verheijden (2009). Some researchers have found that emotional eaters perceive increased hunger when faced with particular stressors (Konttinen et al., 2010) and restrained eaters' ability to restrain food intake is undermined by stressors, resulting in overeating (Elfhag & Morey, 2008; Wong, Wong, Wong, & Lee., 2010). Emotional eating is inversely correlated with self-control that leads to obesity (Konttinen, Hukkala, Sarlio-Lahteenkorva, Silventoinen, & Jousilahti, 2009) and the higher level of BMI was predominantly related to poor self-control (Koike, Hardy & Richards, 2016). The respective eating behaviors cause obesity or simply weight gain worldwide generally and among Pakistani female specifically (Moazzam, & Khalid, 2008), because of in the Pakistani scenario, female spent most of the time at homes or spent time related to cooking activities, this factor also contributes to uncontrolled eating. Moreover, the constantly starvation and dieting also cause uncontrolled eating. Thus, uncontrolled eating arises the much essential element to discuss in the context of obesity for Pakistani population (Suhail, 2002). Recent study proved that eating habit explains about proportions of BMI and sedentary behavior differences among young female population (Al-Haifi et al., 2013).

Meanwhile, the lack of physical activity has been the center of attention in the context of obesity due to its considerable contribution to respective phenomenon and it is associated with medical health problems (Chodzko-Zajko, 2014). Lack of physical activity cause obesity (Zoeller, 2009) and lowest allocation of time to physical activity shows a high risk of obesity especially abdominal obesity (Correa-Burrows & Burrows, 2013). Adults are less active in terms of physical activity or physical exercise (Poh et al., 2010), due to certain barriers and need to consider this issue seriously specifically in female adults and introduce some intervention programs to increase awareness, motivation, and skills related to physical activity (Ibrahim, Karim, Oon, & Ngah, 2013).

Body image dissatisfaction (BID) has received an extensive amount of concentration when considering the link between obesity and psychological distress, and it has been suggested that BID places people at risk for psychological distress (Markowitz, Friedman, Arent, 2008; Young, 2012). Researchers have reported that Pakistani women are similar to British women (White and Asian) in aspiring for a thinner "Western Ideal" body (Bardwell & Choudary, 2000). The media has had a negative influence on young university students' body image, with more young men showing dissatisfaction than women (Khan, Khalid, Khan, & Jabeen, 2011). Keeping the lifestyle changes and the pressure for "Thin and Fit", it is asserted inevitable to investigate the physical fitness, body shape satisfaction, and body shape concerns in the Pakistani women. Furthermore, higher BMI is positively associated with greater levels of BID (Docteur, Urdapillete, Defrance, & Raison, 2010), and obese groups tend to have higher levels of dissatisfaction with their bodies compared to non-obese individuals (Sarwer, Wadden, & Foster, 1998). Body image is necessary to examine its development and processes, conceptual dimensions, and prevalence, as well as the

extant research of the presence of body image in overweight and obese people and the current measurements of body image (Paxton & Franko, 2010; Schwartz & Brownell, 2004; Thompson, 2001). Although the focus of body image evaluation and concern often is focused on weight and shape, especially in relation to obesity and eating disorders, individuals experience dissatisfaction, discrimination and embarrassment regarding their appearance (Dixon, Dixon, & O'Brien, 2002; Gingras, Fitzpatrick, & McCargar, 2004). Weight stigmatization significantly mediated the relationship with body mass index and body dissatisfaction (Stevens, Herbozo, Morrell, Schaefer, & Thompson, 2016). Recent literature supports that body image is related to body weight and it need to be addressed (Sklar, 2015).

In Pakistan, it is important to highlight the behaviors that contribute to obesity (Bhanji, Khuwaja, Siddiqui, Azam, & Kazmi, 2011). As a solution of above problems current study carried out to measure diet pattern, physical exercise, eating behavior, sedentary behavior, self-control and body image among overweight adults. Literature supported that all these factors consider as contributing factors toward overweight and obesity. Furthermore, Cognitive behavior therapy applied for controlling and regulating above all factors because there is dire need to introduced intervention strategy to reduce overweight, decreased waist-to-hip ratio (WHR) and excessive percentage of body fat as well as control and maintain overweight and obesity contributing factors.

