Factors of Overweight/Obesity in Taiwanese Adolescents

by

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A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved September 2012 by the
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ARIZONA STATE UNIVERSITY

December 2012

ABSTRACT

Two studies were conducted to test a model to predict healthy lifestyle behaviors, physical activity, and body mass index (BMI) in Taiwanese adolescents by assessing their physical activity and nutrition knowledge, healthy lifestyle beliefs, and perceived difficulty in performing healthy lifestyle behaviors. The study drew upon cognitive behavioral theory to develop this study.

The pilot study aimed to test and evaluate psychometric properties of eight Chinese-version scales. The total sample for the pilot study included 186 participants from two middle schools in Taiwan. The mean age was 13.19 for boys and 13.79 for girls. Most scales including Beck Youth Inventory self-concept, Beck Youth Inventory depression, Beck Youth Inventory anxiety, healthy lifestyle beliefs, perceived difficulty, and healthy lifestyle behaviors scales Cronbach alpha were above .90. The Cronbach alpha for the nutrition knowledge and the activity knowledge scale were .86 and .70, respectively.

For the primary study, descriptive statistics were used to describe sample characteristics, and path analysis was used to test a model predicting BMI in Taiwanese adolescents. The total sample included 453 participants from two middle schools in Taiwan. The mean age of sample was 13.42 years; 47.5% (n = 215) were males. The mean BMI was 21.83 for boys and 19.84 for girls. The BMI for both boys and girls was within normal range. For path analysis, the chi-square was 426.82 (df = 22, p < .01). The *CFI* of .62 and the *RMSEA* of .20 suggested that the model had less than an adequate fit (Hu & Bentler, 1999). For alternative model, dropping the variable of gender from the model, the results indicated that

it in fact was an adequate fit to the data (chi-square (23, 453) =33.75, $p > .05$; *CFI*= .98; *RMSEA*= .03).

As expected, the results suggested that adolescents who reported higher healthy lifestyle beliefs had more healthy lifestyle behaviors. Furthermore, adolescents who perceived more difficulty in performing healthy lifestyle behaviors engaged in fewer healthy lifestyle behaviors and less physical activity. The findings suggested that adolescents' higher healthy lifestyle beliefs were positively associated with their healthy lifestyle behaviors.

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INTRODUCTION

State of Science of Adolescent Obesity Research

Adolescents who are overweight or obese have a greater likelihood of being obese adults and have a high probability to be diagnosed with cardiovascular disease or hypertension compared to adolescents who are non-overweight or obese (Chou & Pei, 2010; Chen et al., 2008; Chen, Fox, Haase, & Wang, 2006; Daniels, Arnett, Eckel, Gidding, Hayman, Kumanyika, Robinson, Scott, Jeor, & Williams, 2005; Huang, 2008; Wei, Sung, Lin, Lin, Chiang, & Chung, 2003). Chen et al. (2008) found that Chinese American children with a higher BMI had higher levels of LDL and total cholesterol. Type-II diabetes and high blood pressure are major medical issues for obese adolescents (Chou & Pei, 2010; Daniels, et al., 2005; Huang, 2008; Wei, Sung, Lin, Lin, Chiang, & Chung, 2003).

The prevalence of obesity in adolescents has increased worldwide. Unhealthy lifestyle behaviors lead adolescents to be overweight or obese and other medical issues as well. Taiwan, China and the world health organization (WHO) defined BMIs 24, 24 and 25 for overweight, respectively and 27, 28 and 30 for obesity (Pan et al., 2008). Childhood and adolescent obesity have increased globally (Flegal, 2005). The percentage of overweight youth in the U.S. aged 6 to 19 years is around 17 % (Ogden et al., 2006). The national health and nutrition examination survey (NHANS) data indicated that 19.6 % of children aged 6 to 11 and 18.1 % of adolescents aged 12 to 19 years old were

overweight (Centers for Disease Control and Prevention, 2011). In Taiwan, the availability of junk-food and high-fat diets have steadily increased for adolescents, and lifestyles have become more sedentary. A recent survey in Taiwan indicated that 14.0 % of male and 9.6 % of female adolescents were overweight; 15.3 % of male and 8.6 % of female adolescents were obese (Taiwan Department of Health, 2011).

Some important factors may contribute to increased calorie consumption, sedentary behaviors, or food portions. Physical activity patterns have changed in past years, and a study showed more sedentary behavior during school and play time (Dietz, 2005). Higher levels of sedentary behaviors have been associated with an increase in body mass index (BMI) in recent years (Berkey et al., 2000). Moreover, Liou et al. (2010) found that time spent viewing, such as using computer or internet surfing, was associated with a higher prevalence of obesity in Taiwanese adolescents. Obesity was related to large food portion size (Berg, Lappas, Wolk, Strandhagen, Toren, Rosemgran, Thelle, & Lissner, 2009). The number of supermarkets in America has declined by 15 %, but the number of convenience stores and fast-food eateries has doubled (Schewartz & Browenell, 2005). Children exposure to high-fat, high-sugar food, such as soda and fast food along with larger portion sizes, increases the intake of these energy-dense foods (Ello-Martin, Ledikwe, & Roll, 2005). Moreover, the cost and portion size of energy-dense, high-sugar, and high-fat food has decreased, which has increased consumption (Popkin, Duffy, & Gordon-Larsen, 2005). Chinese-American children reported eating

approximately seven high-fat and high-sugar items everyday; however, high-sugar intake and high-fat were not related to children's BMI (Chen & Kennedy, 2005).

Energy-dense food has become competitive food among adolescents. Competitive food or foods of minimal nutritional value (FMNV) are defined as foods that provide less than five percent of the Reference Daily Intake (RDI) for eight specific nutrients per serving, including protein, vitamin A, vitamin C, niacin, riboflavin, thiamin, and iron (Fleischhacker, 2007). The United States Department of Agriculture (USDA) defines four categories of foods and beverages that are FMNV, including soda water, water ices, which are water-based without containing fruits, chewing gum, and candies (Fleischhacker, 2007). In addition, many high schools provide high-fat cookies or cakes (80%) and French fries (62%) on their menu (Wechsler, Brener, Kueester, & Miller, 2001). These competitive foods are eaten instead of student consumption of more nutritious foods, so competitive foods may contribute to childhood obesity (Cullen & Zakeri, 2004; Kubik, Lytle, Hannan, Perry, & Story, 2003).

The availability of high-fat and energy-dense foods have rapidly increased in recent years. Adolescents can easily find Western food, such as pizzas, pastries, and ice cream in Taiwan (Hsieh & FizGerald, 2005). This leads to the consequence that food patterns are becoming westernized (Hsieh & FizGerald, 2005). Liou, Liou, & Chang (2010) indicated that half of adolescents drank a high-sugar drink everyday and boys ate more fried foods, cake, and high-sugar drinks than girls. Adolescents in Taiwan are adopting sedentary

lifestyle behaviors, such as watching television and playing computer or video games (Chen et al, 2001; Liou, Liou, & Chang, 2010; Yu, 1999; Mackenzie, 2000). Moreover, boys spend more time using computers, surfing the internet, or playing video game; otherwise girls focus on studying and doing homework (Liou, et al., 2010).

What has been less explored in Taiwan is the psychosocial sequelae associated with being overweight. In other cultures, it has been shown that a number of mental health problems may be strongly tied to obesity, either as an effect or as a correlate. Stice and Whitenton (2002) showed that higher body weight was associated with poorer body image among adolescents. Furthermore, even girls at below or normal range of BMI still feel dissatisfaction in their body images, but this is especially so with overweight girls (Rinderknecht & Smith, 2002). In addition, obese boys have slightly higher rates of depression, and depression in childhood may be a risk factor for obesity later (Goodman & Whitaker, 2002; Wardle & Cooke, 2005). A study found that obesity was significantly related to depression and depressive symptoms among 15- to17-year-olds and perception of weight as overweight was related to higher depressive symptoms in adolescents (Daniels, 2005; Rickard, Kent, Nilsson, & Jerzy, 2005). Therefore, overweight and obesity have been shown to be associated with both medical and psychosocial consequences.

Statement of the Problem

According to research findings, obesity in adolescents result from unhealthy lifestyle behaviors, such as eating high-dense and sugar-contained

food and sedentary behaviors. Intake of soft drinks and sweetened drinks has increased among adolescents. Studies found that sweetened beverage intake was related to being overweight among children (Blum, Dennis, Jacobson, & Donnelly, 2005; Forshee & Storey, 2003; Rockett, Berkey, Field, & Colditz, 2001). A study indicated that obese adolescents had less physical activity compared to non-obese adolescents, which showed that physical activity was very important for weight management (Fonseca & de Matos, 2005). The relationship among determinants and lifestyle behaviors has been identified in the western population (Melnyk, Small, Jacobson, Kelly, O'haver, & Mays, 2009; Melnyk, Small, Strasser, Crean, & Kelly, 2007), but the relationship between determinants and lifestyle behaviors has not been well explicated in the Taiwanese population. Because of a lack of research in Taiwan describing the relationships between determinants and healthy lifestyle behaviors in Taiwanese adolescents, an explanatory model was proposed to determine the variables that predict this problem, specifically in Taiwanese middle school adolescents.

Purpose of the Study

The goals of the proposed study were to test a theoretical model that predicts healthy lifestyle behaviors and BMI in Taiwanese adolescents so that a theory-based intervention targeting these variables could be developed and tested in order to promote healthy lifestyle behaviors in this population. Cognitive behavioral theory (CBT) was chosen as the model for this study because CBT operates on the hypothesis that a client's emotional distress was

a result of a faulty belief system, and CBT's concepts had been successfully used in intervention studies in adolescents (Akker, Puiman, Groen, Timman, Jongejan, & Trijsburg, 2007; Bernnan, Walkley, Lukeis, Risteska, Archer, Digre, Fraser, & Greenway, 2009; Jelalian, Mehlenbeck, Lloyd-Richardson, Birmaher, & Wing, 2006; Melnyk, Small, Strasser, Crean, & Kelly, 2007; Melnyk, Small, Jacobson, Kelly, O'HAVER, & Mays, 2009; Savoye, Shaw, Dziura, Tamborlane, Rose, Guandalini, Goldberg-Gell, Burgert, Cali, Weiss, & Caprio, 2007; Tsiros, Sinn, Brennan, Coates, Walkley, Petkov, Howe, & Buckley, 2008). Therefore, CBT was used as the model for this study with Taiwanese adolescents.

Chapter 2

LITERATURE REVIEW

Unhealthy lifestyle behaviors lead both adolescents and adults to become obese. Recently, the Trust for America's Health (TFAH) found that adult obesity rates in the past year increased in 28 states, while only the District of Columbia (D.C.) showed a decrease (Robert Wood Johnson Foundation, 2010). According to a national survey in Taiwan in 2007, the prevalence of overweight and obesity in adolescents aged 13 to 15 years was around 10.9 to 15.4% (Liou, Chen, Chiang, Chien, & Hung, 2007). Moreover, the prevalence of overweight and obesity in children and adolescents in Taiwan was around 11.8% to 14.2% in 2006 (TDOH, 2011). The following review of literature examines the available research on variables related to adolescents and obesity.

Adolescence

The many critical developmental changes that occur in adolescence make them a distinct group. Adolescence consists of three stages of development: (a) early adolescence, from 10 to 13 years old; (b) middle adolescence from 14 to 17 years old; (c) late adolescence from 18 to 21 years old (Radizik, Sherer, & Neinstein, 2002). The psychological changes of adolescence are related to puberty and dramatic changes of puberty occur in several areas: (a) brain and endocrine system stimulate rapid acceleration in weight and height; (b) primary sexual characteristics develop such as ovaries and testes; (c) second sexual characteristics develop, including growth of

pubic, body, and facial hair; (d) body composition changes, such as distribution of muscle and fat; (e) the circulatory and respiratory systems changes such as increased strength and physical tolerance (Neinstein & Kaufman, 2002; Pickett, 2000). The changes in adolescence include physical, such as beards in males and breast enlargement in females, and physiological well-being, such as testes in males and ovaries in females (Rew, 2005). Testes and ovaries secrete significant hormones in middle adolescence, such as estrogen for females and androgen for males (Widmaier, Raff, & Strang, 2006). These hormones play an important role for adolescents about developing secondary sex characteristics so that endocrine disorders will affect physical and physiological well-being in adolescents (Widmaier et al., 2006). In their social life, adolescents prefer being with peer groups rather than with their parents (Rew, 2005). These changes in adolescents are significantly challenging. Adolescents positively pass through this critical period of development and well adoption to the physical and psychosocial changes is important for any adolescent and school (Jing, 2010). In addition, about one-third of obese children become obese adults, and half of obese school-age children become obese adults (Chu, 2010). That is, middle school adolescent was chosen as a major area of emphasis for this study.

Culture and Adolescence

There are differences between Western and Chinese cultures regarding adolescent development. In Chinese society, the mainstream of culture codes and culturally realities will determine meanings, beliefs and human behaviors

(Lam, 1997). Chinese culture originated from Confucian philosophy and people who are Chinese tend to co-operate with others, which differs significantly from Western culture (Bond & Huang, 1986; Bond, 1986a, 1992b; Liang, 1967). The fundamental concept of Confucianism is that the individual is never isolated and is always part of society to maintain harmonious interpersonal relationships (Abbott, 1970; Fang, 1980). However, the Western culture focuses on the autonomous individual, which is opposite to the Chinese culture. Many rights are considered as basic human rights in Western society (Lam, 1997). Hofstede (1980) indicated that Chinese people have collectivistic culture values and norms, which mean people are part of society and are connected within group members. On the other hand, individualism for Western people is first priority, in which individuals have loose ties and are expected to be independent (Hofstede, 1980).

Based on the differences between Chinese and Western philosophy above, cultural differences affect Chinese and Western adolescents' thinking and behaving in different ways. Generally, Chinese adolescents are socialized to: (a) control self-directed behaviors and to reduce sole personal characteristics, (b) operate with skills and behaviors, such as conformity, and (c) become part of large a group and contribute to social concern (Chen, 2000). In contrast, the primary goals of socialization in the Western culture are independent, and social relationships and responsibilities are made by personal choice (Greenfield & Suzuki, 1998). Therefore, Western adolescents place a high value on independence and less concern about conformity to social

norms. These cultural differences are apparent from the beginning of children's development.

Culture is an integrated pattern of learned behaviors and beliefs. Chinese people share what they learn about behaviors and beliefs among groups including thoughts, relationships, values, and customs (Donini-Lenhoff & Hedrick, 2000). Culture also can be thought as an inherited by the individual perceives and learns from people about how to experience and to behave (Kamil & Khoo, 2006). Exploration of the cultural dimensions underlying Taiwanese adolescents' healthy lifestyle beliefs and behaviors is critical for understanding of meaningful determinants and conducting interventions.

Obesity in Adolescents

Definition of Obesity. The Centers for Disease Control and Prevention (CDC) define two levels of overweight in children, at risk and overweight, omitting the label of obese in this population. They define at risk for overweight as a body mass index (BMI) between the 85th and 95th percentiles with overweight being defined as a BMI greater than the 95th percentile. Alternatively, the American Obesity Association (AOA) defines the 85th percentile as being overweight and the 95th percentile as being obese (AOA, 2005). Overweight and obesity in adults is defined as a BMI of 25 and 30 respectively (Budd & Volpe, 2006). Body mass index is used to determine if an individual is overweight (calculated as weight in kilograms divided by the square of height in meters). The CDC provides the national growth charts for children from birth through age 20. They developed new growth charts for

those ages two through 20 years that include BMI in May, 2001. These charts can be used as a quick reference for health care practitioners to easily identify overweight and obese youth.

There are various criteria for the definition of obesity in Taiwan. The Taiwan Department of Health (TDOH) defines overweight as BMI ≥24 and obese as BMI ≥27, which are different from the World Health Organization (WHO) Asian's criteria, which are defined as overweight as BMI ≥23 and obese as BMI ≥25 (Chu, 2005; Pan, Flegal, Chang, Yeh, Yek, & Lee, 2004). A study indicated that Asians experience grater metabolic risks than Caucasians counterparts at similar BMIs, but the overall prevalence of overweight is lower than Western counterparts in general (Pan et al., 2007).

Prevalence of Overweight in Adolescence. According to the National Health and Nutrition Examination Survey (NHANES), from 2003 -2004, American children 6 to 11 years of age, 2.3 million boys and 2.6 million girls, were overweight. According to NHANES, 17 % of children and adolescents ages 2 to 19 were overweight. Among children 6 to 11 years of age, the percentage of those who were overweight increased from 4.2 % between 1963-1965 to 18.8% from 2003-2004. Among children ages 12 to 19, the percentage of those who were overweight increased from 4.6 % between 1966-1970 to 17.4% from 2003-2004.

A least 18 % of adolescents with ages ranging from 12 to 19 years in the U.S. are obese, according to data from the most recent NHANES, which reports data from 2007-2008 (National Center for Health Statistics, 2010). This

survey was conducted by the National Center for Health Statistics (NCHS) of Centers for Disease Control and Prevention (CDC). Subject data for all NHANES studies stratified by sex, age, and race/ethnicity. The NHANES 2007-2008 study included 3,281 subjects, a smaller sample size than all of three previous studies from 1994, 1980, and 1999, which had 14,468, 11,207, and 3,601 subjects (Ogden, Carroll, Johnson, & Flegal, 2002; Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). Adolescents were classified as obese if their BMI was greater than or equal to 95th percentile for their age and gender. The adolescent obesity rate according to the 2007-2008 NHANES study was 18%, up from 15%in 1999 and 17% in 2005 (National Center for Health Statistics, 2010). One in every 4 children in the United States will be obese in 2015 (Wang & Beydoun, 2007). These dramatic prevalence rates of obesity reflect an epidemic of obesity for adolescents in the U.S. Likewise, the prevalence of obesity for adolescents has dramatically escalated and has become a critical public health issue in Taiwan. A survey indicated that Taiwanese adolescents between 13 to 15 years old found that 14.0 % of males and 9.6 % of females were overweight; 15.3 % of males and 8.6 % of females were obeses (TDOH, 2011).

Determinants of Obesity in Adolescents

Physical activity. A lack of physical activity is associated with higher BMI among children, so physical activity is very important for weight management (Chen et al, 2007). The number of obese adolescents is increasing because people are more sedentary. This lifestyle has influenced the prevalence

of obesity in adolescents. Studies revealed that sedentary activity, such as television viewing, was contributing to an increased incidence of overweight and obesity in children and adolescents (Dowda, Ainsworth, Addy, Saunders, & Riner, 2001; Stettler, Signer, & Suter, 2004). Some studies showed that increased physical activity was associated with decreased BMI in children and adolescents (Berkey, Rockett, Gillman, & Colditz, 2003; Trost, Sirard, Dowda, Pfeiffer, & Pate, 2003). One study also showed that increased physical activity significantly decreased BMI in obese children (Jiang, Xia, Greiner, Lian, & Rosenqvist, 2005).

Dietary Behaviors. Dietary pattern may affect weight status in adolescents. Most children in Taiwan eat high fat, high protein, and low fiber diets (Pan, Chang, Chen, Wu, Tzeng, & Kao, 1999). Excessive intake of low-nutrient and energy-dense foods, such as sugar-sweetened beverages, was a risk factor for overweight and obesity. Furthermore, increases in diet soda drinks were significantly greater for overweight teens compared to normal weight teens (Blum et al., 2005). Yang et al. (2006) indicated that irregular breakfast eating significantly associated with overweight status in Taiwanese adolescents. Thus, dietary behaviors may influence weight status in adolescents.

Knowledge. Knowledge is important in understanding how to reduce BMI in adolescents (Wilson, 2009). A study indicated that increased nutrition knowledge reduced BMI in Taiwanese males but not females (Chen &Tseng, 2010). The nutrition knowledge of Taiwanese children was fair regarding

general nutrition facts but the finding indicated that children having better nutrition knowledge also showed more positive nutrition attitudes and a better quality diet (Lin, Yang, Hang, & Pan, 2007; Oldewage-Theron & Egal, 2010). Lack of knowledge about healthy lifestyle behaviors may lead adolescents to gain weight (Rimmer, Rowland, & Yamaki, 2007). In addition, some teens may not be aware of the health risks associated with poor diet or lack of physical activity (Jobling, 2001).