1.6 Research Questions

1) What is the most effective psycho-physical (CBT + Exercise, CBT + Diet, CBT + Exercise + Diet) method to reduce body weight, body mass index, waist hip ratio and percent body fat?
2) What is the best psycho-physical (CBT + Exercise, CBT + Diet, CBT + Exercise + Diet) method to improve or regulate Physical contributing factors (physical exercise, diet pattern, eating behaviors, & sedentary behaviors) of obesity?
3) What is the most effective psycho-physical (CBT + Exercise, CBT + Diet, CBT + Exercise + Diet) method to improve Psychological associated factors (body image & self-control) of obesity?
4) What are the relationship of eating behaviors, sedentary behaviors, body image and self-control with body weight, body mass index, waist to hip ratio and percent body fat?

1.7 Research Objectives

This study embarks on the following objectives:

1) To measure the efficacy of psycho-physical ways for reduction of body weight, body mass index, waist to hip ratio and percent body fat among women.

2) To measure the effectiveness of psycho-physical ways to improve physical contributing factors (physical activity, food intake, eating behaviors, & sedentary behaviors) related to obesity among women.

3) To measure the effectiveness of psycho-physical ways to improve psychological associated factors (body image & self-control) of obesity among women.

4) To measure the relationship of eating behaviors, sedentary behaviors, body image and self-control with body weight, body mass index, waist to hip ratio and percent body fat.

1.8 Significance of the Study

The significance point of this study is eclectic approach (combined) for weight reduction and obesity treatment by using psycho-physical method in the form of modified cognitive behavior therapy, physical exercise (supervised) and physical activities (unsupervised), as well as diet management (supervised & unsupervised).

Secondly, study addresses and regulating major physical contributing factors of obesity according literature such as imbalanced diet, lack of exercise, abnormal eating behaviors, and sedentary behaviors.

Thirdly, study addresses and improved psychological contributing factors of obesity according literature such as less self-control and negative or disturb body image.

Fourthly, study focuses all diagnostic components of obesity that are body weight, body mass index (BMI), waist circumference, hip circumference, waist-to-hip ratio (WHR), and percentage of body fat (PBF).

Fifthly, this study is experimental in nature and high power (90% with effect size 0.28) of randomized control trial with repeated measures design along with follow-up and provides intervention to reduce all diagnostic components of obesity (body weight, BMI, WHR, & PBF) as well as regulating and improving selected contributing factors of obesity such as diet, exercise, eating behaviors, sedentary behaviors, self-control, and body image.

Importantly such type of intervention was not provided for Pakistani population before as well as for other Asian countries population.

Finally, the current study findings justified with similar and contrast literature and discussed with power wise and with effect size wise as well.

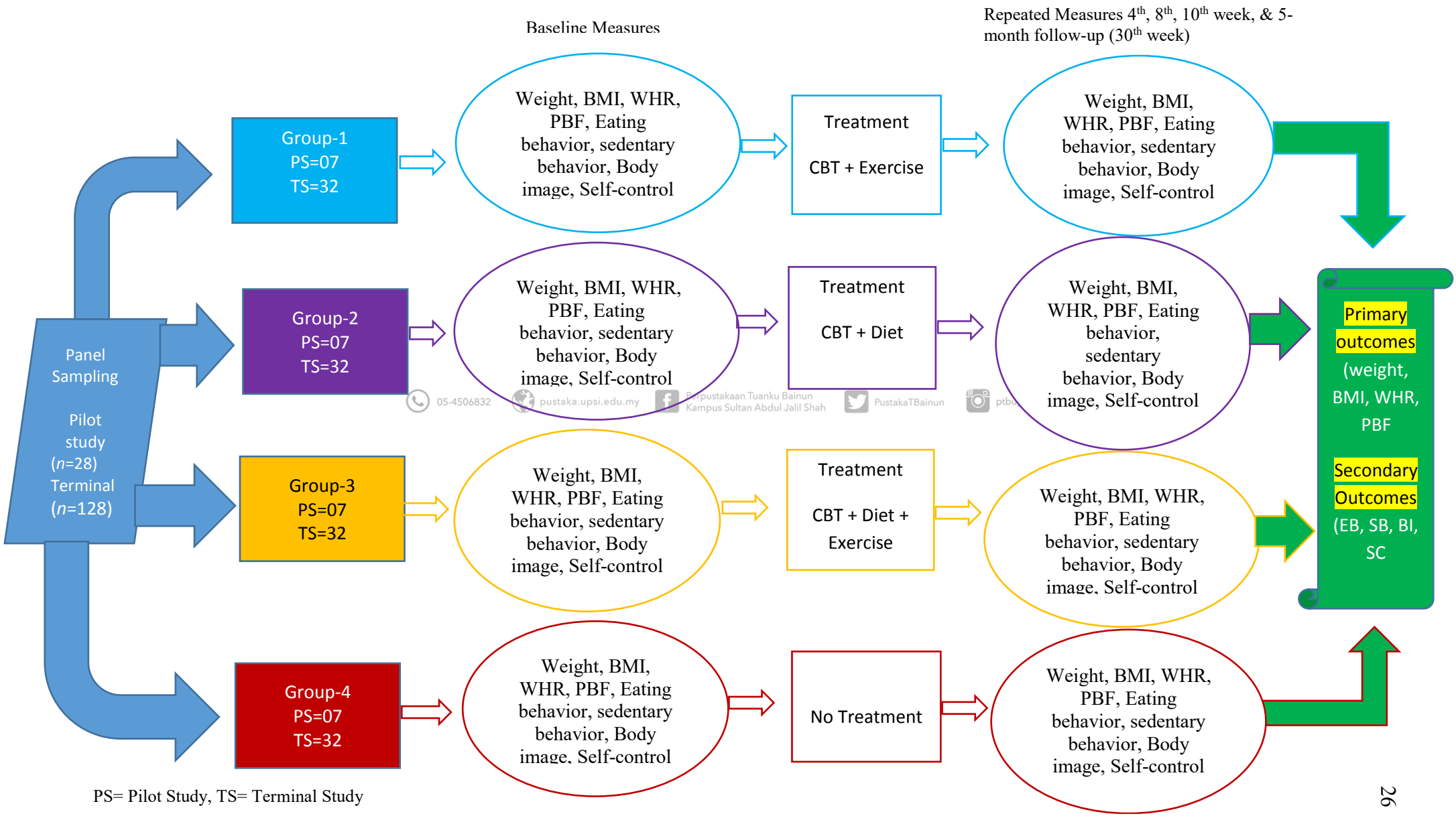
1.9 Scope of the Study

This intervention study incorporates key studies from 1951 to present about multiple treatment-based outcomes regarding overweight and contributing obesity and weight gain related factors in adults. The treatment interventions strategies included are physical exercise, diet management, eating and sedentary behaviors, and psychologically body image, self-control and cognitive behavior therapy implemented

by the researcher. The current study justified findings with literature support along with power and effect size wise. The current study recruited one hundred and twenty-eight overweight Pakistani women from age ranged 18 to 60 years through panel sampling. Findings of this study are available for concerned health departments and future studies.

1.10 Procedural Framework

The current study procedural framework consists of pilot study and terminal study (real study) with repeated measures from four randomized groups. Repeated measures based on continuous assessment with defined interval from baseline to week 10^{th} for pilot study as well as for terminal study with 5-months follow-up. The figurative representation shows in figure 1.2 on the following page.



PS= Pilot Study, TS= Terminal Study

Figure 1.2. Procedural Framework

BMI= Body mass index, WHR= Waist hip ratio, PBF= Percent body fat, EB= Eating behavior, SB= Sedentary behavior, BI= Body image, SC= Self-control

1.11 Theoretical Background

The current study primarily focuses on obese and overweight adults. The overarching aim of the study is to provide effective intervention for weight reduction among adults through psycho-physical methods. It is evident through the literature that there are several methods for weight reduction but most effective methods without surgery addresses the current study. According to the scenario it is inevitable to consider the following theories for the theoretical background of the study.