Gender. Obesity in adolescents varies by gender around the world (Sweeting, 2008). Evidence indicates that girls who are overweight and/or obese are lower than boys in Taiwan (Chen, Fox, & Haase, 2008; Chen, Fox, Haase, & Ku, 2010; Chu, 2010; Chou & Pei, 2010; Hsu, Chen, Tsai, & Hsiao, 2011). A study showed that the prevalence of overweight in Chinese adolescents has tripled from 4.8 % in 1991 to 15.4 % in 2006 and overweight and/or obese boys were higher than girls (Chi, Huxley, Wu, & Dibeley, 2010). Furthermore, obese boys had more concern about their weights than overweight boys in Taiwan and girls had a similar outcome as boys (Yen, Yen, Liu, Huang, & Ko, 2009).

Outcomes of Adolescent Obesity

Depression, Anxiety and Self-esteem. Approximately one–fifth of adolescents have psychiatric disorders, and prevalence estimates for depressive disorder is 0.92-8% (Cooper & Coodyer, 1993; Ford, Goodman, & Meltzer, 2003; Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993). The findings from this study indicated that adiposity accounted for 62% of the total effect of

depressive symptoms through its correlation with body dissatisfaction and pressure to be thin; moreover, the factor that related to depressive symptoms was pressure to be thin (Chaiton, Sabiston, O'Loughlin, McGrath, Maximova, & Lambert, 2009). In addition, a study indicated that obesity and depression were associated and overweight was related to higher depressive symptoms (Daniels, 2005; Warschburger, 2005).

Adolescents are likely vulnerable to develop poor self-concept because self-concept is quickly developing during this stage of human development (Talen & Mann, 2009). Overweight adolescents easily suffer from psychosocial and emotional consequences, such as stigmatization, teasing and poor self-concept (Davison & Brich, 2001; O'Dea & Abraham, 1999; Latner & Stunkard, 2003; Ozmen, Ozmen, Ergin, Cetinkaya, Sen, Dundar, & Taskin, 2007). Furthermore, low self-concept has been related to unhealthy eating behaviors and depressive mood in adolescents (Falkner, Neumark-Sztainer, Story, Jeffrey, Beuhring, & Resnick, 2001; Sjoberg, Nilsson, & Leppert, 2005). Gender differences in self-concept were shown in studies of adolescents. Studies indicated that there was poor self-concept in obese females compared to males (O'Dea, 2006; Strauss, 2000). Strauss (2000) found that obese adolescents with a low level of self-concept were associated with increased rates of sadness, loneliness, and nervousness. Moreover, adolescents with low self-concept were more likely to drink alcohol and smoke (Strauss, 2000).

Obese adolescents may have psychological problems, such as anxiety and depression. Studies indicated higher levels of anxiety in obese adolescents compared to non-obese adolescents (Brize, Siegfried, Ziegler, Lamertz, Herpetz-Dahlmann, Remschmidt, Wittchen, & Hebebrand, 2000; Hammar, Campbell, Campbell, Moores, Saren, Gareis, & Lucas, 1972). Gender differences in anxiety have been found in studies of adolescents and studies indicated that there was poor self-concept in obese females compared to males (Anderson, Cohen, Naumova, Jacoques, Dsc, & Must, 2007).

Obesity was not only associated with health problems but also affected mental health, including depression, poor body image, and low self-concept. Chen et al. (2010) found that thinness was an ideal body image for Taiwanese adolescents. A study revealed that higher body dissatisfaction was associated with higher BMI, low self-concept, and lower satisfaction with appearance for both genders in Taiwanese adolescents (Chen, Fox, Hasse, & Ku, 2010). In addition, gender differences have been found in recent studies in which females were dissatisfied with their body, developed eating disorders, and experienced depressive symptoms in Asian populations (Huang, Sousa, Tu, & Hwang, 2005; Yen, Tzeng, Chu, Lu, O'Brien, Chang, Hsieh, & Chou, 2009; Wilkosz, Chen, Kenndey, & Rankin, 2011). The finding indicated that the strongest factor related to pressure to be thin for overweight/obese adolescents was boys' teasing (Chen et al., 2010).

Definition and Related-Concept of Depression. The dictionary's definition of depression is: (a) a feeling of sadness in which you feel there is no

hope for the future and (b) a medical condition that makes you feel extremely unhappy so that you cannot live a normal life (Longman Advance American Dictionary, LAAD, 2000). Another dictionary definition of depression is just sadness (Wen Shin's new English- English Dictionary, 2007). There are some related concepts of depression: sadness and hopelessness. The dictionary definition of sadness is: (a) unhappy, especially because something bad had has happened to you or someone else; (b) making you feel unhappy (Longman Advance American Dictionary, 2000). A study has shown that there is a difference between sadness and depression because sadness is a function of loss, and a function of sadness is depression (Leventhal, 2008). Moreover, the dictionary definition of hopelessness is: (a) a hopeless situation is so bad that there is no chance of success or improvement and (b) feeling or showing no hope (LAAD, 2000). The American Psychiatric Association's (APA) has defined "hopelessness" as a pervasive pessimism about the future.

Attributes of Depression. The word depression can be described as a depressed mood, and most people have experienced it. According to symptoms, the International Classification of Mental and Behavioral Disorders (ICD-10) defined a classification system for the term of depression (WHO, 1993) (Table A1). According to psychiatric and psychological perspectives, the symptoms of depression can be classified into four domains: (a) mood change, (b) cognitive impairment, (c) motor deficits and (d) circadian deregulations (Mayberg, 2003). The Diagnostic and Statistical Manual of Mental Disorders is based on descriptive features such as symptoms, degrees of severity and course of the illness (DSM

IV-TR; American Psychiatric Association, 2004). Depression is not a nursing diagnosis. However, some symptoms of hopelessness are similar to depression, including decreased affect, lack of initiative, decreased appetite, and sleep disturbance (APA, 2004) (Table A2).

Hopelessness versus Depression Attributes. According to the literature, studies indicate that there are similar attributes between hopelessness and depression. Some characteristics of depression, including loss of energy, insomnia, and fatigue (APA, 2004) can resemble hopelessness. One study showed that depressive mood, sadness, apathy, loss of interest, indecisiveness, or suicidal thoughts are depressive symptoms (APA, 2004), similar to the negative expectancy evident in hopelessness (Dunn, 2005). Depression seems to be a deeply sad response because of past events; however, hopelessness is based on expectation about the future (Dunn, 2005). The study showed that hopelessness can tend to hopelessness depression (Dunn, 2005) (Table A2).

Culture and Mental Health. The experience of depression is physical rather than psychological in Chinese society. Findings indicated that most depressed Chinese individuals did not report feeling sad, but expressed feeling stressed and fatigued (Kleinman, 2004). People in Taiwan who report a high level of anxiety may not be accepted by society because expressing a high level of anxiety is shameful (Ma, Huang, Chang, Yen & Lee, 2008). Expression of anxiety symptoms for Taiwanese people is different because of a negative cultural attitude. People with anxiety in Taiwan have both subjective symptoms, such as worry and unstable emotions, and objective symptoms,

such as diarrhea (Lai, Chang, Connor, Lee, & Davidson, 2004). Based on the findings above, cultural differences affect expression of mental health disturbances.

Theoretical Framework

The most important purpose of theory is to guide research, and theory provides the framework and content for a specific branch of science (Rew, 2005). The second purpose of theory is to guide clinical practice or interventions. Moreover, theory guides the studies conducted by researchers that are disseminated and translated into information that can be used in practice (Rew, 2005). The third purpose of theory is to organize observations and findings that may appear inconsistent (Roger, 1970).

Cognitive behavioral theory (CBT) is composed of several sub-theories including Beck's theory of depression, Ellis's rational emotive behavior theory, and Clark's model for anxiety (Beck, 1976; Corey, 2001; Gao, 2001) and different theories are collectively called CBT. On the other hand, Chinese culture also is a complicated culture and has undergone rapid changes and multi-dimensions. Nowadays, many beliefs, values, and ways of life co-exist with traditional values (Gao, 2001). CBT is created by Western researchers (Beck, 1976; Corey, 2001; Gao, 2001). Therefore, it is critical to examine how CBT works in Taiwanese adolescents and in order to provide culturally sensitive interventions for future studies.

Behavioral Theory

Overview. Lindsley, Skinner, and Solomon, were the first to use the term of behavior therapy (BT) in 1953. The assumptions of BT and behavioral modification are that specific and observable new behaviors replace maladaptive ones. The purpose of BT is to adapt the individual's behavior only but behavior modification is based on changing the individual's behaviors with relation to their environments (Keehn & Webster, 1969). A behavioral technique was named operant conditioning by Skinner in 1988. Operant conditioning emphasizes behavior choices and involves individuals' past experiences of outcomes of those behaviors. Individuals will choose behaviors with positive outcomes over behaviors with negative consequences (Skinner, 1988).

Cognitive Theory

Overview. Cognitive Theory (CT) is a psychotherapeutic approach that aims to solve problems concerning dysfunctional emotions, behaviors and cognitions through goal-oriented and systematic procedures (Beck, 1967). Cognitive theory is based on a theory of personality that emphasizes how one thinks determines how one feels and behaves. Cognitive theory is a process of empirical investigation, reality testing, and problem solving between therapist and client (Beck & Weishaar, 1989).

What is meant by the term cognition? First of all, cognition is thinking, and it is a subjective process used to transform experience into meaning (Goldstein, 1982). Second, the concept of cognition is holistic sense, and it

takes into account the enigmatic forms of consciousness involved in imagery, symbolism, and other non-verbal forms of awareness (Goldstein, 1982). In addition, cognition can be known as a state and as a process. As a state, cognition refers to personal knowledge, which can be categorized as explicit knowledge and tacit knowledge (Goldstein, 1982). Explicit knowledge can be understood in conversation terms, and it also can be shared with others. However, tacit knowledge cannot be told to others, it contains a kind of latent awareness. As a process, cognition refers to the many functions of the mind. Attention and perception are examples of cognitive processes (Goldstein, 1982).

Cognitive theory began in the 1960s, and Beck was the father of cognitive theory (Beck, 1967a, 1974b). The main schools of treatment of emotional disturbances were traditional neuropsychiatry, psychoanalysis, and behavior therapy (Beck, 1976). Those schools of treatment of emotional disturbances share one basic assumption:" The emotionally disturbed person is victimized by concealed forces over which he has no control" (Beck, 1976). The first goal of cognitive theory is to change faulty perceptions and incorrect interpretations of the world with functional representation of the world. Beck wanted to access the content of depressed clients' dreams to test Freud's belief that depression was a manifestation of anger turned inward (Beck, 1967). Beck found that his clients' dreams contained the same themes of low self-esteem that matched their verbal expression (Beck, 1967). Beck continued clinical observations and experimental research, and Beck developed his theory of

emotional disorders and a cognitive model of depression (Beck, 1963; Loeb, Beck, & Diggory, 1971; Leob, Feshbach, Beck, & Wolf, 1964).

Cognitive theory is based on the premise that anxiety is caused by a person's negative thinking: how we think affects how we feel and how we behave (Dobson, 2008). In the late 1970s, Beck and his cognitive theory of depression revolutionized our understanding of depression and anxiety and the important role that negative automatic thought processes or "negative thinking" as a mediator for depression and anxiety (Beck, 1967). For example, a person is invited to attend a party (event). The person thinks that she or he does not know what to say at the event (cognitive appraisal), and then she or he feels nervous and anxious (emotion). She or he makes excuses and avoids the party (behavior). The party is incoming data perceived by an individual. The person has had prior negative experiences at parties. The negative experiences are stored in her or his memory. The party as incoming data causes automatic thoughts. These automatic thoughts are negative. The person starts negative self-talk, which results in emotions. These emotions then activate people's defense mechanisms.

Cognitive theory focuses on three levels of cognitive phenomena: (a) automatic thoughts; (b) cognitive distortions, and (c) schema (Wright, 2006). The automatic thoughts are specifically private or unspoken and occur in an immediate way as we evaluate the significance of events in our lives (Wright, 2006). Cognitive distortions are systematic errors in reasoning. Schema is based on individual experiences when the person interacts with others and the

environment (Freeman, 2005). Core beliefs are called schema, and schemas are rules of thinking. People need to build up their schemas to handle a lot of information that they receive everyday and to help them make good decisions (Wright, 2006). A person's negative thinking results from schemas about outer objects and is influenced by automatic thoughts and cognitive distortions. For example, if a student thinks about a lot of assignments that are due next week (event), the student thinks that it is too much and too difficult for me (automatic thought). Afterward a student feels anxiety and sadness (emotion). According to the example, the malfunction effect under assumptions or schema and the person's reactions to an outer object operates through cognition distortions and automatic thoughts. The assumption of cognitive theory is that negative thinking can be modified through empirical analysis and logical discourse (Young, 1990). According to this assumption, therapeutic interventions based on theories about schema and distortions release distress for clients. Using rational thinking can alleviate emotional symptoms, and thinking with reasoning can alleviate emotional disturbances as well (Beck, 1983).

Cognitive behavioral theory (CBT)

Overview. Albert Ellis is the pioneer of cognitive-behavioral theory (CBT), and CBT resulted from the field of Albert Ellis and Aaron Beck. Ellis began the development of rational-emotive therapy (RET) in the 1950s, and RET has been called rational emotional behavior therapy since 1993 (REBT) (Ellis, 1957a, 1962b). REBT became the first modern CBT by combining

cognitive theory with behavioral theory. It was later followed by other CBT model such as Beck and Bandura (Ellis, 1994; Ellis & MauLaren, 1998).

CBT operated on the hypothesis that a client's emotional distress is the result of a faulty belief system, including automatic thoughts, cognitive errors and schema (Freeman & Roy, 2005; Wright, Basco, & Thase, 2006). The automatic thoughts are specifically private or unspoken and occur in an immediate way as we evaluate the significance of events in our lives (Wright, Basco, & Thase, 2006, p. 7). Cognitive errors included: (a) awfulizing (e.g., It is awful to be abandoned), (b) I-can't-standitis (e.g., I can't stand being alone), (c) damnation of oneself and others (e.g., He's rotten for leaving me. I must be worthless), (d) overgeneralizing (e.g., Since my father raped me, all men will), (e) jumping to conclusions (e.g., Since he abused me, I must be a despicable person), (f) personalizing (e.g., It's my fault my mother married a violent alcoholic), (g) all-or-nothing thinking (e.g., If you are at all like my father, and you are completely like him) (Ellis & Dryden, 1997; Ellis & MacLaren, 1998; Gandy, 1995).

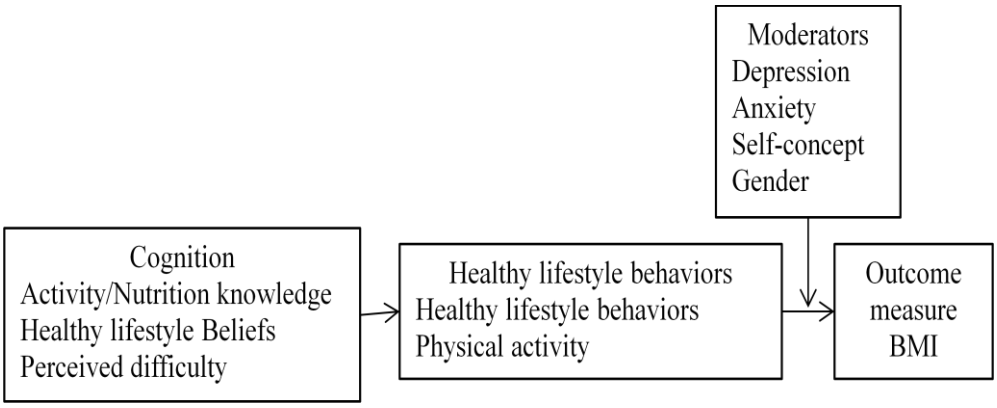
The intervention CBT originated with Beck's evaluations of negative thought patterns and logical or illogical errors that underlined the behaviors of depressed persons (Beck, 1963a, 1964b, 1967c). The assumption underlying CBT is that changing people's dysfunctional thinking and their psychological symptoms will change their behavior. The CBT techniques including problem solving, self-statement modification, self-control training, cognitive restructuring and behavior modification and skills are often used in children and adolescents (Grave & Blissett, 2004, pp. 399-420). Therefore, if therapists change people's

cognitive errors and correct their negative schemas, it will result in positive automatic thinking. There are over 325 published findings on cognitive-behavioral theory (Butler, Chapman, Forman, & Beck, 2006). One study found that cognitive-behavioral theory was significantly effective for adult unipolar, adolescent unipolar depression, generalied anxiety disorder, panic disorder with or without agoraphobia, social phobia, PTSD, and childhood depressive and anxiety disorders (Butler et al., 2006).

Some predictive studies have been conducted in both Taiwan and the U.S., but there are important predictors such as healthy lifestyle behaviors that have not been explored in Taiwanese adolescents (Table A4). According to the literature review above, given the complexity of the problem as shown in many studies across the world, a model was proposed to guide what factors to explore to describe the problem specifically in this region. Cognitive behavioral theory was used to frame an exploratory study of these factors in Taiwan. The CBT operated on the hypothesis that a client's emotional distress was a result of a faulty belief system. The theory predicted that adolescents who lack beliefs/confidence/knowledge in their ability to live a healthy lifestyle and who perceive healthy lifestyle behaviors /physical activity as difficult would have increased BMI as well; moreover, the level of depression, anxiety, self-concept, and gender would be explored as moderators that affect the relationship between healthy lifestyle behaviors and BMI in Taiwanese adolescents. Thus, the goals of the proposed study were to describe the relationships among cognitive/mental health variables (e.g., healthy lifestyle beliefs), and healthy lifestyle behaviors

on BMI in Taiwanese adolescents and to prepare to develop and test an intervention program to promote and support healthy lifestyle behaviors. This conceptual model is illustrated in Figure 1.

Figure 1. Cognitive-Behavioral Theory Conceptual Model (CBT model) to predict BMI



Specific Aims and Hypothesis

Specific Aim 1: Examine the role of variables in the CBT model in predicting the behavior variables of healthy lifestyle behaviors and physical activity in Taiwanese middle adolescents.

Hypothesis 1: There would be a positive relationship between activity knowledge and healthy lifestyle behaviors in Taiwanese middle adolescents.

Hypothesis 2: There would be a positive relationship between nutrition knowledge and healthy lifestyle behaviors in Taiwanese middle adolescents.

Hypothesis 3: There would be a positive relationship between healthy lifestyle beliefs and healthy lifestyle behaviors in Taiwanese middle adolescents.

Hypothesis 4: There would be a negative relationship between perceived difficulty and healthy lifestyle behaviors in Taiwanese middle adolescents.

Hypothesis 5: There would be a positive relationship between activity knowledge and physical activity in Taiwanese middle adolescents.

Hypothesis 6: There would be a positive relationship between healthy lifestyle beliefs and physical activity in Taiwanese middle adolescents.

Hypothesis 7: There would be a negative relationship between perceived difficulty and physical activity in Taiwanese middle adolescents.

Specific Aim 2: Examine the role of variables in the CBT model in predicting BMI in Taiwanese middle adolescence.

Hypothesis 1: There would be a negative relationship between healthy lifestyle behaviors and BMI in Taiwanese middle adolescents.

Hypothesis 2: There would be a positive relationship between physical activity and BMI in Taiwanese middle adolescents.

Specific Aim 3: Explore behavior variables (e.g., healthy lifestyle behaviors and physical activity) that may mediate the relationships in the theoretical framework regarding BMI.

Hypothesis 1: Healthy lifestyle behaviors would mediate the relationship between activity knowledge and BMI.

Hypothesis 2: Healthy lifestyle behaviors would mediate the relationship between nutrition knowledge and BMI.

Hypothesis 3: Healthy lifestyle behaviors would mediate the relationship between healthy lifestyle beliefs and BMI.

Hypothesis 4: Healthy lifestyle behaviors would mediate the relationship between perceived difficulty and BMI.

Hypothesis 5: Physical activity would mediate the relationship between activity knowledge and BMI.

Hypothesis 6: Physical activity would mediate the relationship between healthy lifestyle beliefs and BMI.

Hypothesis 7: Physical activity would mediate the relationship between perceived difficulty and BMI.

Specific Aim 4: Explore variables (e.g., depression, anxiety, self-concept and gender) that may moderate the relationship between healthy lifestyle behaviors and BMI in Taiwanese adolescents.