1.11.1 Self-regulation Theory and Systems Theory

The theory of "Self-regulation" and systems supported this study. Shapiro, and Schwartz, (2000) posited that theory focuses on intention. Further, they explained about inner motivation of individual and intentionally regulate self-mechanisms activation for the specific goal such as weight reduction was marked peculiarity of the respective theory. Whenever, the required change interacts with the internal mechanism and feedback, the system asserts with change via self-regulation.

The specific loops of feedback provide the in order required to sustain an internal well balanced and maintained desired behavior to adopt transience required to a novel scenario. A paradigm of alteration in the self-regulation system of weight control may be help to weight loss, yet, accompanied with the devastating effects on eating schedules and patterns. The recuperate of provisional complaint, the need for eating cues are intensified and person consumed food in a large amount and

consequently weight is regained, after achieving an established weight. Similarly, this study motivates the participants intentionally regulates their diet pattern and maintain balanced diet. Study proved that self-regulation theory helpful for weight reduction and management and self-regulation programmed improved weight loss when provided face to face (Rena-Wing, Tate, Gorin, Raynor, & Fava, 2006).

1.11.1.1 Relevance of Theory to the Study

This theory addresses the intention and internal mechanism of the individual particularly intentionally focuses on regulation of diet and noticed feedback to achieve the desired goals. Similarly, this theory contains self-control that current study also considered and improved. Secondly, theory focus on intention to change their self-mechanism according your desired goal because internal mechanism of human adopts changes with focuses attention. The current study also focused on intention and motivated participants to change their life routine intentionally and adopt changes with internal motivation such as increase physical activity, control their diet patterns and eating behaviors, as well as decreased sedentary behavior intentionally. This theory is also in-line with the scope of the current study.

1.11.2 The Social Cognitive Theory (SCT)

This is second relevant theory with current study. The social cognitive theory developed by Bandura in 1989, the most accepted theory to assess behavior change, particularly in the context of intervention-based researches regarding obesity and food intake patterns (Liou & Contento, 2001). Social Cognitive Theory (SCT) suggests about the continuous interactions of individual's self and physical environment for the purpose of behavioral modification according desired behavior. Behavioral modification is more likely to occur when an individual possesses improved tactics to control diet for greater self-efficacy regarding weight reduction, and positive consequences expectancies to overcome obesity. SCT has been shown to have good predictability with behaviors (control diet, increased exercise and physical activity) related to weight loss (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003).

1.11.2.1 Relevance of Theory to the Study

The current theory focuses on evaluating behavior change according to goal and constantly interaction with the environment and also learn a better skills and positive outcomes expectancies. The current study also considered change behavior related to eating behavior, physical activity, and sedentary behavior by teaching skills and constantly interact with other group members as well as installed positive outcome expectancies to reduced obesity. This theory is also in-line with the scope of the current study.

1.11.3 Theory of Planed Behavior (TPB)

This is the third relevant theory in this study. Researchers have been attracted to the (TPB) "Theory of Planned Behavior" due its emphasis on intention in behavior change (Hardeman et al., 2002). Behavioral intents, also referred to as intentional implementation (Gollwitzer, 1999), has been shown as a strong predictor of health-related goal accomplishment (Ajzen, 1991; Sullivan & Rothman, 2008). Theory of Planed Behavior (TPB) is recognized as a theoretical framework to conceptualize behaviors relating weight reduction and maintaining weight loss regarding interventions. Although the preponderance of research conducted with Theory of Planed Behavior (TPB) adopted experimental based quantitative methods (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003; Liou & Contento, 2001). Most of these studies have used the Theory of Planed Behavior (TPB) to exclusively evaluating behaviors and values (Ajzen, 2002).

Theory of Planed Behavior (TPB) postulates that behavior is based on emotions, subjective norms and self-perceptions of attitude and self-control regarding positive or negative behavioral performances. Attitudes replicate an appraisal of adopting a behavior and viewpoints related to positive or negative consequences of performing the behavior. The mentioned subjective norms are focused on the views of others about a person and their expectations as well as person's avoidance from these expectations. Perceived behavioral control is predicted by controlled beliefs and perceived influence. In accordance with the respective theory (TPB) Theory of Planed Behavior ethics, an individual enhances the tendency to adopt a particular behavior if she/he planned to do so with courage. This is likely to be the case if a person possesses a constructive attitude

regarding the behavior, perceives that relevant behavior adoption and its performance as well. Theory of Planed Behavior (TPB) also has been used as a conceptual framework for understanding the behaviors parallel to overweight and obesity.

Multiple studies have used a Theory of Planed Behavior (TPB) approach to probe into the changes in exercise related behaviors (Courneya, Bobick, & Schnicke, 1999; Hoyt, Rhodes, Hausenblas, & Giacobbi, 2009; Rhodes & Courneya, 2003), eating patterns (Conner, Norman, & Bell, 2002; Rodgers & Brawley, 1993) and weight as well. Studies conducted by Baranowski and colleagues (2003), Gardner and Hausenblas (2004), and Schifter and Ajzen (1985) found that the perceptions of subjective norms and behaviors positively determined the weight reduction and obesity control. Conner, Norman, and Bell, (2002) supported the same factors to reduce weight (Rhodes & Courneya, 2003). Another study suggested that Theory of Planed Behavior (TPB) indicated actual weight loss (MacDonald, 2012; Hunt & Gross, 2009; Courneya, Bobick, & Shnicke, 1999).

1.11.3.1 Relevance of Theory to the Study

The current theory focuses on planned behavior related to goal achievement with intention, behavioral control, positive and negative outcomes as well as subjective norms. The current study also established planned behavior related to weight loss with attention, motivation and teaching positive and negative outcomes regarding target variables such as controlling diet pattern and eating behavior, increasing exercise and physical activity, reducing sedentary behavior, improving body image and self-control

on eating as well as providing awareness of subjective norms related to obesity or overweight. This theory is also in-line with the scope of the current study.

1.11.4 Counteractive Control Theory (CCT)

The final relevant theory is counteractive control theory. It is notably relevant to eating and self-control. Counteractive Control Theory (CCT) focused on self-controlling and adoption of food consuming attitudes. According to this theory if person acquire self-control with regard of eating or person sacrifices on eating and maintains self-control he or she will overcome of their weight problem. This theory is effective in the scenario of weight and obesity reduction involving the motivation to the specific population shell out short-term expenditure (increase self-control on eating) and acquire long lasting positive outcomes (obesity reduction). Counteractive Control Theory (CCT) investigated the struggles related self-control on overly intake of food and restricted to consume less calories. While considering short-term efforts yet, accompanied with long-term positive outcomes (Trope & Fishbach, 2000; Fishbach & Trope, 2005). There are numerous studies used Counteractive Control Theory (CCT) for weight loss, and relationship between eating and self-control (Kroese, Evers, & De Rider, 2009; Coelho, Polivy, Herman, & Pliner, 2008; 2009; Coelho, Jansen, Roefs, & Nederkoorn, 2009; Smeets, Kroese, Evers, & de Ridder, 2013).

1.11.4.1 Relevance of Theory to the Study

This theory focuses on the self-control on eating and outcomes of the action to restricted food intake that works on short term cost (sacrifices on eating) and long-term benefits (body weight and obesity reduction) principles. The current study also considered self-control on eating and more focusses on the outcome as a form of body weight and obesity reduction. Participants' increase self-control on overeating (restricted calories, fat, and carbohydrate intake) by adopting behavior according instruction for short time as short-term cost and get long term benefits as a reduction of body weight and obesity. This theory is also in-line with the scope of the study.

1.12 Hypotheses

It was hypothesized that....

1) CBT + Exercise + Diet intervention would result in a significantly greater weight loss as compared to CBT + Exercise, CBT + Diet, and control group across a 10-week intervention.
2) CBT + Exercise + Diet intervention would produce significantly greater reduction of body mass index, waist to hip ratio, and percent body fat as compared to CBT + Exercise, CBT + Diet, and control group across a 10-week intervention.
3) CBT + Exercise + Diet intervention would result in a significantly greater reduction in sedentary behaviors as compared to CBT + Exercise, CBT + Diet, and control group across a 10-week intervention.

4) CBT + Exercise + Diet intervention would produce significantly better improvement in eating behaviors, body image and self-control as compared to CBT + Exercise, CBT + Diet, and control group across a 10-week intervention.

5) CBT + Exercise + Diet intervention would result in a significantly greater reduction in dietary intake (calories, fat, carbohydrates) as compared to CBT + Diet group across a 10-week intervention.