Hypothesis 1: Depression would moderate the relationship between healthy lifestyle behaviors and BMI.

Hypothesis 2: Anxiety would moderate the relationship between healthy lifestyle behaviors and BMI.

Hypothesis 3: Self-concept would moderate the relationship between physical activity and BMI.

Hypothesis 4: Depression would moderate the relationship between physical activity and BMI.

Hypothesis 5: Anxiety would moderate the relationship between physical activity and BMI.

Hypothesis 6: Self-concept would moderate the relationship between physical activity and BMI.

Hypothesis 7: Gender would moderate the relationship between healthy lifestyle behaviors and BMI.

Hypothesis 8: Gender would moderate the relationship between physical activity and BMI.

Chapter 3

METHODOLOGY

Design of the Study

This research consisted of two phases. The first phase was a pilot study in which the questionnaires/instruments, which were originally designed for English speakers in the United States, were translated into traditional Chinese versions that could be administered to middle school students aged 13 to 15 years residing in Taiwan. The translated instruments were administered to a pilot sample of 186 Taiwanese students. Based on recent psychometric analyses of the pilot data, additional adaptations were made to the instruments to be used in the second phase of this study.

During the second phase, the adapted questionnaires were administered on a different sample of middle school Taiwanese students aged 13 to 15 years. Data were examined using path analysis. A model was specified following the theoretical relationships among variables (see Figure 2). The model included exogenous variables (i.e., activity/nutrition knowledge, healthy lifestyle beliefs, and perceived difficulty as well as depression, anxiety, self-concept and gender), which were defined as independent variables that were not predicted by other variables in the model, and endogenous variables, which were defined as dependent variables (i.e., physical activity, healthy lifestyle behaviors, and BMI).

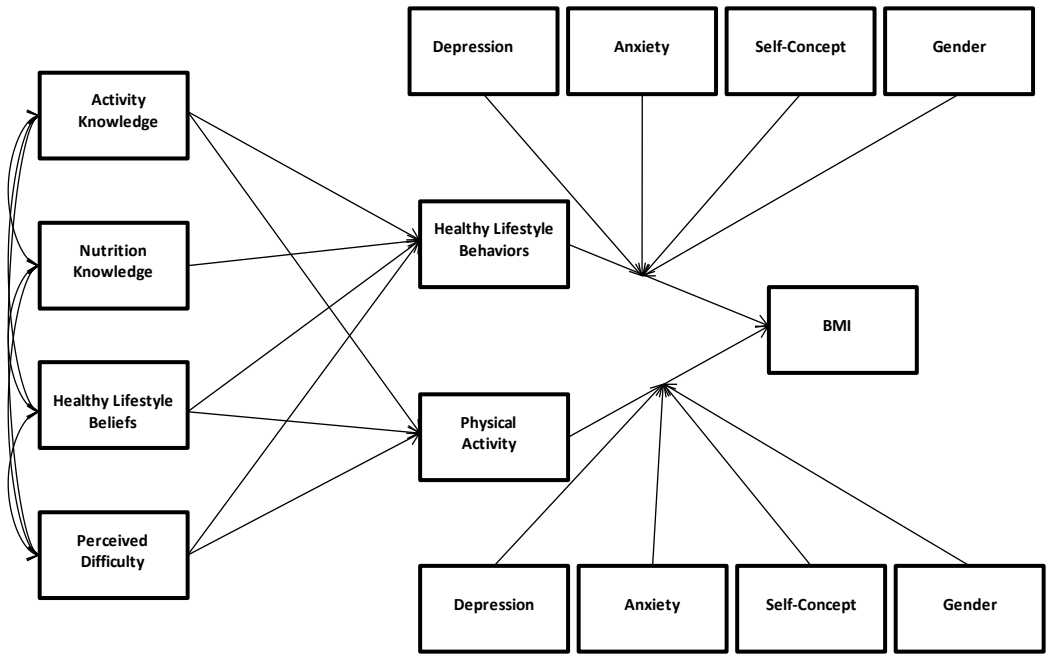


Figure 2. Presentation of conceptual path model of the relationships among variables (i.e., activity/nutrition knowledge, healthy lifestyle beliefs, and perceived difficulty as well as depression, anxiety, self-concept and gender, physical activity, healthy lifestyle behaviors) to predict BMI.

Sampling for Pilot and Primary Study

Setting and Sample. Students who were ages 13 to 15 years were recruited from classes in two middle schools in Taiwan. Data collection date and time were decided by schools and the researcher did the data collection after notification by the schools. The size of a class was approximately 35 students. Data were collected on a convenience sample of 453 junior, sophomores and senior students at two middle schools in Taiwan. Considering assumptions of path analysis, a large sample size of 453 participants were recruited for this study. Incentives (e.g., notebook and pencil) were provided to the adolescents for their participation in the study.

Inclusion/Exclusion criteria. Criteria for inclusion included: (a) adolescents 13 to 15 years of age who were in middle school, Taiwan; and (b) adolescents who could read and write Chinese. Exclusion criteria included: (a) adolescents who could not read and write Chinese; (b) adolescents who were under 13 or over 15 years of age in middle school, Taiwan; (c) adolescents who did not complete assent form; and (d) parents or legal guardians who did not complete consent form.

Instruments

Operational Definitions

Healthy Lifestyle Beliefs. Healthy lifestyle beliefs are defined as adolescents' beliefs/confidence about their ability to engage in a healthy lifestyle.

Healthy Lifestyle Behaviors. Healthy lifestyle behaviors are defined as adolescents' recent healthy lifestyle behavioral practices, such as "I make healthy food choices."

Perceived Difficulty. Perceived difficulty is defined as adolescents' perceived difficulty in living a healthy lifestyle.

Nutrition Knowledge. Knowledge is questions regarding nutrition, such as "It is a good idea to have fruit juice at every meal."

Activity Knowledge. Knowledge is questions regarding physical activity, such as "Dancing is exercise."

Physical Activity. Physical activity is defined as how often adolescents do physical activity such as "Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?"

Depression. Depression is defined as adolescents' depressive symptoms.

Anxiety. Anxiety is defined as adolescents' anxiety symptoms and specific worry about school performance.

Self-Concept. Self-concept is defined as how adolescents think of themselves. The example of a question is, "I am a good person."

Moderators. Variables (i.e., depression, anxiety, self-concept, and gender) that affect the direction and/or strength of a relation between an independent or criterion variable (Baron & Kenny, 1986). A moderator variable affects relationships between two variables so that the nature of the impact of the predictor on the criterion varies according to the level of the moderator (Sauders, 1956).

Mediators. The independent variable (i.e., healthy lifestyle behaviors and physical activity) causes the mediator which then causes the outcome (Shadish & Sweeney, 1991).

Translation and Back-Translation Procedures

The aim of translation is not only to achieve linguistic equivalent of instruments but also to maintain the conceptual meaning of original questions. According to Beaton and colleagues' cross-culture adaptation guidelines (2000), at least two forward translations, the first forward (from original to

target language) of the questionnaires be made by independent bilingual translators. Furthermore, they suggest that the questionnaires are translated back into the original language. Three translators, who were proficient in both English and Chinese, translated the questionnaires from English to Chinese and three other translators, who were proficient in both English and Chinese, did the back-translation (from Chinese to English).

The unclear items were modified and these back-translated items were compared to original items for discrepancies in language or meaning (Forman & Owen, 1999). For a cultural appropriateness perspective, two researchers, whose native language is Mandarin, who both major in nursing, did the re-wording of unclear items based on cultural meaning. Two researchers used "salty cookies" instead of pretzel. Two researchers did the re-wording of these unclear items to achieve the equivalent of these items based on cultural meaning. In order to modify the scales and ascertain the reliability and validity of the instruments, the researcher conducted a psychometric pilot study before the second phase of the study.

Demographic Information

For both the pilot and primary study, the questionnaire measured demographic information on age, gender, grade, family composition and the highest level of educational achievements for parent(s)/guardian(s). For primary study, additional demographic information collected including date of birth, body weight and height. In addition, body weight and height were documented using school nurse records.

Body Mass Index

Schools in Taiwan are required to measure height and weight for students at the beginning of the fall semester. The researcher, using the school nurse's records, recorded the students' height and weight onto the students' questionnaire. These measurements were used to calculate body mass index (BMI), which was calculated as body weight (kg) divided by the square of height (meter).

Physical Activity

Two questions were used to assess time spent in physical activity (Prochaska, Sallis & Long, 2001). The items included "over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?" and "over a typical or usual week, on how many days were you physically active for a total of at least 60 minutes per day?" This measure was tested in adolescents (N=148) by Prochaska and collogues (2001) and had an intraclass correlation of .77.

Psychometric Properties of the Instruments

For the remaining six instruments, exploratory factor analyses (EFA) were conducted on the pilot data to identify the underlying dimensions of the scales. The purpose of this study was to identify and interpret the latent factor structure which may uniquely account for a large part of the correlations among a number of measure variables (or items), so principal axis factor analysis was selected instead of principal components analysis (Fabrigar, Wegener, MacCallum, & Strahan, 1999). The principal axis extraction method

was used because of its relative tolerance of non-normality and demonstrated ability to recover weak factors (Briggs & MacCallum, 2003; Widaman, 1993).

The number of factors to extract was determined by visually inspecting the scree plot and parallel analysis (Horn, 1965; Velicer, 1976) as well as by interpretability of the factor solution. In parallel analysis, the scree plot of the eigenvalues from the real data is compared with the scree plot of the eigenvalues from the random data so that the researcher can obtain the absolute maximum number of factors that should be extracted (Resise, Waller, & Comrey, 2000). The researcher might not extract a factor from the real data that explains less variance than a corresponding factor in the simulated random data (Resise et al., 2000). To yield interpretable factors, the extracted factor solution was rotated. Because correlated, rather than uncorrelated factors would reflect a more realistic representation, an oblique rotation was used. Sepcifically, promax rotation (Hendrickson & White, 1964) with a *k* value of 4 was utilized (Gorsuch, 1997; Tataryn, Wood, & Gorsuch, 1999) which produced an interpretable pattern matrix of coefficients (i.e., correlations between the individual items and the factors).

Pattern coefficients $\geq .40$ were considered salient and practically significant (Stevens, 2002). Complex loadings which were salient on more than one factor were rejected in the interest of parsimony and to honor simple structure (Thurstone, 1947). Factors with a minimum of 3 salient pattern coefficients, internal consistency reliability $\geq .70$, and that were theoretically meaningful were considered adequate. Moreover, squared multiple correlations

were used to estimate the initial communalities (Gorsuch, 2003). These communalities indicate the proportion of variance of the measured variables that is accounted for by the latent factors.

Prior to the EFA, criteria for determining the factor adequacy of the correlation matrix were established using two statistics. To ensure that the correlation matrix was not random, Bartlett's test of sphericity (Bartlett, 1950) was used to determine whether the correlations matrix was not an identity matrix (i.e., items are uncorrelated in the population). Kaiser-Meyer-Olkin measure of sampling adequacy (KMO; Kaiser, 1970) was also used to determine the inter-item partial correlations were not large in comparison to observed correlations. A KMO value, which can range from 0 to 1, with a minimum standard of .6 indicates the appropriateness of factor analysis (Kaiser, 1974). After confirming that the correlation matrix was factorable, the matrix was then submitted for EFA.

The published psychometric properties and the psychometric analyses from the pilot data was reported for the Beck Youth Inventory, Healthy Lifestyle Beliefs Scale, Perceived Difficulty Scale, Healthy Lifestyle Behaviors Scale, Nutrition Knowledge Scale and the Activity Knowledge Scale. Based on simple structure, internal consistency, and interpretability, the researcher used these criteria to decide on the factor solution.

M*plus* was used to conduct confirmatory factor analysis (CFA) all scales for both pilot and primary studies according to the factors identified through EFA (Muthén, and Muthén, 1998 -2009). Global fit indices were used

to assess model fit and the fit indices assessed include Chi-Square, comparative fit index (*CFI*), and Root Mean Square Error of Approximation (*RMSEA*). The criterions for global fit indices were as same as data analysis for phase II study.

The Beck Youth Inventory

The Beck Youth Inventory (2nd edition; Beck, Beck, Jolly, & Steer, 2005) is a well-known instrument for youth 7 to 18 years of age, which measures five constructs: self-concept, depressive symptoms, anxiety symptoms, anger, and disruptive behavior. Three subscales from the Beck youth inventory were utilized for this study, including the Self-Concept Inventory, Depression Inventory, and Anxiety Inventory. Each of these subscales have items using a four-point Likert scale that ranges from 0, indicating "never" and 3, indicating "always".

Self-Concept Scale. The Self-Concept Inventory is an 17-item scale. This scale contains statements about global sense of self in youth. Total scores for the Self-Concept Inventory ranging from 0 to 51 are usually reported as T scores using norms provided by the author. The Cronbach'α typically exceeds .86 (Beck et al., 2005).

Depression Scale. The Depression Inventory is an 20-item scale. The depression scale measures depressive symptoms in youth. Total scores for the Depression Inventory range from 0 to 60, and are usually reported as T scores using norms provided by Beck and his colleagues, 2005. The Cronbach'α typically exceeds .86 (Beck et al., 2005).

Anxiety Scale. The Anxiety Inventory is an 20-item. This scale contains statements trait anxiety in youth. Total scores for the Anxiety Inventory range from 0 to 60, and are usually reported as T scores using norms provided by Beck and his collogues, 2005. The Cronbach'α typically exceeds .86 (Beck et al., 2005).

Healthy Lifestyle Beliefs Scale

The Healthy Lifestyle Beliefs Scale (HLBS) is an 16-item instrument, which measures belief/confidence about facets of maintaining a healthy lifestyle (Melnyk & Small, 2003b). Adolescents respond to each of the items (e.g., "I believe that I can be more active." and "I am sure that I will do what is best to lead a healthy life.") on a five-point Likert scale. Total scores ranged from 16 to 80 with higher scores indicating stronger beliefs/confidence about ability to engage in health lifestyle behaviors. Cronbach's α of .87 was reported for adolescents (Melnyk et al., 2006). Face validity was established with teens (N=10). Content validity was established by adolescent health specialists (N=8).

Perceived Difficulty Scale

Perceived Difficulty Scale (PDS) is an 11-item instrument, which measures one's perceived difficulty in living a healthy lifestyle (Melnyk & Small, 2003c). Adolescents responded to each of the items on a five-point Likert scale that ranges from 1 "very hard to do" to 5 "very easy to do" (e.g., eat healthy, exercise regularly). Items are reverse scored for analysis and scores ranged from 11 to 55. Higher scores indicate a greater degree of

perceived difficulty to engage in healthy lifestyle. The Perceived Difficulty Scale was adapted from another similar scale used with teens in an HIV-preventive intervention study (Morrison-Beedy, Nelson, & Volpe, 2005). Cronbach's α of .83 was reported for adolescents (Melnyk et al., 2006).

Healthy Lifestyle Behaviors Scale

Adolescents responded to 16 items of Healthy Lifestyle Behaviors Scale (HLBS). Adolescents responded to each of the items (e.g., "I exercise on a regular basis" and "I say something positive to my Parent/friends every day.") on a five-point Likert scale (Melnyk & Small, 2003a). Total scores range from 16 to 80 and higher scores indicate more healthy lifestyle behaviors. Cronbach's α of .78 was reported for adolescents (Melnyk et al., 2006). Face validity was established with teens (N=10). Content validity was established by adolescent with health experts (N=8).

Nutrition Knowledge Scale

Nutrition Knowledge Scale (NKS) is an 12-item instrument, which measures knowledge regarding food nutritional information, eating habits, and health (e.g., "It is a good idea to have fruit juice at every meal," "French fries are a good vegetable choice" and "It is a good thing to add salt to food." (Melnyk & Small, 2003d). Adolescents responded by answering "yes," "no," or "don't know." If questions were answered correctly, a point was achieved. If questions were answered incorrectly or "don't know," no points were achieved. The possible range of scores is from 0 to 12. Face validity was established with teens (N=10). Content validity was established by adolescent with health

experts (N=8). Cronbach's α of .84 was reported for adolescents (Melnyk et al., 2006).

Activity Knowledge Scale

Activity Knowledge Scale (AKS) is an 8-item instrument, which measures knowledge regarding physical activity (e.g., "Exercise helps reduce stress" and "Dancing is exercise") (Melnyk & Small, 2003e). Subjects responded by answering "yes," "no," or "don't know." If questions were answered correctly a point was achieved. If questions are answered incorrectly or "don't know" no points were achieved. Therefore, the possible range of scores was from 0 to 8. Face validity was established with teens (N=10). Content validity was established by adolescent with health experts (N=8). Cronbach's α of .84 was reported for adolescents (Melnyk et al., 2006).

Results of EFA and CFA of the instruments for Pilot Study

The Beck Youth Inventory

Self-Concept Scale. Descriptive statistics, which included means, standard deviations, skewness, kurtosis, and correlations of item to scale total, was used for self-concept scale. The item means ranged for self-concept scale from 1.25 to 2.14 and the item-to-total correlations ranged from .43 to .74. The skewness and kurtosis for these items were in acceptable range. (See Table 1).

The adequacy of using factor analysis on the correlation matrix for the pilot data was examined. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) was calculated at .92 for the Self-concept Scale. Additionally, Bartlett's test of sphericity was significant ($\chi^2 = 2005.26$, $p <$

.01), indicating that the correlation matrix was not an identity matrix. Hence, the correlation matrix was appropriate for factor analysis.

Visual inspection of the scree plot suggested a three-factor solution, while the parallel analysis suggested a two factor structure. The three-factor solution, which accounted for 51.6% of total variance and met simple structure, was retained. The factors were moderately correlated: Factor I and Factor II at .74, Factor I and Factor III at .59, and Factor II and Factor III at .66.

Nine items loaded saliently on factor I, with an internal consistency of .89. Five items loaded saliently on factor II, with an internal consistency of .86. Three items loaded saliently on factor III, with an internal consistency of .84. Three items did not load on any factor. Consequently, three items (i.e., "I work hard," "I feel strong," and "I am good at telling jokes.") were deleted. The Cronbach's α for the Self-Concept Inventory with Taiwanese adolescents ranged from .84 to .89 and the total scale was .93. (See Table 2).

A three-factor model was specified for the self-concept items. The Satorra-Bentler chi-square goodness-of-fit test revealed a lack of perfect fit in the population, $\chi^2_{S\text{-}B}$ (N=185, df=113)=192.66, p<.01. Nevertheless, the comparative fit index of .95 showed that the model adequately reproduced the covariances among the 17 items, while the root mean square error of approximation of .06, with 90% *CI* of .05 to .08, suggested that the fit was adequate. The standardized factor loadings that ranged from .55 to .82 were all significant at the .05 level, suggesting that factor, self-concept scale,

represented self-concept. On the basis of the two fit indices and factor loadings, the three-factor model was adequate for the purpose of primary study. (See Figure 3).