6) CBT + Exercise + Diet intervention would result in a significantly greater amount of moderate-to-vigorous physical activity (activity time, walking steps) as compared to CBT + Exercise group across a 10-week intervention.

7) CBT + Exercise + Diet group would result in a significantly greater weight loss as compared to CBT + Exercise, CBT + Diet, and control group across a 5-month follow-up.

8) CBT + Exercise + Diet group would produce significantly greater reduction of body mass index, waist to hip ratio, and percent body fat as compared to CBT + Exercise, CBT + Diet, and control group across a 5-month follow-up.

9) CBT + Exercise + Diet group would result in a significantly greater reduction in sedentary behaviors as compared to CBT + Exercise, CBT + Diet, and control group across a 5-month follow-up.

10) CBT + Exercise + Diet group would produce significantly better improvement in eating behaviors, body image and self-control as compared to CBT + Exercise, CBT + Diet, and control group across a 5-month follow-up.

11) CBT + Exercise + Diet group would result in a significantly greater reduction in dietary intake (calories, fat, carbohydrates) as compared to CBT + Diet group across a 5-month follow-up.

12) CBT + Exercise + Diet group would result in a significantly greater amount of moderate-to-vigorous physical activity (activity time, walking steps) as compared to CBT + Exercise group across a 5-month follow-up.

13) Eating behaviors of uncontrolled eating and emotional eating significantly positively correlated with body weight, body mass index, waist to hip ratio, and percent body fat at 10-week intervention.

14) Eating behavior of cognitive restraint significantly negatively correlated with body weight, body mass index, waist to hip ratio, and percent body fat at 10-week intervention.

15) Sedentary behavior significantly positively correlated with body weight, body mass index, waist to hip ratio, and percent body fat at 10-week intervention.

16) Body image significantly negatively correlated with body weight, body mass index, waist to hip ratio, and percent body fat at 10-week intervention.

17) Self-control significantly negatively correlated with body weight, body mass index, waist to hip ratio, and percent body fat at 10-week intervention.

1.13 Conceptual and Operational Definitions of Variables

1.13.1 Cognitive-Behavioral Therapy (CBT)

A well-known treatment perspective, Cognitive Behavioral Therapy (CBT) is based to overcome negative thoughts and relieving emotional pain due to any psychological distress. CBT is a treatment method to recognize problematic thoughts and then reconstruct them for the purpose of problem solving (Painot, Jotterand, Kammer, Fossati, & Golay, 2001).

CBT in the therapeutic perspective refers to recognition of errors of thought and identifying negative beliefs underlying pathological behavior (Beck, 1963; 1964; 1967).

The cognitive behavior therapy is a treatment method adopted to change people's dysfunctional thinking and their psychological symptoms that further lead to change their behavior and formulated positive automatic thinking (Butler, Chapman, Forman, & Beck, 2006).

In this study CBT refers to psychological treatment for weight and obesity reduction from cognitive restructuring and behavior modification of overweight or obese people by using techniques (Motivational Interviewing, Self-monitoring, & Problem solving). Motivational interviewing applied on participants as instilling hope to reduce obesity with a short time by encouraging them to regulate all obesity

associated factors (exercise, diet, eating behavior, sedentary behavior, body image, & self-control) and to attain level of changing in own-self and other group members. Self-monitoring applied by providing awareness to the participants to note down changes on daily basis in terms of body weight, BMI, WHR, PBF and other associated factors. Problem solving used to ask participants regarding hurdles to achieve desired behavior and sorted out current problems that effects suggested routine or behavior (regular exercise, balanced diet, controlling eating behavior and sedentary behavior, improving body image and self-control). The current study measures or assess CBT through cognitive behavior therapy effectiveness questionnaire (CBTEQ) developed by researcher to check efficacy of the CBT. It is self-reported Likert questionnaire consists of 18 items with responses strongly agree to disagree.

1.13.2 Diet

Diet is multiple range of food which provide energy and adequacy to a balance of energy in our body. A balanced diet must be comprised of essential nutrient elements such as vitamins, proteins, fats, minerals, carbohydrates, and water according to bodily requirements.

In this study diet refers to ingestion of exact amount of food containing essential nutritional elements such as carbohydrate, proteins, fats, vitamins, minerals, and water that required minimum by the body in a day. The current study measure by using “MyFitnessPal” application and self-reporting diaries which are self-monitored by

participants. Self-reporting diaries calculate food intake on the daily basis in terms of calories intake, fats intake and carbohydrates intake.

1.13.3 Exercise or Physical Activity

Exercise or physical activity is defined as skeletal muscles movement which results to energy expenditure. Kilocalories may be used to measure energy consumption. Sports, conditioning, household, occupational, or other activities are the daily life regions for energy spending. Exercise is another form of physical activity, but it is different in terms of preplanned physical activity, repetition and conducted for the purpose of physical fitness and weight reductions (Caspersen, Powell, & Christenson, 1985).

In this study exercise is a physical activity of a person that is planned, structure, and repetitive for the purpose of weight reduction, maintenance and fitness of the body. The current study offered exercise from moderate to vigorous jogging, use of treadmills, and other aerobic physical activity supervised by physiotherapist during a session from 40min to 50min in a week. Further, unsupervised physical activity suggested by physiotherapist to the participants as home-based activity of aerobic dancing, jogging, walking, cycling etc. The current study measures physical activity through self-reporting diaries and pedometer that participants recorded on the daily basis. Pedometer used to count walking steps and self-reporting diaries used to assess time duration of moderate to vigorous physical activity in a day or 5 days in a week.

1.13.4 Eating Behavior

Eating behaviors are defined as the motives and food intake patterns, as well as frequency of thoughts and actions, in terms of an organism's consuming solid or liquid (Elsner, 2001).

In this study eating behaviors refers to ingestion behavior of an organism composed of consuming a solid or liquid as the response to physical cues to hunger. The current study defined eating behaviors as three perspectives uncontrolled, emotional, and restrained eating. Uncontrolled eating refers to inability to control over consumption of food during eating while emotional eating includes eating in response to both diffuse and clearly labeled emotions and restrained eating is the degree to which individual eats less than he or she actually would like to eat. The current study measure eating behavior through the Three Factor Eating Questionnaire (TFEQ) introduced by (Karlsson, Persson, Sjöström, & Sullivan, 2000), containing 21 Yes/No based items, 1 – 4 response scale 12 items, as well as with vertical ratings. All item responses are categorized and combined into three different scales. Uncontrolled eating scale bearing 9 items, Cognitive Restraint composed of 6 items, and emotional eating asserted with 6 items.

1.13.5 Sedentary Behavior

Sedentary behavior refers to spend most of the time by sitting or lying, watching television or playing video game, which causes a lack of physical activity and lower energy expenditure (Matheson, Killen, Wang, Varady, & Robinson, 2004).

In this study sedentary behavior defined as a lack of physical activity or immobility of a person that spent time in sitting or lying down during certain activities (work, study, driving, using mobile phone and computer, watching television). The current study measures sedentary behavior from the Adult Sedentary Behavior Questionnaire (SBQ-Adults). The respective scale measured 9 specific physical activity behaviors such as amount of time spend in watching television, playing computer/video games, time spending in sitting whilst listening music, talking on the phone without any physical activity, doing office work or paper work, reading whilst sitting on one place, sitting and playing a musical instrument, arts and crafts work without moving physically, driving/riding a train, car or bus by sitting in it. The respective former described 9 items separately evaluated on weekend days and weekdays basis. The options of 15 minutes or less, 30 minutes, 1 hour, 2 hours, 3 hours, 4 hours, 5 hours, or 6 hours or more were used as responses.

1.13.6 Self-control

Self-control refers to avoid from the behavioral tendencies despite of having lot of urge to adopt anything, yet to refrain from it (Tangney, Baumeister, & Boone, 2004).

In this study self-control refers to the ability of a person to control his/her impulses, emotions, and behavior in perspective of uncontrolled eating, emotional eating, physical exercise and sedentary behavior. The current study measures self-control from the Brief Self-control Scale (BSCS). The current scale has 13 questions with five-point scale options from not like me at all to very much like me.