Table 1

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Self-Concept Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	I work hard	184	1.79	0.90	-0.27	-0.73	0.45
2	I feel strong	184	1.57	0.91	0.07	-0.80	0.51
3	I like myself	184	1.82	0.96	-0.16	-1.11	0.73
4	People want to be with me	183	1.60	0.92	0.09	-0.91	0.66
5	I am just as good as the other kids	184	1.54	0.94	0.09	-0.92	0.71
6	I feel normal	183	2.14	0.91	-0.65	-0.67	0.58
7	I am a good person	184	1.96	0.89	-0.32	-0.92	0.61
8	I do things well	184	1.54	0.81	0.39	-0.54	0.73
9	I can do things without help	184	1.25	0.85	0.36	-0.41	0.43
10	I feel smart	184	1.39	0.97	0.37	-0.84	0.67
11	People think I'm good at things	184	1.42	0.93	0.31	-0.76	0.74
12	I am kind to others	184	1.99	0.85	-0.27	-0.95	0.62
13	I feel like a nice person	183	1.86	0.95	-0.27	-1.00	0.70
14	I am good at telling jokes	184	1.36	0.96	0.32	-0.83	0.43
15	I am good at remembering things	184	1.56	0.85	0.13	-0.66	0.59
16	I tell the truth	184	1.86	0.79	-0.29	-0.33	0.55
17	I feel proud of the things I do	184	1.57	0.98	0.12	-1.04	0.73
18	I am a good thinker	184	1.68	0.89	0.06	-0.89	0.57
19	I like my body	182	1.78	0.99	-0.23	-1.04	0.65
20	I am happy to be me	183	2.18	0.95	-0.76	-0.65	0.68

Table 2

EFA of Factor loadings for Self-Concept Scale

	Items	Factor I	Factor II	Factor III
18	I am a good thinker	.778		
11	People think I'm good at things	.772		
9	I can do things without help	.744		
8	I do things well	.670		
17	I feel proud of the things I do	.657		
15	I am good at remembering things	.603		
10	I feel smart	.603		
19	I like my body	.414		
16	I tell the truth	.408		
3	I like myself		.883	
4	People want to be with me		.881	
20	I am happy to be me		.568	
5	I am just as good as the other kids		.491	
12	I am kind to others		.483	
7	I am a good person			.998
13	I feel like a nice person			.866
6	I feel normal			.509
Cronbach α		.89	.86	.84
Total Cronbach α			.93	

Figure 3 CFA of Factor loadings for Self-Concept Scale

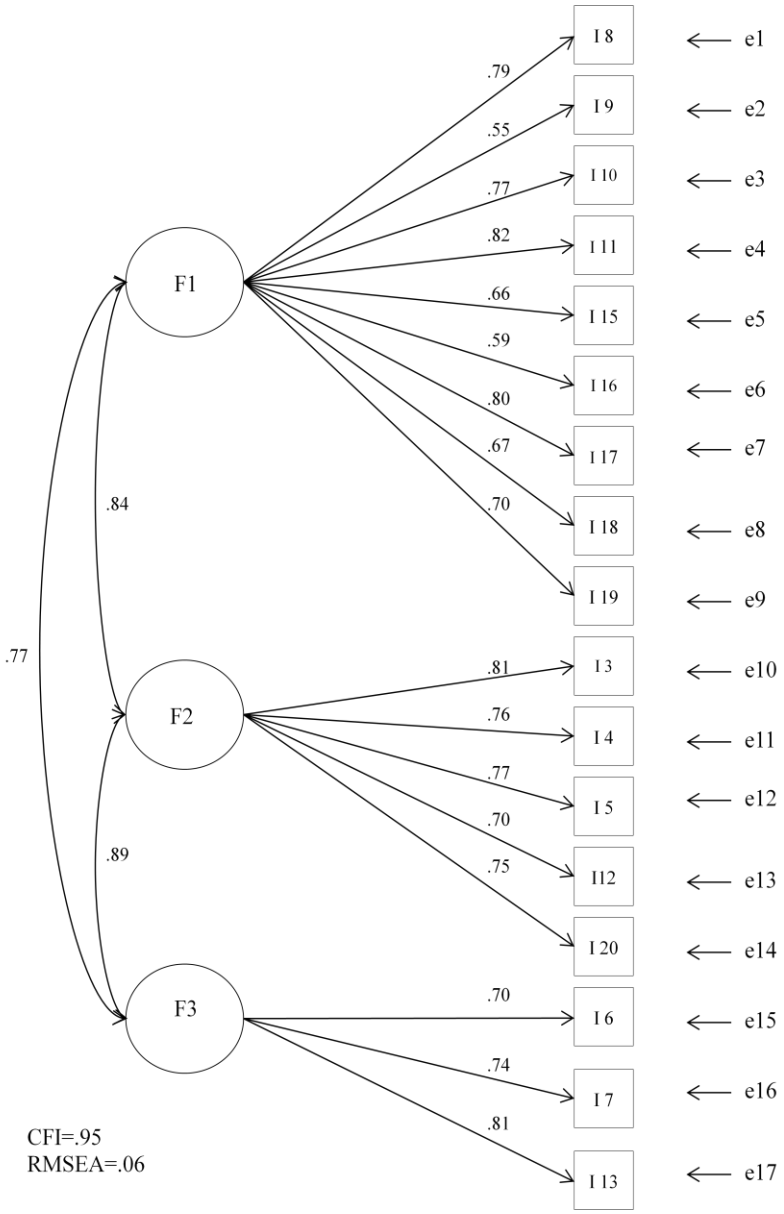


Figure 3. The correlated error between item 9 and item 11 was .30; the correlated error between item 19 and item 20 was .30; the correlated error between item 7 and item 13 was .58.

Depression Scale. The item means for the depression scale ranged from .52 to 1.05 and the item-to-total correlations ranged from .30 to .85. The skewness and kurtosis for these items listed in Table 3. The KMO measure of sampling adequacy was calculated at .95. Additionally, Bartlett's test of sphericity was significant ($\chi^2 = 2703.37$, $p < .01$), indicating the correlation matrix was appropriate for factor analysis. Visual inspection of the scree plot suggested two-factors whereas parallel analysis suggested a one-factor solution. The two-factor solution, which accounted for 56% of total variance, was retained. The factors were correlated at .80. Thirteen items loaded saliently on factor I, with an internal consistency of .94. Seven items loaded saliently on factor II, with an internal consistency of .90. The Cronbach's α for the Depression Inventory with Taiwanese adolescents was from .90 to .94 and for the total scale was .95. (See Table 4).

A two-factor model was specified for the depression items. The Satorra-Bentler chi-square goodness-of-fit test revealed a lack of perfect fit in the population, $\chi^2_{S\text{-}B}$ (N=186, df=166)=239.13, p<.01. Nevertheless, the comparative fit index of .96 showed that the model adequately reproduced the covariances among the 20 items, while the root mean square error of approximation of .05, with 90% *CI* of .03 to .06, suggested that the fit was between mediocre and fair. The standardized factor loadings that ranged from .35 to .92 were all significant at the .05 level, suggesting that factor, depression scale, represented depression. On the basis of the two fit indices and factor

loadings, the two-factor model was adequate for the purpose of primary study. (See Figure 4).

Table 3

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Depression Scale

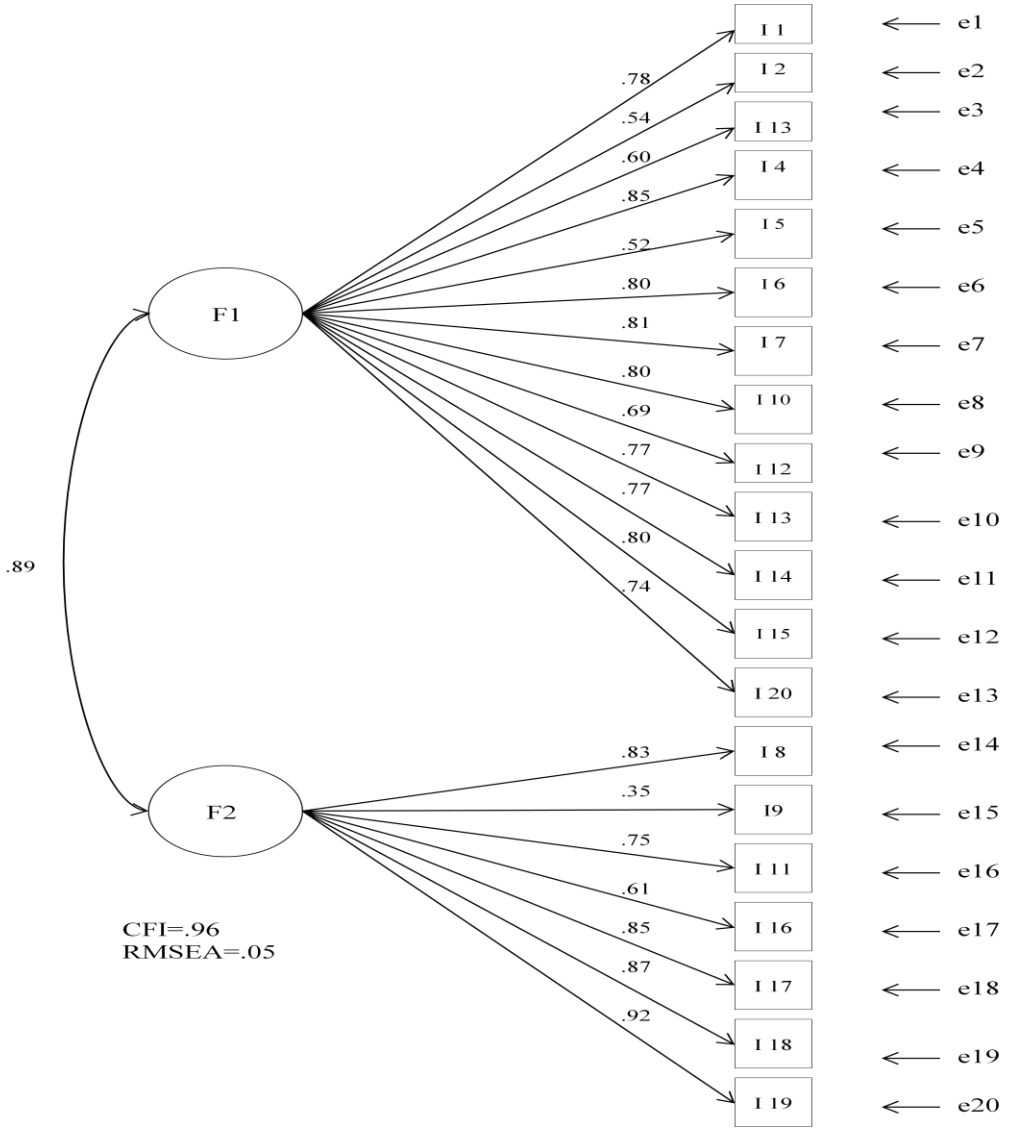
	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	I think my life is bad	186	0.95	0.85	0.85	0.39	0.76
2	I have trouble doing things	186	0.55	0.65	1.14	1.65	0.53
3	I feel that I am a bad person	186	0.50	0.72	1.60	2.71	0.57
4	I wish I were dead	186	0.66	0.94	1.37	0.83	0.81
5	I have trouble sleeping	186	0.62	0.77	1.12	0.73	0.52
6	I feel no one loves me	186	0.55	0.86	1.64	1.97	0.76
7	I think bad things happen because of me	186	0.73	0.83	1.05	0.61	0.77
8	I feel lonely	186	1.05	0.93	0.73	-0.19	0.78
9	My stomach hurts	186	0.68	0.75	1.00	0.73	0.30
10	I feel like bad things happen to me	186	0.91	0.87	0.81	0.10	0.76
11	I feel like I am stupid	186	1.04	0.99	0.65	-0.59	0.75
12	I feel sorry for myself	185	0.75	0.92	1.07	0.24	0.68
13	I think I do things badly	185	0.84	0.89	0.98	0.35	0.73
14	I feel bad about what I do	186	0.67	0.77	1.16	1.22	0.74
15	I hate myself	186	0.52	0.85	1.75	2.34	0.77
16	I want to be alone	186	0.95	1.02	0.74	-0.64	0.55
17	I feel like crying	186	1.05	1.04	0.75	-0.57	0.79
18	I feel sad	185	0.95	1.01	0.91	-0.20	0.84
19	I feel empty inside	186	1.00	1.03	0.78	-0.54	0.85
20	I think my life will be bad	186	0.53	0.89	1.63	1.59	0.68

Table 4

EFA of Factor loadings for Depression Scale

	Items	Factor I	Factor II
10	I feel like bad things happen to me	.856	
20	I think my life will be bad	.847	
13	I think I do things badly	.794	
7	I think bad things happen because of me	.767	
15	I hate myself	.734	
14	I feel bad about what I do	.713	
12	I feel sorry for myself	.609	
3	I feel that I am a bad person	.566	
4	I wish I were dead	.563	
1	I think my life is bad	.514	
6	I feel no one loves me	.490	
5	I have trouble sleeping	.416	
2	I have trouble doing things	.399	
17	I feel like crying		.916
19	I feel empty inside		.894
18	I feel sad		.813
8	I feel lonely		.682
16	I want to be alone		.532
11	I feel like I am stupid		.501
9	My stomach hurts		.426
Cronbach α		.94	.90
Total Cronbach α		.95	

Figure 4. CFA of Factor loadings for Depression Scale



Note. The correlated error between item 4 and item 12 was -.29; the correlated error between item 12 and item 11 was .41; the correlated error between item 17 and item 18 was .49.

Anxiety Scale. The item means for the anxiety scale ranged from .48 to 1.62 and the item-to-total correlations ranged from .40 to .79. The skewness and kurtosis for these items listed in Table 5. According to the KMO of .94 for the BDI-II: Anxiety Scale and the Bartlett's test of sphericity ($\chi^2 = 2190.67$, $p < .01$), indicating that the correlation matrix was appropriate for factor analysis. Although the scree plot suggested two-factors and parallel analysis suggested uni-dimensional construct. The two-factor solution, which accounted for 52% of total variance and met simple structure, was retained. The factor I and factor II were correlated at .74. Fifteen items loaded saliently on factor I, with an internal consistency of .94. Five items loaded saliently on factor II, with an internal consistency of .82. The Cronbach's α for the Anxiety Inventory with Taiwanese adolescents was from .82 to .94 and for total scale was .94. (See Table 6).

A two-factor model was specified for the anxiety items. The Satorra-Bentler chi-square goodness-of-fit test revealed a lack of perfect fit in the population, $\chi^2_{S\text{-}B}$ (N=185, df=166)=282.01, p<.01. Nevertheless, the comparative fit index of .93 showed that the model adequately reproduced the covariances among the 20 items, while the root mean square error of approximation of .06, with 90% *CI* of .05 to .07, suggested that the fit was between mediocre and fair. The standardized factor loadings that ranged from .38 to .83 were all significant at the .05 level, suggesting that factor, anxiety scale, represented anxiety. On the basis of the two fit indices and factor

loadings, the two-factor model was adequate for the purpose of primary study. (See Figure 5).

Table 5

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Anxiety Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	I worry someone might hurt me at school	185	0.57	0.79	1.32	1.13	0.64
2	My dreams scare me	185	0.78	0.71	0.81	0.99	0.59
3	I worry when I am at school	185	0.69	0.83	1.16	0.86	0.75
4	I think about scary things	185	0.87	0.93	0.76	-0.44	0.74
5	I worry people might tease me	185	0.99	0.93	0.75	-0.22	0.67
6	I am afraid that I will make mistakes	184	1.15	0.87	0.51	-0.28	0.75
7	I get nervous	185	1.23	0.87	0.47	-0.35	0.68
8	I am afraid I might get hurt	185	0.73	0.92	1.15	0.42	0.76
9	I worry I might get bad grades	184	1.62	1.00	-0.05	-1.07	0.40
10	I worry about the future	185	1.34	1.01	0.25	-1.01	0.56
11	My hands shake	184	0.52	0.75	1.52	2.14	0.46
12	I worry I might go crazy	185	0.48	0.87	1.73	1.90	0.73
13	I worry people might get mad at me	185	1.04	0.99	0.64	-0.64	0.75
14	I worry I might lose control	185	0.74	0.98	1.13	0.11	0.75
15	I worry	185	0.84	0.98	1.03	0.03	0.71
16	I have problems sleeping	184	0.53	0.77	1.48	1.77	0.58
17	My heart pounds	184	0.64	0.85	1.25	0.82	0.59
18	I get shaky	184	0.49	0.77	1.61	2.08	0.61
19	I am afraid that something bad might happen to me	185	0.84	0.96	0.88	-0.26	0.79
20	I am afraid that I	185	0.70	0.96	1.27	0.50	0.61

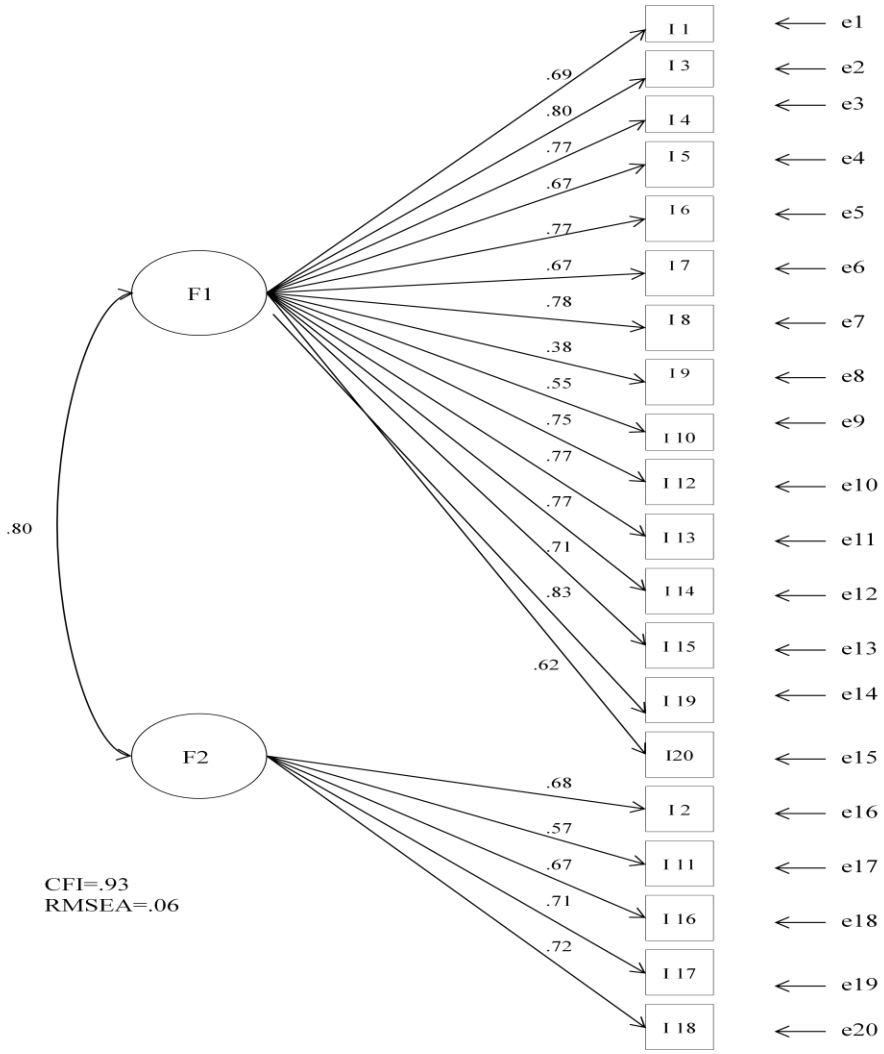
Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
might get sick						

Table 6

EFA of Factor loadings for Anxiety Scale

	Items	Factor I	Factor II
19	I get shaky	.854	
5	I worry people might tease me	.840	
1	I worry someone might hurt me at school	.780	
6	I am afraid that I will make mistakes	.758	
13	I worry people might get mad at me	.737	
10	I worry about the future	.666	
3	I worry when I am at school	.654	
8	I am afraid I might get hurt	.629	
9	I worry I might get bad grades	.616	
12	I worry I might go crazy	.547	
14	I worry I might lose control	.533	
20	I am afraid that I might get sick	.498	
4	I think about scary things	.493	
15	I worry	.467	
7	I get nervous	.422	
18	I get shaky		.926
11	My hands shake		.829
17	My heart pounds		.713
16	I have problems sleeping		.610
2	My dreams scare me		.521
Cronbach α		.94	.82
Total Cronbach α		.94	

Figure 5. CFA of Factor loadings for Anxiety Scale



Note. The correlated error between item 9 and item 10 was .33; the correlated error between item 12 and item 14 was .36; and the correlated error between item 11 and item 18 was .31.

Healthy Lifestyle Beliefs Scale

The item means for the healthy lifestyle scale ranged from 2.99 to 4.21 and the item-to-total correlations ranged from .49 to .80. The skewness and kurtosis for these items listed in Table 7. According to the KMO of .93 and Bartlett's test of sphericity ($\chi^2 = 1291.80$, $p < .01$), the correlation matrix was appropriate for factor analysis. Although the scree plot suggested two-factors and parallel analysis suggested uni-dimensional structure. The two-factor solution, which accounted for 57% of total variance and parsimony, was retained. Eight items loaded saliently on factor I, with an internal consistency of .91. Eight items loaded saliently on factor II, with an internal consistency of .89. The factors were correlated at .75. The Cronbach's α for the Healthy Lifestyle Beliefs Scale with Taiwanese adolescents ranged from .75 to .91 and the Cronbach's α of total scale was .94. (See Table 8).

A two-factor model was specified for the healthy lifestyle beliefs items. The model did not perfectly fit the data, $\chi^2_{S\text{-}B}$ (N=185, df = 96) = 160.53, p<.01; however, it had adequate fit with *CFI* of .95 and marginal fit with *RMSEA* of .06, (with 90% *CI* between .04 to .08). The standardized loadings, which were significant, ranged between from .51 and .85, suggesting that the two-factor was indicative of healthy lifestyle beliefs. (See Figure 6).

Table 7

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Health Lifestyle Beliefs Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	I am sure that I will do what is best to lead a healthy life	185	4.03	1.04	-1.28	1.51	0.71
2	I believe that exercise and being active will help me to feel better about myself	182	4.21	0.94	-1.51	2.62	0.72
3	I am certain that I will make healthy food choices	185	3.60	0.94	-0.41	0.32	0.73
4	I know how to deal with things in a healthy way that bother me	185	3.72	1.02	-0.65	0.29	0.73
5	I believe that I can reach the goals that I set for myself	185	3.64	0.96	-0.44	0.07	0.67
6	I am sure that I can handle my problems well	185	3.72	0.98	-0.72	0.51	0.75
7	I believe that I can be more active	185	3.84	1.03	-0.93	0.55	0.80
8	I am sure that I will do what is best to keep myself healthy	183	3.95	0.90	-0.99	1.46	0.78
9	I am sure that I can spend less time watching TV	184	2.99	1.08	-0.00	-0.43	0.49
10	I know that I can make	184	3.31	1.01	-0.20	-0.30	0.56

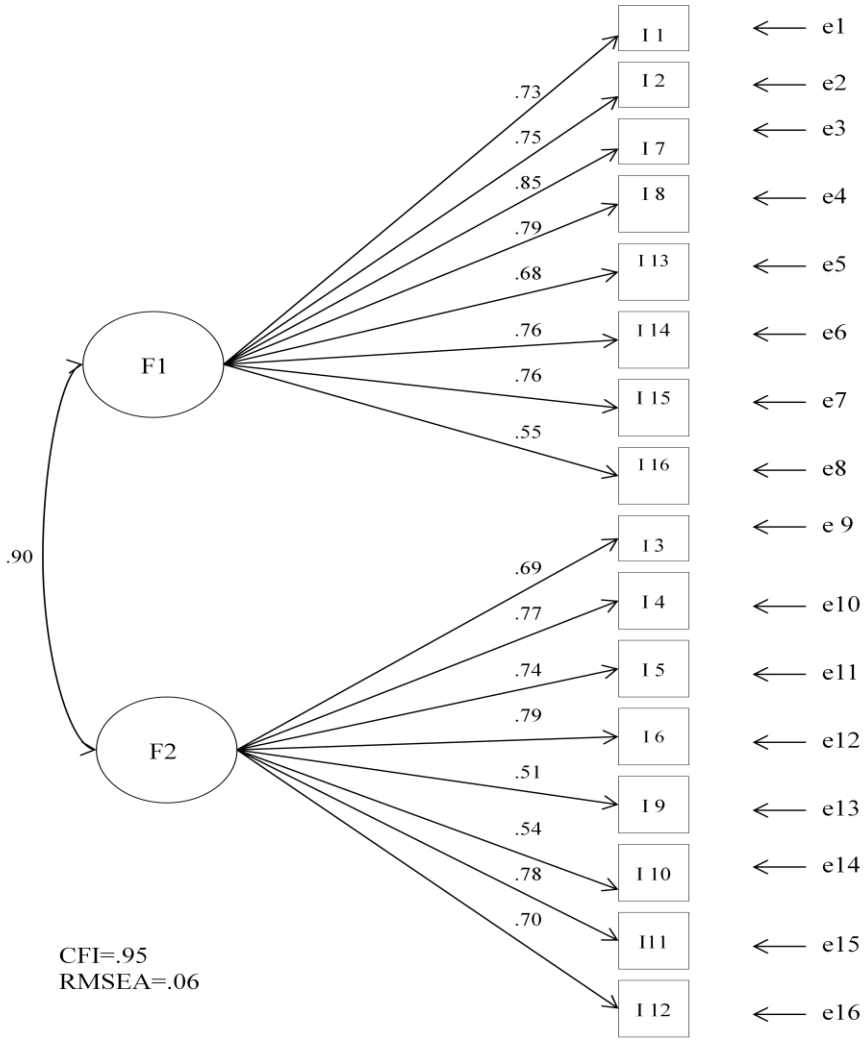
	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
	healthy snack choices regularly						
11	I can deal with pressure from other people in positive ways	184	3.39	1.07	-0.38	-0.20	0.73
12	I know what to do when things bother or upset me	185	3.56	1.10	-0.60	-0.11	0.62
13	I believe that my parents and family will help me to reach my goals	185	3.63	1.13	-0.59	-0.24	0.67
14	I am sure that I will feel better about myself if I exercise regularly	185	4.08	0.98	-1.26	1.61	0.71
15	I believe that being active is fun	185	4.06	0.99	-1.26	1.67	0.72
16	I am able to talk to my parents/family about things that bother or upset me	185	3.51	1.13	-0.53	-0.31	0.57

Table 8

EFA of Factor loadings for Health Lifestyle Beliefs Scale

	Items	Factor I	Factor II
14	I am sure that I will feel better about myself if I exercise regularly	.989	
2	I believe that exercise and being active will help me to feel better about myself	.927	
15	I believe that being active is fun	.868	
1	I am sure that I will do what is best to lead a healthy life	.724	
7	I believe that I can be more active	.580	
8	I am sure that I will do what is best to keep myself healthy	.485	
13	I believe that my parents and family will help me to reach my goals	.477	
16	I am able to talk to my parents/family about things that bother or upset me	.410	
12	I know what to do when things bother or upset me		.849
9	I am sure that I can spend less time watching TV		.728
5	I believe that I can reach the goals that I set for myself		.691
11	I can deal with pressure from other people in positive ways		.680
10	I know that I can make healthy snack choices regularly		.546
4	I know how to deal with things in a healthy way that bother me		.533
6	I am sure that I can handle my problems well		.510
3	I am certain that I will make healthy food choices		.436
Cronbach α		.91	.89
Total Cronbach α		.94	

Figure 6. CFA of Factor loadings for Health Lifestyle Beliefs Scale



Note. The correlated error between item 1 and item 2 was .42; the correlated error between item 1 and item 3 was .39; the correlated error between item 2 and item 3 was .29; the correlated error between item 3 and item 10 was .29; the correlated error between item 9 and item 10 was .35; the correlated error between item 13 and item 16 was .39; the correlated error between item 14 and item 15 was .42.

Perceived Difficulty Scale

The item means for the perceived difficulty scale ranged from 1.72 to 2.39 and the item-to-total correlations ranged from .57 to .78. The skewness and kurtosis for these items listed in Table 9. According to the KMO of sampling .88 and Bartlett's test of sphericity ($\chi^2 = 1228.42$, $p < .01$), the correlation matrix was appropriate for factor analysis. Although the scree plot suggested two-factors and parallel analysis suggested uni-dimensional structure. The two-factor solution, which accounted for 55% of total variance and parsimony, was retained. One item (i.e., "Cope/deal with stress") did not load on any factor. Consequently, this item was deleted. Six items loaded saliently on factor I, with an internal consistency of .87. Five items loaded saliently on factor II, with an internal consistency of .86. The factors were moderately correlated at .67. The Cronbach's α for the Perceived Difficulty Scale with Taiwanese adolescents ranged from .86 to .87 and the Cronbach's α of total scale was .91. (See Table 10).

A two-factor model was specified for the perceived difficulty items. The model did not perfectly fit the data, $\chi^2_{S\text{-}B}$ (N=184, df = 55) = 890.97, p<.01; however, it had adequate fit with *CFI* of .96 and marginal fit with *RMSEA* of .07, (with 90% *CI* between .05 to .10). The standardized loadings, which were significant, ranged between from .42 and .83 suggesting that the two-factor was indicative of perceived difficulty in engaging in healthy lifestyle behaviors. (See Figure 7).

Table 9

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Perceived Difficulty Scale

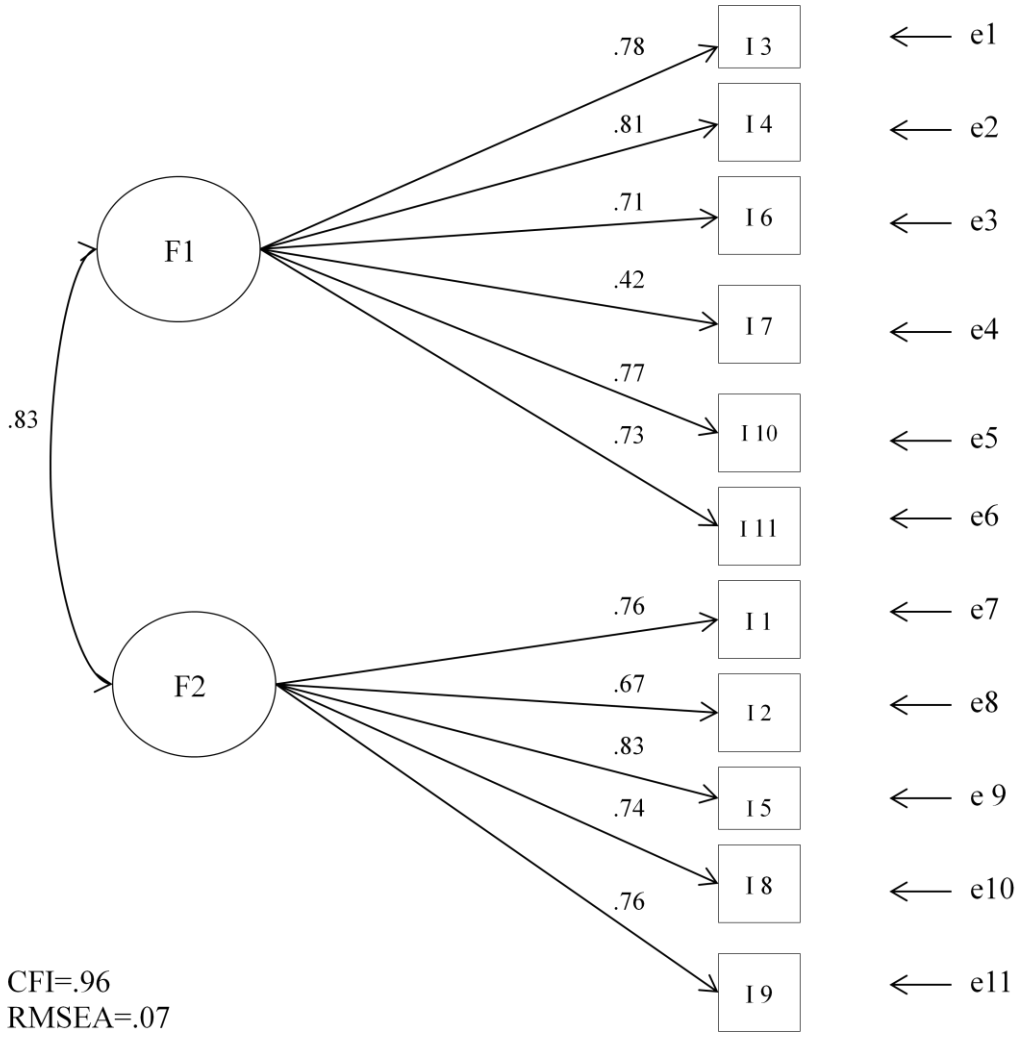
	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	Eat healthy	162	2.18	0.79	-0.33	-1.31	0.72
2	Not eat unhealthy foods that I like	120	2.35	0.76	-0.69	-0.95	0.66
3	Exercise regularly	148	2.09	0.84	-0.18	-1.55	0.63
4	Exercise instead of watching TV, relaxing, or using the computer	130	2.25	0.81	-0.49	-1.30	0.78
5	Buy healthy foods to eat	158	2.23	0.78	-0.42	-1.24	0.76
6	Find a safe place to exercise	174	1.89	0.76	0.20	-1.24	0.79
7	Have exercise equipment at home (for example, jump rope, weights, sneakers)	166	1.72	0.79	0.55	-1.17	0.57
8	Take the time to buy healthy foods	142	2.39	0.72	-0.76	-0.72	0.63
9	Take the time to help plan and prepare healthy meals	137	2.39	0.73	-0.75	-0.76	0.69
10	Take the time to exercise regularly	139	2.12	0.82	-0.23	-1.48	0.74
11	Take the time to plan an exercise schedule	133	2.32	0.78	-0.62	-1.09	0.76
12	Cope/Deal with stress	155	2.15	0.79	-0.28	-1.35	0.68

Table 10

EFA of Factor loadings for Perceived Difficulty Scale

	Items	Exercise	Healthy Eating
3	Exercise regularly	.948	
10	Take the time to exercise regularly	.853	
11	Take the time to plan an exercise schedule	.728	
6	Find a safe place to exercise	.616	
4	Exercise instead of watching TV, relaxing, or using the computer	.604	
7	Have exercise equipment at home (for example, jump rope, weights, sneakers)	.403	
8	Take the time to buy healthy foods		1.041
5	Buy healthy foods to eat		.591
9	Take the time to help plan and prepare healthy meals		.573
1	Eat healthy.		.535
2	Not eat unhealthy foods that I like		.514
Cronbach α		.87	.86
Total Cronbach α		.97	

Figure 7. CFA of Factor loadings for Perceived Difficulty Scale



Note. The correlated error between item 1 and item 4 was -.36; the correlated error between item 3 and item 10 was .37; the correlated error between item 6 and item 7 was .32; the correlated error between item 10 and item 11 was .45; the correlated error between item 9 and item 11 was .41.

Healthy Lifestyle Behaviors Scale

The item means for the healthy lifestyle behaviors scale ranged from 2.91 to 4.06 and the item-to-total correlations ranged from .43 to .70. The skewness and kurtosis for these items listed in Table 11. According to the KMO of .87 and Bartlett's test of sphericity ($\chi^2 = 1287.33$, $p < .01$), the correlation matrix was appropriate for factor analysis. Although the scree plot suggested two-factors and parallel analysis suggested uni-dimensional structure. The two-factor solution was problematic because only two items loaded saliently on factor II and five items did not loaded saliently. Consequently, the two-factor solution was rejected. The uni-dimensional structure met criteria. Sixteen items loaded saliently on factor, with an internal consistency of .90. The Cronbach's α for the Health Lifestyle Behaviors Scale with Taiwanese adolescents was .90. (See Table 12).

A one-factor model was specified for the healthy lifestyle behaviors items. The model did not perfectly fit the data, $\chi^2_{S\text{-}B}$ (N=185, df = 99) = 162.10, p<.01; however, it had adequate fit with *CFI* of .93 and marginal fit with *RMSEA* of .06, (with 90% *CI* between .04 to .08). The standardized loadings, which were significant, ranged between from .40 and .76, suggesting that the one-factor was indicative of healthy lifestyle behaviors. (See Figure 8).

Table 11

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Healthy Lifestyle Behaviors Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	I make healthy food choices	185	3.62	0.90	-0.38	0.00	0.70
2	I exercise on a regular basis	185	3.55	1.03	-0.20	-0.61	0.59
3	I exercise with my friends/parent	185	3.33	1.11	-0.26	-0.52	0.57
4	I limit television viewing and video game playing to 2 hours per day or less	185	2.91	1.22	0.10	-0.86	0.56
5	I eat fresh fruits and vegetable snacks.	185	3.83	0.97	-0.68	0.05	0.60
6	I say something positive to my Parent/friends every day	185	3.65	1.06	-0.63	0.01	0.57
7	I eat low-fat foods in my diet.	185	3.07	1.02	-0.08	-0.21	0.59
8	I drink only one sugared drink a day (for example, regular soda or juice)	185	3.45	1.22	-0.45	-0.65	0.43
9	I choose water as a beverage instead of a sugared drink at least once a day	185	4.06	1.04	-1.03	0.51	0.45
10	I set goals I can accomplish	185	3.81	0.93	-0.56	0.11	0.65
11	I eat at least three meals a week with my peers	185	3.91	1.26	-0.96	-0.10	0.43

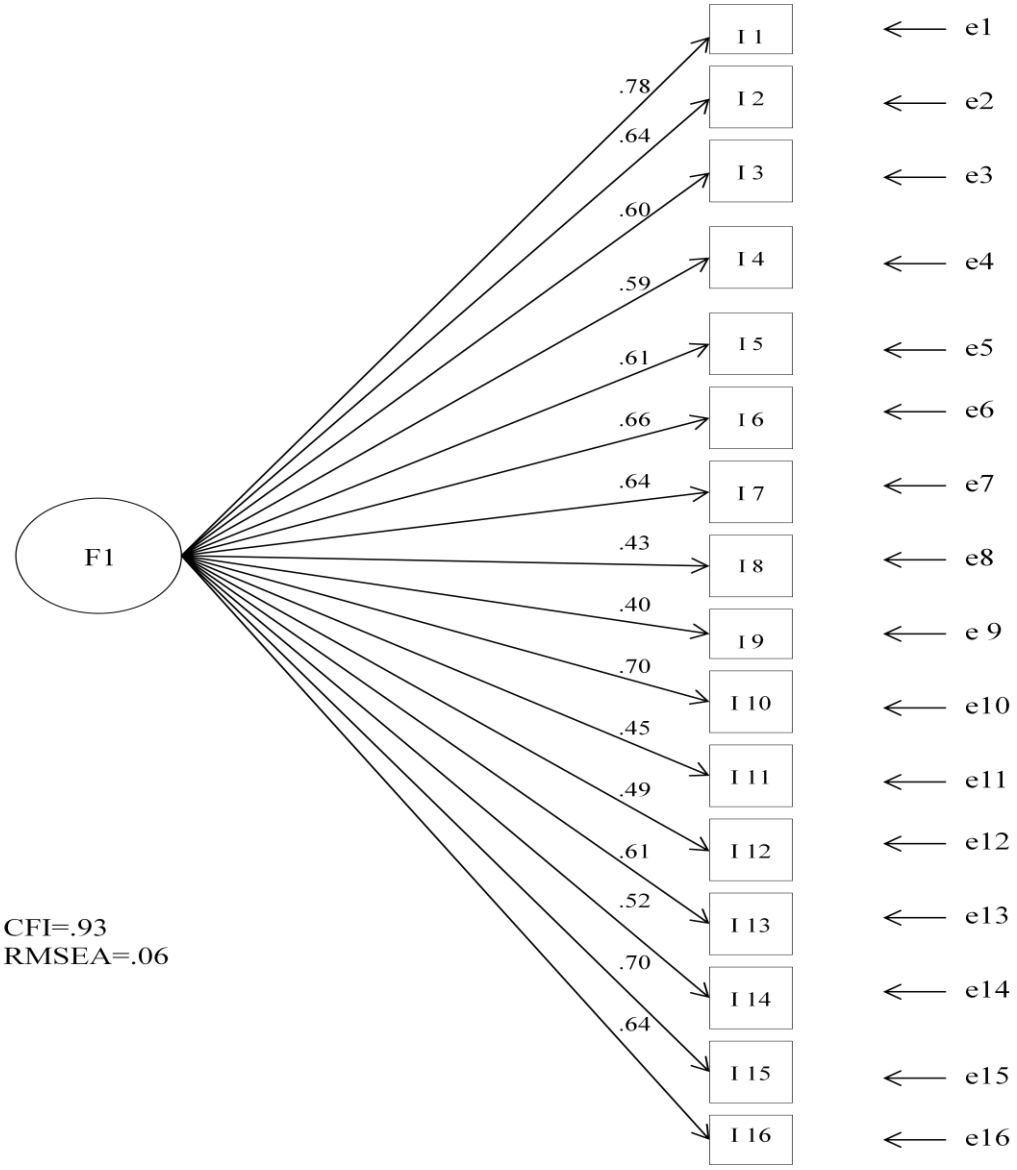
	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
12	I do not add salt to my foods	185	3.39	1.16	-0.40	-0.51	0.47
13	I eat broiled or baked foods instead of fried foods	185	3.33	0.95	-0.21	-0.03	0.59
14	I talk about my worries or stress every day	184	3.31	1.11	-0.23	-0.45	0.54
15	I do what I should do to lead a healthy life	183	4.05	0.98	-1.09	1.09	0.69
16	I do healthy things to cope/deal with my worries and stress	185	3.79	1.05	-0.76	0.14	0.66

Table 12

EFA of Factor loadings for Healthy Lifestyle Behaviors Scale

	Items	Factor I
1	I make healthy food choices	.757
15	I do what I should do to lead a healthy life	.740
16	I do healthy things to cope/deal with my worries and stress	.708
10	I set goals I can accomplish	.687
2	I exercise on a regular basis	.649
5	I eat fresh fruits and vegetable snacks	.623
7	I eat low-fat foods in my diet	.620
3	I exercise with my friends/parent	.618
13	I eat broiled or baked foods instead of fried foods	.618
6	I say something positive to my Parent/friends every day	.613
4	I limit television viewing and video game playing to 2 hours per day or less	.583
14	I talk about my worries or stress every day	.568
12	I do not add salt to my foods	.494
9	I choose water as a beverage instead of a sugared drink at least once a day	.457
11	I eat at least three meals a week with my peers	.447
8	I drink only one sugared drink a day (for example, regular soda or juice)	.436
Cronbach α		.90

Figure 8. CFA of Factor loadings for Healthy Lifestyle Behaviors scale



Note. The correlated error between item 2 and item 3 was .53; the correlated error between item 8 and item 9 was .38; the correlated error between item 9 and item 15 was .29; the correlated error between item 14 and item 16 was .36; the correlated error between item 15 and item 16 was .37.