1.13.7 Body Image

Body Image is characterized by perception about self in terms of appearance and body shape. Moreover, it involves bodily evaluation, regarding excessive concern with basic schemas, feelings and thought as well as behaviors in context of personal physical appearance (Cash, 2002c; Cash, 2004; Cash & Pruzinsky, 2004).

In this study body image refers to multidimensional “psychological experience of embodiment,” which not only includes perceptions of one’s physical appearance, also including evaluative beliefs, feelings, thoughts and reactions relating the individual’s bodily appearance. The current study measures body image using short version of MBSRQ-AS 34-items scale, which constitute five subscales and official name of the scale is MBSRQ-AS (Multidimensional Body-Self Relations

Questionnaire-Appearance Scale Short-version) developed by Cash (2005). The detail of sub-scales is followings; the sub scale of Appearance Evaluation (AE) comprised of 7 items that assess physical appearance appraisals on positive and negative basis. The other sub-scale including 12 items, Appearance Orientation (AO), evaluated the amount of venture an individual put toward her or his appearance. Next, sub scale composing 4 items, Overweight Preoccupation (OWP) evaluated weight vigilance, fat anxiety, dieting, and disordered food consumption behaviors. Further, sub-scale consists of 9-items named The Body Areas Satisfaction Scale (BASS), evaluated the degree of dissatisfaction with specific facial features and weight as well (Cash, 2005). Finally, 2 items composed of individual's evaluation regarding categorization of her or his weight from very lower to higher category of weight in the sub scale of Self- Classified Weight (SCW).

1.13.8 Obesity

Obesity is referred to the glut of body fat due to excessive energy consumption and a lack of physical activity and a subsequent weight gain (Cheung, & Mao 2012).

Another explanation of obesity from the medical practitioner's point of view as "a state of uncontrollable fat in body and the fat create multiple adverse health outcomes (Spiegelman & Flier, 2011).

Obesity refers to abnormal or excessive fat accumulation that may impair health." Moreover, World Health Organization (WHO) presented the numerical way of

defining obesity and categorized it as per weight intensity which was called Body Mass Index (BMI) (WHO, 2008).

In this study obesity refers to an excessive adipose tissue and is commonly described in terms of percentage of body fat, waist to hip circumferences and Body Mass Index. The current study assesses obesity by using Inbody-370 composition analyzer. This is bioelectric impedance analyzer is considered as an accurate digital measure of body weight BMI, WHR, and PBF with significant validity and reliability.

1.13.9 Body Mass Index (BMI)

BMI (Body Mass Index) defined as an evaluative tool for measurement of weight and expressed as a weight ratio in kilograms which is divided by height in meters and squared. According to a standard overweight recommended by WHO is defined “as a Body Mass Index equal to or more than 25, and ‘obesity’ as a BMI equal to or more than 30”. A normal weight is considered from 20 to 24.9 BMI (WHO, 2008).

In this study BMI refers to a body fat measure with calculation and then by dividing it with weight (kg) and by height (m^2). The current study measures BMI by using Inbody-370 composition analyzer. This is bioelectric impedance analyzer is a digital instrument to evaluate BMI.

1.13.10 Percent Body Fat (PBF)

Percent Body Fat is defined as the extent to which the fats are stored in human body. Adult male with >25% and female possessing >30% body fat considered as obese.

In this study percent body fat refers to the relative amount of fat on one's body compared to fat-free mass that mostly calculated from bio impedance analyzer. The current study measures PBF by using Inbody-370 composition analyzer. This composition analyzer is a valid and reliable digital instrument to measure accurate PBF.

1.13.11 Waist-to-hip Ratio (WHR)

Waist hip ratio (WHR) is the ratio of waist perimeter to hip perimeter. Basically, it is the way of estimating the extent of obesity. Waist to Hip Ratio >0.90 considered obesity in male and WHR >0.85 in women indices obesity (World Health Organization, 1999).

In this study WHR refers to the ratio of the abdominal, hip and buttocks fat circumferences of a person which is derived by the division of waist to hip (W/ H). The current study measures waist to hip ratio by using Stadiometer, Insertion tape, and Inbody-370 composition analyzer. This bioelectric impedance analyzer is a valid and reliable digital instrument to measure accurate WHR.