Nutrition Knowledge Scale

The item means for the nutrition knowledge scale ranged from .26 to .83 and the item-to-total correlations ranged from -.04 to .64. The skewness and kurtosis for these items listed in Table 13. Nutrition knowledge scale was a binary scale so *MPlus* was used for conducting exploratory factor analysis in order to retain an appropriate the tetrachoric correlation matrix. Although the scree plot suggested three-factor, parallel analysis suggested two-factor, and theoretical suggested one-factor. Only one item loaded on factor III for three-factor solution and none of items loaded on factor II for three-factor solution. Consequently, these two solutions were rejected. The one-factor solution, which was the internal consistency at .86, was retained. Six items did not load on any factor. Therefore, these items (i.e., "People need to drink 2 large glasses of milk per day (8 ounce glass)," "It is better to broil foods than fry them," "Consuming a lot of fruit juice can lead to cavities in your teeth," "The amount of salty food someone eats can cause high blood pressure," "One serving size of meat should be the size of a deck of cards," and "People eat more when they are bored than when are busy.") were deleted. The Cronbach's α for the Nutrition Knowledge Scale with Taiwanese adolescents was .86. (See Table 14).

A one-factor model was specified for the nutrition knowledge items. The model was perfectly fit for the data, $\chi^2_{S\text{-}B}$ (N=184, df = 170) = 393.53, p<.01; furthermore, it also had adequate fit with *CFI* of .95 and marginal fit

with *RMSEA* of .08. The standardized loadings, which were significant, ranged between from .50 and .97, suggesting that the one-factor was indicative of nutrition knowledge. (See Figure 9).

Table 13

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Nutrition Knowledge Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	People need to drink 2 large glasses of milk per day (8 ounce glass)	186	0.61	0.49	-0.47	-1.80	0.03
2	It is a good idea to have fruit juice at every meal	184	0.45	0.50	0.22	-1.97	0.41
3	Whole milk is healthier than skim milk.	184	0.35	0.48	0.62	-1.64	0.31
4	Ice cream is healthier for you than low fat frozen yogurt	184	0.76	0.43	-1.23	-0.49	0.65
5	Pretzels are higher in fat than potato chips	184	0.26	0.44	1.13	-0.73	0.19
6	French fries are a good vegetable choice	184	0.83	0.38	-1.74	1.02	0.60
7	It is better to broil foods than to fry them	186	0.59	.494	-0.35	-1.90	0.03
8	Eating chicken with skin on it is healthier than eating chicken without skin	184	0.57	0.50	-0.27	-1.95	0.40
9	A fruit rollup is a good fruit choice	183	0.61	0.49	-0.44	-1.83	0.44
10	It is a good thing to add salt to food	184	0.83	0.38	-1.74	1.02	0.55
11	Consuming a lot of fruit juice can lead to cavities in your teeth	186	0.50	0.50	0.00	-2.02	0.10
12	White bread has	183	0.61	0.49	-0.46	-1.81	0.46

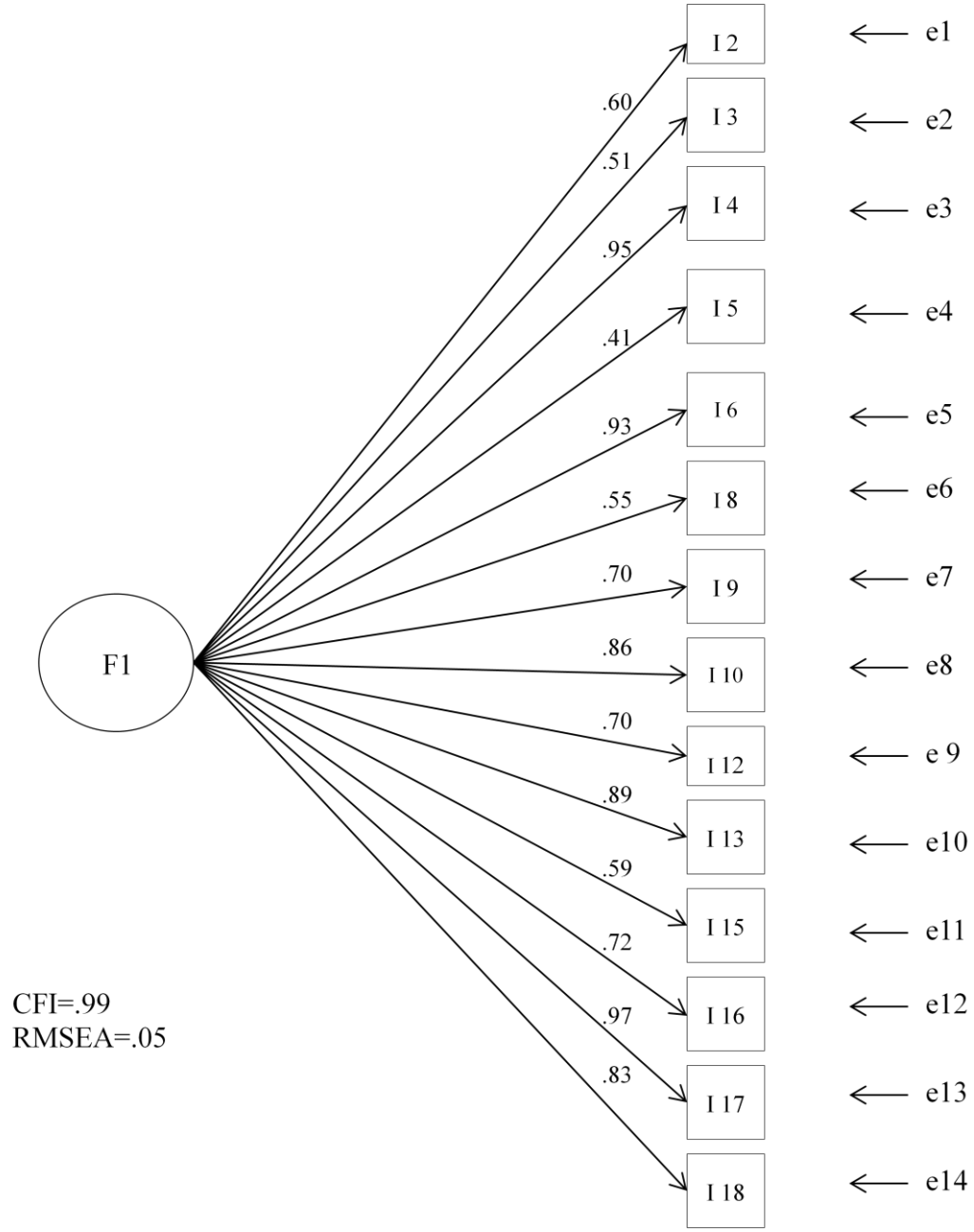
	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
	as much fiber in it as wheat bread						
13	Pop is just as good of a drink choice as carbonated bottled water	184	0.79	0.41	-1.46	0.14	0.60
14	The amount of salty food someone eats can cause high blood pressure	186	0.68	0.47	-0.79	-1.39	0.11
15	Fruit Loops are just as healthy as Raisin Bran cereal	183	0.41	0.49	0.37	-1.88	0.32
16	Canned soups have a healthy amount of salt in them	184	0.71	0.45	-0.94	-1.12	0.45
17	Dried soups (for example, Ramen noodles) are a healthy choice for lunch or snack	184	0.83	0.38	-1.79	1.20	0.64
18	Packaged peanut butter crackers are a better snack than yogurt	183	0.68	0.47	-0.79	-1.39	0.54
19	One serving size of meat should be the size of a deck of cards	186	0.39	0.49	0.44	-1.82	-0.04
20	People eat more when they are bored than when they are busy	186	0.78	0.42	-1.36	-0.15	0.16

Table 14

EFA of Factor loadings for Nutrition Knowledge Scale

	Items	Factor I
2	It is a good idea to have fruit juice at every meal	.601
3	Whole milk is healthier than skim milk.	.504
4	Ice cream is healthier for you than low fat frozen yogurt	.948
5	Pretzels are higher in fat than potato chips	.411
6	French fries are a good vegetable choice	.929
8	Eating chicken with skin on it is healthier than eating chicken without skin	.556
9	A fruit rollup is a good fruit choice	.696
10	It is a good thing to add salt to food	.861
12	White bread has as much fiber in it as wheat bread	.694
13	Pop is just as good of a drink choice as carbonated bottled water	.885
15	Fruit Loops are just as healthy as Raisin Bran cereal	.594
16	Canned soups have a healthy amount of salt in them	.722
17	Dried soups (for example, Ramen noodles) are a healthy choice for lunch or snack	.966
18	Packaged peanut butter crackers are a better snack than yogurt	.830
Cronbach α		.86

Figure 9. CFA of Factor loadings for Nutrition Knowledge Scale



Activity Knowledge Scale

The item means for the activity knowledge scale ranged from .23 to .95 and the item-to-total correlations ranged from .55 to .65. The skewness and kurtosis for these items listed in Table 15. Activity knowledge scale was a binary scale so *MPlus* was used for conducting exploratory factor analysis in order to retain an appropriate the tetrachoric correlation matrix. Although the scree plot suggested two-factor, parallel analysis suggested a three-factor, and theoretical suggested one-factor. Only one item loaded on three-factor solution. One item's factor loading was over than one and one item had cross-loading for two-factor solution. Therefore, two- and three- factor solutions were rejected. The uni-dimensional structure, which was the internal consistency at .70, was retained. Two items (i.e., "Running is better for you than walking" and "Being out of breath and dizzy when you exercise is a sign of a good workout") did not load on any factor so that these items were deleted. The Cronbach's α for the Physical Knowledge Scale with Taiwanese adolescents was .70. (See Table 16).

A one-factor model was specified for the activity knowledge items. The model did not perfectly fit the data, $\chi^2_{S\text{-}B}$ (N=176, df = 54) = 106.17, p<.01; moreover, it also did not have adequate fit with *CFI* of .90 and fit with *RMSEA* of .07. The standardized loadings, which were significant, ranged between from .44 and .82 suggesting that the one-factor was indicative of activity knowledge. (See Figure 10).

Table 15

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Activity Knowledge Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	Exercise helps to reduce stress	176	0.91	0.28	-3.10	7.06	0.58
2	People who are very active are healthier than people who are not	176	0.93	0.25	-3.46	10.06	0.56
3	Being active can give you more energy	176	0.86	0.34	-2.14	2.60	0.56
4	Being active can lower your blood pressure	176	0.74	0.44	-1.10	-0.81	0.55
5	Exercise can help to prevent diabetes	176	0.55	0.50	-0.21	-1.98	0.58
6	Regular exercise can make you feel happy	176	0.86	0.34	-2.14	2.60	0.57
7	Running is better for you than walking	176	0.23	0.42	1.27	-0.38	0.65
8	Dancing is exercise	175	0.93	0.26	-3.28	8.83	0.57
9	Being out of breath and dizzy when you exercise is a sign of a good workout	175	0.56	0.50	-0.24	-1.96	0.64
10	People who exercise 3 or more times each week burn more calories every day than people who do not	175	0.90	0.31	-2.64	5.01	0.57
11	Children whose parents exercise tend to be more active than children whose	176	0.57	0.50	-0.28	-1.95	0.60

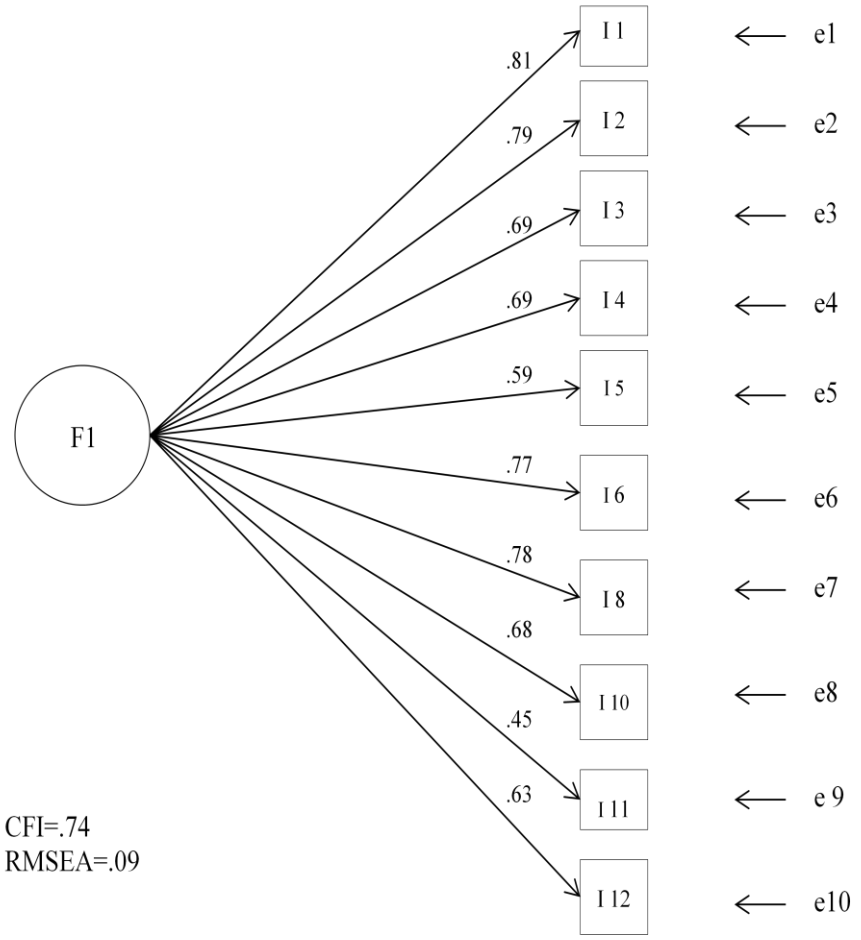
	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
	parents do not exercise						
12	It is good to stretch out and do some slow activities before exercise	176	0.95	0.22	-4.11	15.07	0.59

Table 16

EFA of Factor loadings for Activity Knowledge Scale

	Items	Factor I
1	Exercise helps to reduce stress	.815
2	People who are very active are healthier than people who are not	.790
3	Being active can give you more energy	.689
4	Being active can lower your blood pressure	.682
5	Exercise can help to prevent diabetes	.582
6	Regular exercise can make you feel happy	.778
8	Dancing is exercise	.775
10	People who exercise 3 or more times each week burn more calories every day than people who do not	.675
11	Children whose parents exercise tend to be more active than children whose parents do not exercise	.441
12	It is good to stretch out and do some slow activities before exercise	.632
Cronbach α		.70

Figure 10. CFA of Factor loadings for Activity Knowledge Scale



The psychometric table for each scale is listed in Table 17. For phase II, the study ignored factor analysis and used original questionnaires for the purpose of comparing the current to previous studies.

Table 17

Psychometric Property of Scales

Name of Scales	# of Items	Example Items	Internal Consistency
The Beck Youth Inventory			
(a) Self-Concept Scale	17	I feel strong	α= .93
(b) Depression Scale	20	I think that my life is bad	α= .95
(c) Anxiety Scale	20	My dreams scare me	α= .94
Healthy Lifestyle Beliefs Scale	16	I am sure that I will do what is best to lead a healthy life	α= .94
Perceived Difficulty Scale	11	Take the time to exercise regularly	α= .91
Healthy Lifestyle Behaviors Scale	16	I make healthy food choices	α= .90
Nutrition Knowledge Scale	12	French fries are a good vegetable choice	α= .86
Activity Knowledge Scale	8	Exercise helps to reduce stress	α= .70

Human Subject Protocols for Pilot and Primary Study

The pilot study was approved and conducted while the second phase was reviewed by the ASU and Taiwan school IRB. After IRB approval, the researcher contacted the school principals for permission to get samples. Once permission was obtained, the researcher explained the study's purpose and process to the staff and adolescents. Data collection was conducted by the researcher. Adolescents who met criteria were recruited and a meeting time was established for participants.

Recruitment, consent/assent. The researcher distributed written parental consent and student assent to interested students to obtain permission for participation in the study prior to data collection. If their parents/legal guardians had any questions and concerns, parents could contact the researcher. Contact information, such as e-mail and phone number, was provided by the verbal script to participants. During the first 10 minutes of class, the researcher introduced the study and students could ask questions about the study. Students were asked to complete written assent forms. After written assent and parental assent were obtained, the researcher passed out the questionnaire and collected data during the class time.

Human subjects' rights were protected as explained in the consent and assent forms used for the study. Participants were informed that they could choose not to answer any questions on the measures, and they could choose to withdraw from the study at any time. To assure confidentiality, participants'

names only appeared on the consent form and there was no way to connect their names to the questionnaires. All assent and consent forms were locked in a secure cabinet.

Data Analytic Approach for Primary Study

The path model, which is a form of regression modeling, was used to test a model predicting BMI in Taiwanese adolescents for primary study. It should be noted that caution should be used in making causal inferences because the data were collected at one point in time. The model, based on cognitive behavioral theory, looked at the relationship of cognitive variables (physical and nutrition knowledge, healthy lifestyle beliefs, and perceived difficulty) on healthy lifestyle behaviors and physical activity and the impact of lifestyle behaviors and physical activity on BMI. In addition, depression, anxiety, self-concept and gender were examined as possible moderators of the relationship between health lifestyle behaviors and BMI.

The path model was analyzed with *Mplus* version 5.21software (Muthén, and Muthén, 1998 -2009). If the variables were normally distributed, then maximum likelihood (ML) estimation procedure was used to compute the coefficients in the path model. If they were non-normally distributed, then the path model could be conducted on polychoric correlations with the partition maximum likelihood approach (Lee, Poon, and Bentler, 1995).

Evaluating Model Fit in Path Model

Model fit was assessed with the chi-square test and with two approximate fit indices. Model chi-square test evaluates the null hypothesis and whether the model fits perfectly in the population. If the null hypothesis is rejected, it implies that covariance matrix based on the model does not perfectly reproduce the population the covariance matrix. Simply, if the model perfectly fits the data, then we would expect a non-significant chi-square (Kline, 2011). However, the chi-square can be affected by: (a) multivariate non-normality, (b) correlation size which indicates bigger correlations will lead to higher values of chi-square for incorrect model, (c) high proportions of unique variance results in loss of power, and (e) large sample size (Kline, 2011).

In addition to reporting the chi-square, two approximate fit indexes were used to assess the model-fit: root mean square error of approximation (*RMSEA*) and comparative fit index (*CFI*). In addition, the 90% confidence intervals around the *RMSEA* were be reported (Steiger, 1990). *RMSEA* examines model fit in relations to its degrees of freedom. However, one of the limitations for *RMSEA* is that it is sensitive to the level of model complexity because *RMSEA* assesses the model-fit in relation of its degrees of freedom (Steiger & Lind, 1980). A number of authors suggest that *RMSEA* of .05 or lower represents close fit of the model to the data, .05 and .08 represents fair fit, .08 and .10 indicate mediocre fit, and values greater than .10 suggests poor

fit (Browne & Cudeck, 1993; Browne & Mels, 1990; MacCallum, Browne, & Sugawara, 1996; Steiger, 1989).

The *CFI* measures the relative improvement in the fit of researcher's model over that of the baseline model (Bentler, 1990). *CFI* ranges from 0-1 and Hu and Benler (1999) suggested $CFI \geq .95$ indicates acceptable fit. The *CFI* has been criticized because the assumption of the baseline model zero covariances among the observed variables is not very likely to occur in practice (Kline, 2011).

For the path model, the researcher reported the direct effects, indirect effects (i.e., mediation), total direct effects, and interaction (i.e., moderator). The direct effects consisted of the standardized regression coefficients. The Sobel test was used to determine the influence of a mediator on an outcome and the indirect effects was calculated by taking the products of their comprised direct effects. Magnitude of effects was judged as small, medium and large effects had standardized regression coefficients around .10, .30, or .50, respectively (Cohen, 1988).

Interaction terms were computed by taking the cross-product of two predictors. Before the cross-product terms were computed, each predictor was centered by subtracting its mean from the raw scores. This was done to prevent induced collinearity among the predictors and their cross-product (Cohen, Cohen, West, & Aiken, 2003).

Missing Data

Full information maximum likelihood (FIML) was used for dealing with missing data in this study. M*plus* version 5.21 has a default procedure to deal with missing data, which are handled with FIML (Muthén, and Muthén, 1998 -2009). Two advantages of FIML for dealing with missing data are: (a) the imputation procedure and the analysis are conducted simultaneously and (b) FIML has a good ability to estimate accurate standard errors and confidence intervals by retaining sample size (Schlomer, Bauman, & Card, 2010).

Limitation of Study

This study used a convenience sample and was a cross-sectional study, therefore, casual inference cannot be made. Therefore, findings of this study can be not generalized to the population of Taiwanese adolescents.

Chapter 4

RESULTS OF THE PRIMARY STUDY

Sample

The total sample for the primary study was 453 participants. The sample included 47.5% (n=215) males, and 52.5% (n= 238) females whose mean age was 13.42 years (*SD*= .64). The mean and standard deviation of the BMI were 20.78 and 4.30, respectively. The range, mean, and standard deviation of variables are listed in Table 18.

Table 18

Descriptive Statistics for Sample Demographics and Variables (N=453)

	N (%)	*Range*	*Min*	*Max*	*M(SD)*
Activity Knowledge	444	0-12	0	12	8.43 (2.02)
Nutrition Knowledge	433	0-20	0	20	11.79 (3.57)
Healthy Lifestyle Beliefs	384	16-80	16	80	62.25 (9.52)
Perceived Difficulty	433	10-50	12	60	28.27 (8.85)
Healthy Lifestyle Behaviors	418	16-80	15	75	56.74 (9.38)
Physical Activity	451	0-7	0	7	3.50 (1.80)
Depression	432	0-60	0	47	10.19 (9.50)
Anxiety	430	0-60	0	52	12.36 (9.87)
Self-Concept	423	0-60	0	60	33.25 (12.44)
BMI	453		12.8	40.4	20.78 (4.30)
Age	453	13-15	13	15	13.42 (.64)
13 (%)	299 (66.0)				

		N (%)	*Range*	*Min*	*Max*	*M(SD)*
	14 (%)	116 (25.6)				
	15 (%)	38 (8.4)				
			n		%	
Gender						
	Female		238		52.5	
	Male		215		47.5	

Results of Measurement Model for Primary Study

The Beck Youth Inventory

Self-Concept Scale. The item means for the self-concept scale ranged from 1.08 to 2.26 and the item-to-total correlations ranged from .49 to .77. The skewness and kurtosis for these items listed in Table 19. A three-factor model was specified for the self-concept items. The chi-square goodness-of-fit test revealed a lack of perfect fit in the population, $\chi^2_{S\text{-}B}$ (N=452, df =106) =203.68, p<.01(Hu & Bentler, 1999). Nevertheless, the comparative fit index of .97 showed that the model adequately reproduced the covariances among the 17 items, while the root mean square error of approximation of .05, with 90% *CI* of .04 to .05, suggested that the fit was between mediocre and fair. The standardized factor loadings that ranged from .05 to .82 were all significant at the .05 level, suggesting that factor, self-concept scale, represented self-concept. (See Figure 11). The factors were correlated: Factor I and Factor II at .84, Factor I and Factor III at .77, and Factor II and Factor III at .89.

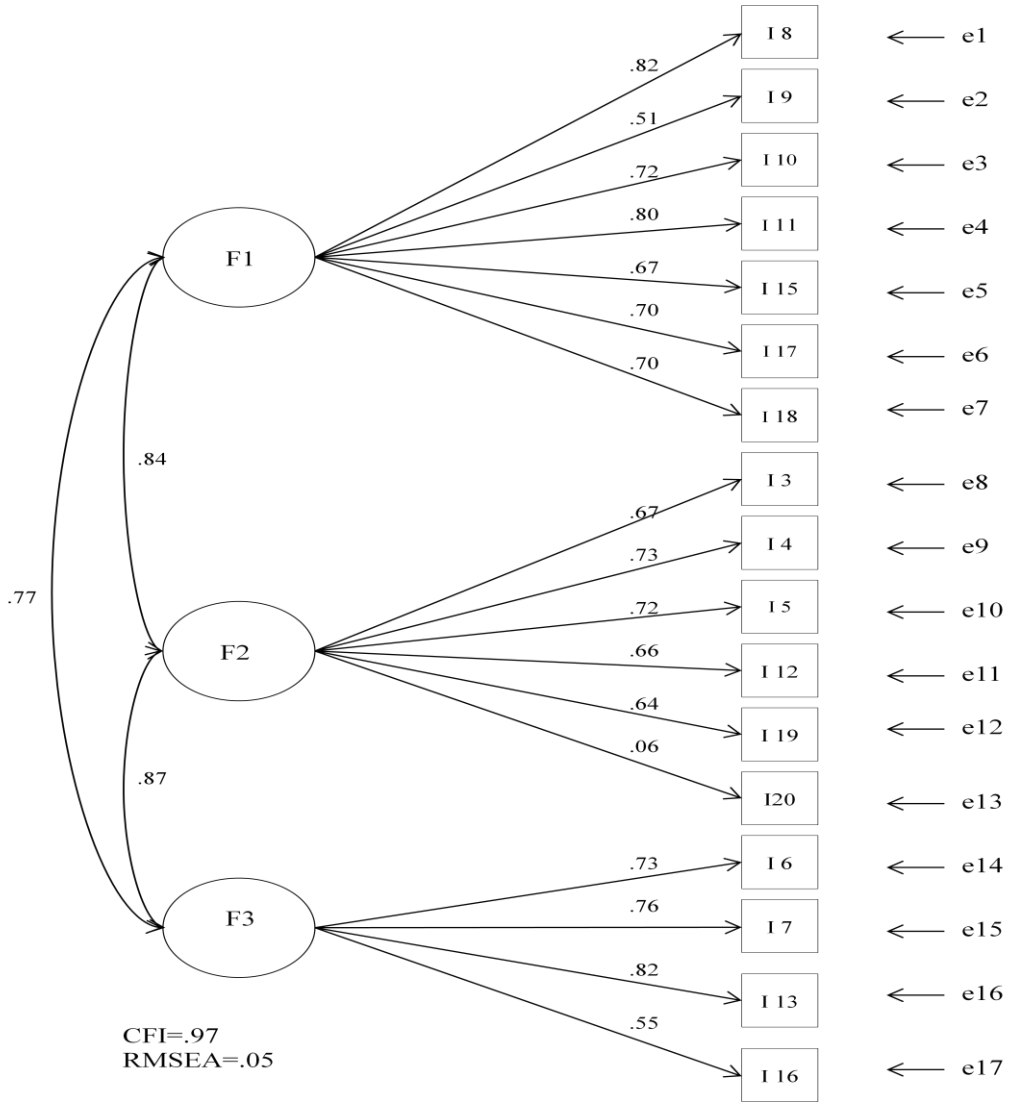
Table 19

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Self-Concept Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	I work hard	443	1.74	0.86	-0.11	-0.72	0.51
2	I feel strong	451	1.57	0.97	0.08	-1.00	0.61
3	I like myself	452	1.92	0.98	-0.36	-1.07	0.67
4	People want to be with me	451	1.68	0.91	-0.10	-0.84	0.67
5	I am just as good as the other kids	452	1.63	0.98	0.03	-1.08	0.65
6	I feel normal	452	2.23	0.97	-0.99	-0.21	0.66
7	I am a good person	453	2.01	0.92	-0.52	-0.73	0.66
8	I do things well	451	1.51	0.82	0.25	-0.53	0.77
9	I can do things without help	453	1.08	0.82	0.51	-0.12	0.45
10	I feel smart	452	1.15	0.96	0.48	-0.71	0.63
11	People think I'm good at things	452	1.34	0.92	0.36	-0.68	0.70
12	I am kind to others	451	1.90	0.89	-0.30	-0.79	0.62
13	I feel like a nice person	452	1.79	1.00	-0.27	-1.05	0.74
14	I am good at telling jokes	450	1.17	1.01	0.49	-0.83	0.49
15	I am good at rememberin g things	452	1.42	0.89	0.25	-0.68	0.59
16	I tell the truth	452	1.85	0.78	-0.23	-0.42	0.53

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
17	I feel proud of the things I do	451	1.43	0.96	0.25	-0.90	0.65
18	I am a good thinker	451	1.51	0.92	0.15	-0.82	0.65
19	I like my body	452	1.91	1.03	-0.40	-1.11	0.65
20	I am happy to be me	452	2.26	0.97	-1.02	-0.18	0.64

Figure 11. CFA of Factor loadings for Self-Concept Scale



Note. The correlated error between item 3 and item 6 was .28; the correlated error between item 3 and item 19 was .26; the correlated error between item 5 and item 12 was -.17; the correlated error between item 5 and item 6 was .28; the correlated error between item 6 and item 19 was .22; the correlated error between item 7 and item 12 was .32; the correlated error between item 8 and item 15 was -.25; the correlated error between item 12 and item 13 was .30; the correlated error between item 17 and item 18 was .26.

Depression Scale. The item means for the depression scale ranged from .29 to .77 and the item-to-total correlations ranged from .38 to .75. The skewness and kurtosis for these items listed in Table 20. A two-factor model was specified for the depression items. The Satorra-Bentler chi-square goodness-of-fit test revealed a lack of perfect fit in the population, $\chi^2_{S\text{-}B}$ (N=453, df =166) =32.35, p<.01. Nevertheless, the comparative fit index of .95 showed that the model adequately reproduced the covariances among the 20 items, while the root mean square error of approximation of .05, with 90% *CI* of .04 to .05, suggested that the fit was between mediocre and fair. The standardized factor loadings that ranged from .39 to .79 were all significant at the .05 level, suggesting that factor, depression scale, represented depression. (See Figure 12). The inter factor correlation was .89.

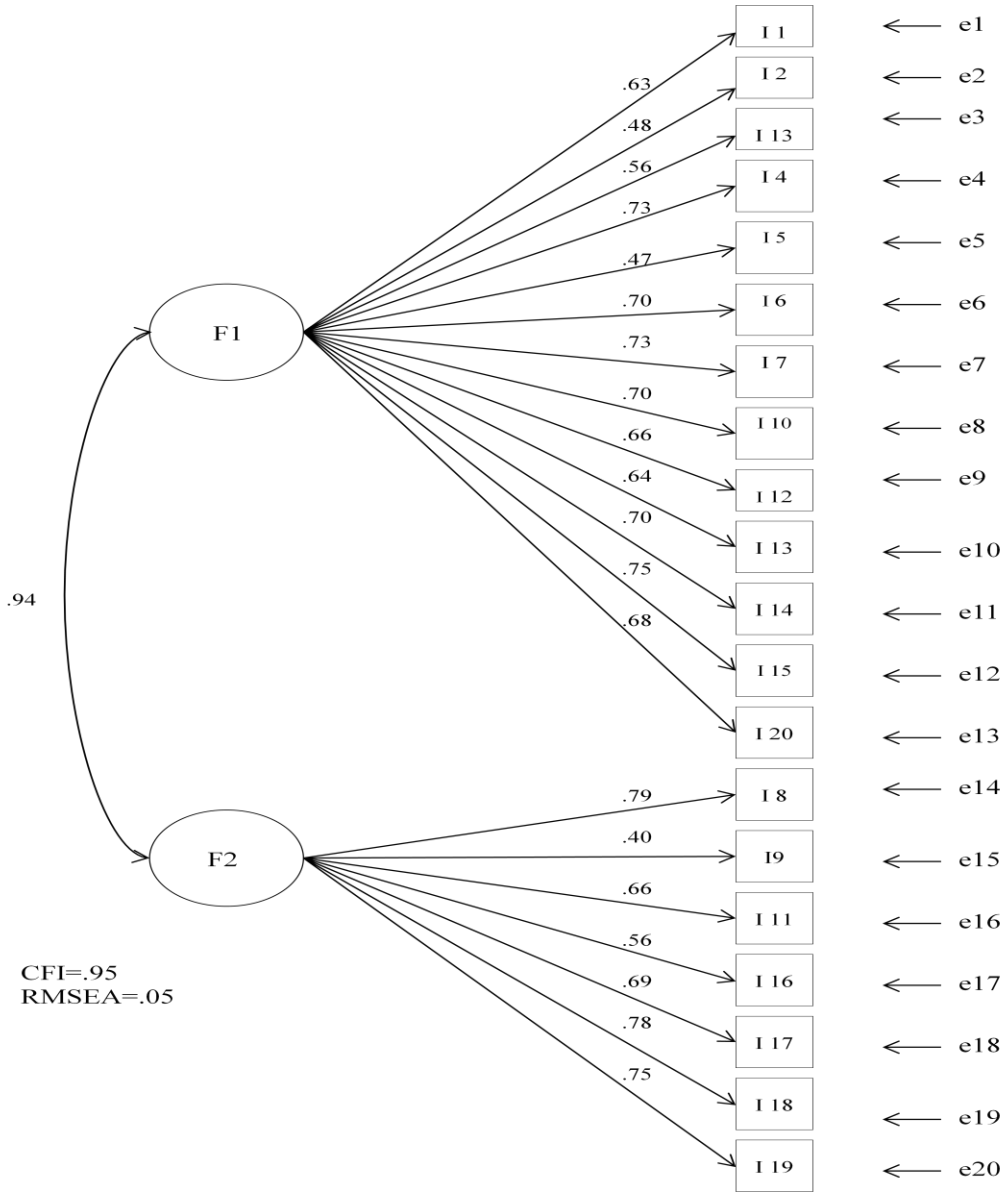
Table 20

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Depression Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	I think my life is bad	452	0.65	0.66	0.70	0.25	0.62
2	I have trouble doing things	451	0.29	0.52	1.80	3.54	0.47
3	I feel that I am a bad person	451	0.36	0.57	1.39	1.34	0.52
4	I wish I were dead	451	0.37	0.70	2.13	4.37	0.70
5	I have trouble sleeping	452	0.35	0.63	1.86	3.18	0.48
6	I feel no one loves me	453	0.36	0.62	1.88	3.63	0.68
7	I think bad things happen because of me	453	0.53	0.73	1.35	1.46	0.70
8	I feel lonely	453	0.73	0.81	1.04	0.66	0.75
9	My stomach hurts	451	0.47	0.68	1.32	1.27	0.38
10	I feel like bad things happen to me	451	0.71	0.74	0.92	0.65	0.68
11	I feel like I am stupid	453	0.77	0.84	1.02	0.55	0.62
12	I feel sorry for myself	453	0.51	0.72	1.40	1.67	0.64
13	I think I do things badly	448	0.73	0.75	0.98	0.98	0.64
14	I feel bad about what I do	451	0.46	0.66	1.49	2.35	0.67
15	I hate myself	452	0.31	0.67	2.43	5.73	0.71
16	I want to be alone	452	0.61	0.85	1.41	1.33	0.55
17	I feel like crying	453	0.62	0.75	1.17	1.10	0.66

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
18	I feel sad	453	0.55	0.73	1.34	1.62	0.75
19	I feel empty inside	452	0.56	0.74	1.36	1.73	0.73
20	I think my life will be bad	452	0.39	0.70	1.97	3.77	0.66

Figure 12. CFA of Factor loadings for Depression Scale



Note. The correlated error between item 8 and item 19 was .36; the correlated error between item 13 and item 14 was .21; the correlated error between item 17 and item 18 was .57.

Anxiety Scale. The item means for the anxiety scale ranged from .26 to 1.42 and the item-to-total correlations ranged from .49 to .74. The skewness and kurtosis for these items listed in Table 21. A two-factor model was specified for the anxiety items. The Satorra-Bentler chi-square goodness-of-fit test revealed a lack of perfect fit in the population, $\chi^2_{S\text{-}B}$ (*N*=453, *df*=162)=320.88, *p*<.01. Nevertheless, the comparative fit index of .94 showed that the model adequately reproduced the covariances among the 20 items, while the root mean square error of approximation of .05, with 90% *CI* of .04 to .05, suggested that the fit was between mediocre and fair. The standardized factor loadings that ranged from .51 to .73 were all significant at the .05 level, suggesting that factor, anxiety scale, represented anxiety. (See Figure 13). The inter factor correlation was .80.

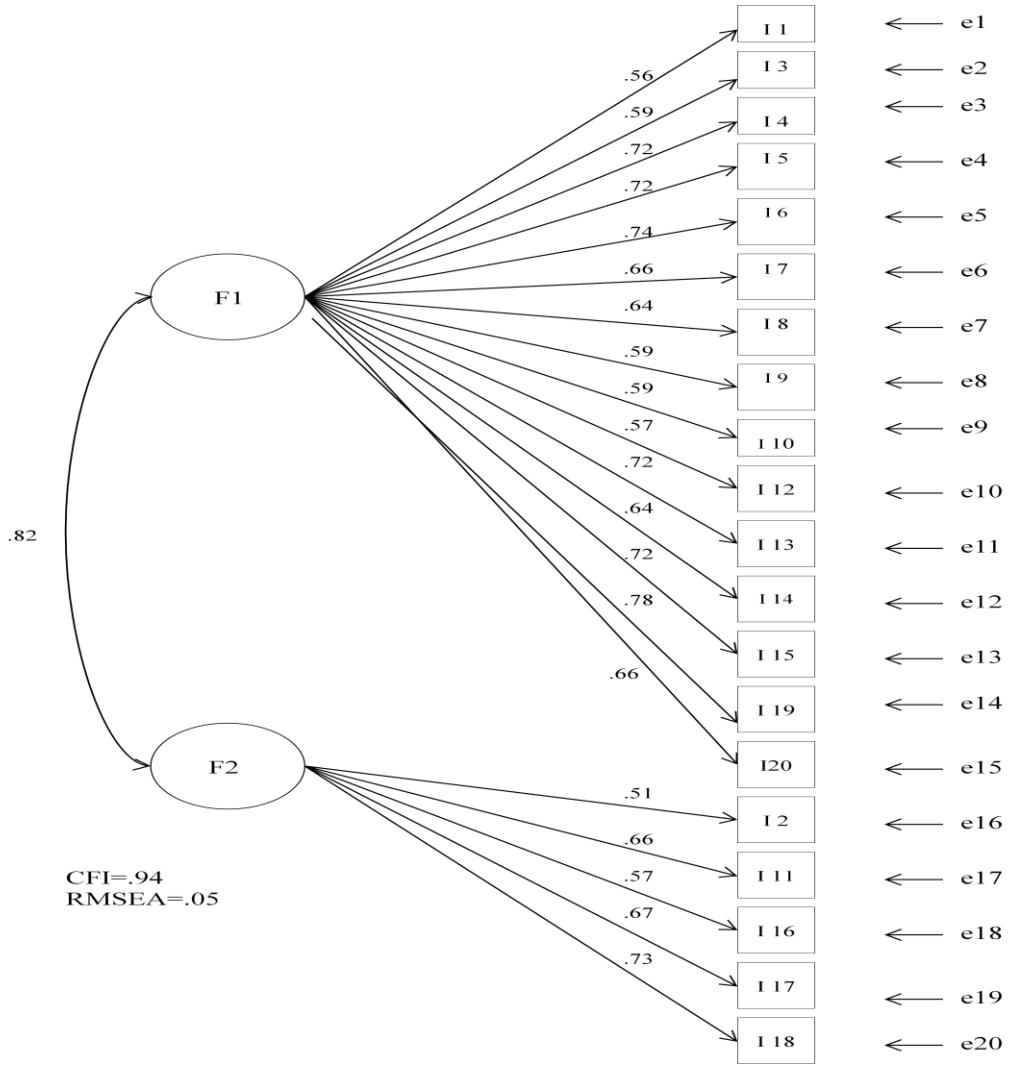
Table 21

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Anxiety Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	I worry someone might hurt me at school	445	0.45	0.69	1.60	2.50	0.59
2	My dreams scare me	453	0.64	0.62	0.59	0.30	0.49
3	I worry when I am at school	452	0.48	0.68	1.46	2.16	0.62
4	I think about scary things	453	0.68	0.78	1.07	0.86	0.73
5	I worry people might tease me	451	0.77	0.80	0.89	0.33	0.69
6	I am afraid that I will make mistakes	451	1.01	0.80	0.65	0.19	0.70
7	I get nervous	453	1.02	0.82	0.61	0.01	0.63
8	I am afraid I might get hurt	450	0.48	0.67	1.42	2.12	0.65
9	I worry I might get bad grades	453	1.42	0.94	0.23	-0.84	0.58
10	I worry about the future	452	0.94	0.94	0.77	-0.30	0.58
11	My hands shake	452	0.36	0.60	1.83	3.82	0.55
12	I worry I might go crazy	452	0.26	0.61	2.71	7.53	0.57
13	I worry people might get mad at me	452	0.77	0.85	1.00	0.42	0.69
14	I worry I might lose control	453	0.49	0.81	1.68	2.15	0.61
15	I worry	452	0.51	0.74	1.40	1.40	0.69
16	I have problems sleeping	453	0.32	0.64	2.28	5.27	0.54
17	My heart pounds	451	0.38	0.57	1.41	2.20	0.56
18	I get shaky	452	0.30	0.57	2.10	5.01	0.60
19	I am afraid that something bad might happen to	452	0.63	0.82	1.32	1.25	0.74

	me						
20	I am afraid that I might get sick	453	0.51	0.76	1.56	2.11	0.65

Figure 13.CFA of Factor loadings for Anxiety Scale



Note. The correlated error between item 1 and item 3 was .33; the correlated error between item 1 and item 8 was .55; the correlated error between item 2 and item 4 was .29; the correlated error between item 3 and item 4 was .22; the correlated error between item 3 and item 8 was .24; the correlated error between item 9 and item 10 was .31; the correlated error between item 12 and item 14 was .21.

Healthy Lifestyle Beliefs Scale

The item means for the healthy lifestyle beliefs scale ranged from 3.27 to 4.29 and the item-to-total correlations ranged from .37 to .66. The skewness and kurtosis for these items listed in Table 22. A two-factor model was specified for the health lifestyle beliefs items. The model did not perfectly fit the data, $\chi^2_{S\text{-}B}$ (N=453, df = 120) = 2394.12, p<.01; however, it had adequate fit with *CFI* of .96 and fit with *RMSEA* of .04, (with 90% *CI* between .03 to .05). The standardized loadings, which were significant, ranged between from .38 and .74 suggesting that the two-factor was indicative of healthy lifestyle beliefs (see Figure 14). The inter factor correlation was .90.

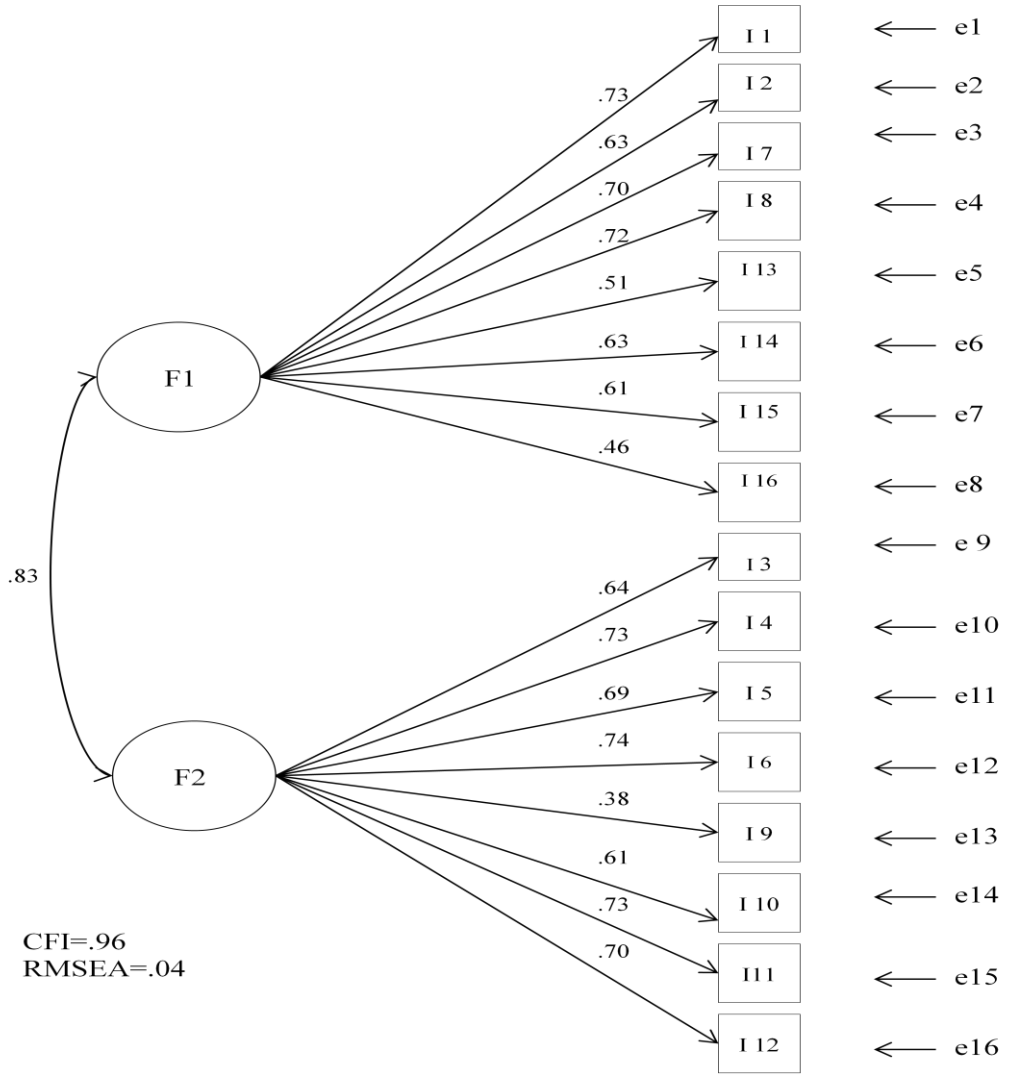
Table 22

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Health Lifestyle Beliefs Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	I am sure that I will do what is best to lead a healthy life	410	4.26	0.77	-0.90	1.01	0.66
2	I believe that exercise and being active will help me to feel better about myself	449	4.31	0.80	-1.04	0.86	0.57
3	I am certain that I will make healthy food choices	451	3.83	0.85	-0.16	-0.55	0.62
4	I know how to deal with things in a healthy way that bother me	449	3.78	0.90	-0.41	0.18	0.66
5	I believe that I can reach the goals that I set for myself	448	3.81	0.87	-0.45	0.18	0.59
6	I am sure that I can handle my problems well	451	3.84	0.86	-0.53	0.63	0.63
7	I believe that I can be more active	453	4.16	0.87	-1.22	2.20	0.60
8	I am sure that I will do what is best to keep myself healthy	453	4.25	0.76	-0.72	0.14	0.66
9	I am sure that I can spend less time watching TV	449	3.27	1.05	-0.17	-0.19	0.37
10	I know that I can make	450	3.53	0.94	-0.16	-0.11	0.60

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
	healthy snack choices regularly						
11	I can deal with pressure from other people in positive ways	451	3.61	0.99	-0.40	0.05	0.64
12	I know what to do when things bother or upset me	451	3.59	1.01	-0.50	0.04	0.63
13	I believe that my parents and family will help me to reach my goals	452	3.85	1.07	-0.81	0.08	0.54
14	I am sure that I will feel better about myself if I exercise regularly	451	4.24	0.87	-1.21	1.55	0.61
15	I believe that being active is fun	450	4.29	0.85	-1.44	2.40	0.57
16	I am able to talk to my parents/family about things that bother or upset me	453	3.50	1.22	-0.44	-0.63	0.52

Figure 14. CFA of Factor loadings for Health Lifestyle Beliefs Scale



Note. The correlated error between item 1 and item 3 was .20; the correlated error between item 2 and item 3 was .11; the correlated error between item 2 and item 15 was .23; the correlated error between item 2 and item 14 was .37; the correlated error between item 3 and item 10 was .32; the correlated error between item 9 and item 10 was .23; the correlated error between item 13 and item 16 was .41; the correlated error between item 14 and item 15 was .46.

Perceived Difficulty Scale

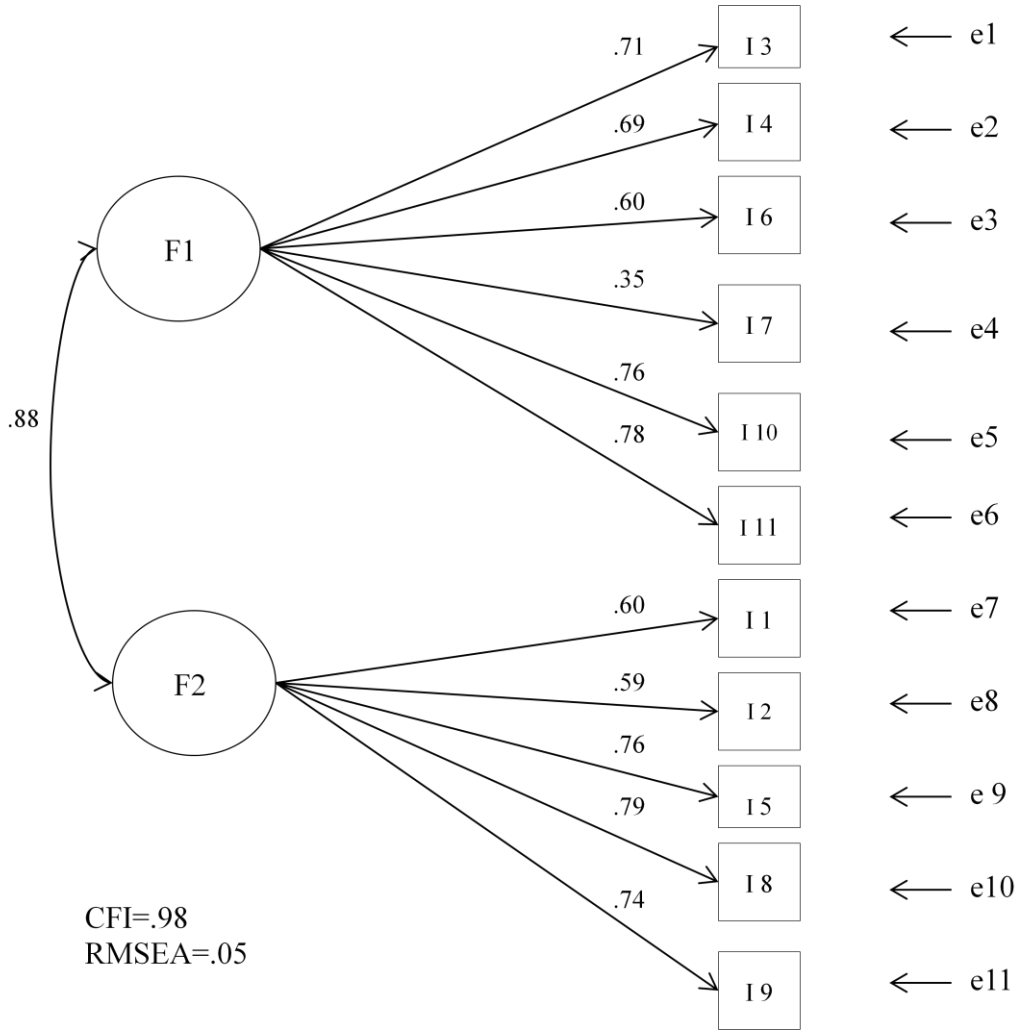
The item means for the perceived difficulty scale ranged from 1.71 to 2.91 and the item-to-total correlations ranged from .37 to .73. The skewness and kurtosis for these items listed in Table 23. A two-factor model was specified for the perceived difficulty items. The model did not perfectly fit the data, $\chi^2_{S\text{-}B}$ (N=452, df = 35) = 76.40, p<.01; however, it had adequate fit with *CFI* of .98 and marginal fit with *RMSEA* of .05, (with 90% *CI* between .04 to .07). The standardized loadings, which were significant, ranged between from .35 and .79 suggesting that the two-factor was indicative of perceived difficulty in engaging in healthy lifestyle behaviors. (See Figure 15). The inter factor correlation was .83.

Table 23

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Perceived Difficulty Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	Eat healthy.	451	2.16	0.90	0.43	-0.24	0.61
2	Not eat unhealthy foods that I like	449	2.91	1.08	0.05	-0.42	0.56
3	Exercise regularly	444	2.22	1.09	0.60	-0.32	0.66
4	Exercise instead of watching TV, relaxing, or using the computer	449	2.63	1.14	0.23	-0.68	0.63
5	Buy healthy foods to eat	451	2.28	1.00	0.52	-0.18	0.67
6	Find a safe place to exercise	451	1.71	0.86	1.28	1.65	0.60
7	Have exercise equipment at home (for example, jump rope, weights, sneakers)	452	1.71	1.06	1.63	2.00	0.37
8	Take the time to buy healthy foods	452	2.66	1.01	0.14	-0.39	0.66
9	Take the time to help plan and prepare healthy meals	453	2.69	1.08	0.22	-0.49	0.73
10	Take the time to exercise regularly	453	2.31	1.15	0.56	-0.54	0.73
11	Take the time to plan an exercise schedule	453	2.71	1.20	0.21	-0.82	0.73
12	Cope/Deal with stress	453	2.37	1.16	0.58	-0.41	0.53

Figure 15. CFA of Factor loadings for Perceived Difficulty Scale



Note. The correlated error between item 1 and item 2 was .18; the correlated error between item 1 and item 3 was .18; the correlated error between item 1 and item 5 was .18; the correlated error between item 3 and item 10 was .44; the correlated error between item 6 and item 7 was .30; the correlated error between item 8 and item 9 was .21; the correlated error between item 9 and item 11 was .32; the correlated error between item 10 and item 11 was .29.

Healthy Lifestyle Behaviors Scale

The item means for the healthy lifestyle behaviors scale ranged from 3.12 to 4.28 and the item-to-total correlations ranged from .40 to .64. The skewness and kurtosis for these items listed in Table 24. A one-factor model was specified for the healthy lifestyle behaviors items. The model did not perfectly fit the data, $\chi^2_{S\text{-}B}$ (N=453, df = 95) = 182.86, p<.01; however, it had adequate fit with *CFI* of .95 and marginal fit with *RMSEA* of .05, (with 90% *CI* between .04 to .06). The standardized loadings, which were significant, ranged between from .44 and .69 suggesting that the one-factor was indicative of healthy lifestyle behaviors. (See Figure 16).

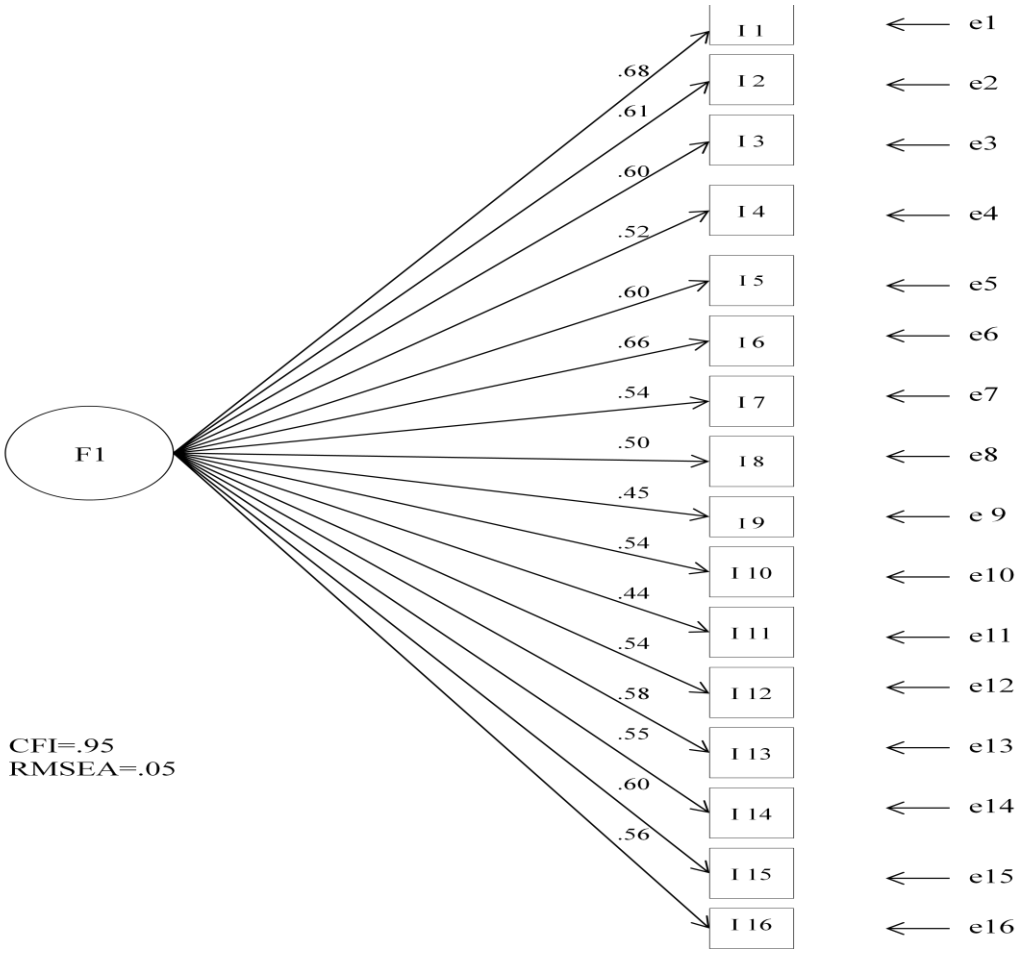
Table 24

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Healthy Lifestyle Behaviors Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	I make healthy food choices	436	3.84	0.90	-0.36	-0.21	0.64
2	I exercise on a regular basis	453	3.79	1.00	-0.58	-0.01	0.59
3	I exercise with my friends/parent	450	3.46	1.15	-0.37	-0.50	0.57
4	I limit television viewing and video game playing to 2 hours per day or less	451	3.12	1.26	-0.15	-0.84	0.51
5	I eat fresh fruits and vegetable snacks.	451	3.92	0.93	-0.65	0.07	0.53
6	I say something positive to my Parent/friends every day	453	3.71	1.02	-0.61	0.12	0.62
7	I eat low-fat foods in my diet.	453	3.20	0.92	0.04	0.44	0.54
8	I drink only one sugared drink a day (for example, regular soda or juice)	453	3.55	1.20	-0.43	-0.69	0.48
9	I choose water as a beverage instead of a	452	4.28	0.89	-1.25	1.40	0.42

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
	sugared drink at least once a day						
10	I set goals I can accomplish	452	4.02	0.87	-0.60	0.09	0.50
11	I eat at least three meals a week with my peers	451	4.19	1.14	-1.29	0.80	0.40
12	I do not add salt to my foods	453	3.77	1.13	-0.67	-0.26	0.52
13	I eat broiled or baked foods instead of fried foods	452	3.42	0.99	-0.21	0.16	0.58
14	I talk about my worries or stress every day	449	3.35	1.18	-0.30	-0.64	0.55
15	I do what I should do to lead a healthy life	451	4.25	0.81	-1.05	1.32	0.58
16	I do healthy things to cope/deal with my worries and stress	453	3.90	1.00	-0.75	0.29	0.55

Figure 16. CFA of Factor loadings for Healthy Lifestyle Behaviors Scale



Note. The correlated error between item 1 and item 2 was .30; the correlated error between item 2 and item 3 was .36; the correlated error between item 6 and item 14 was .18; the correlated error between item 7 and item 8 was .28; the correlated error between item 8 and item 9 was .25; the correlated error between item 12 and item 13 was .20; the correlated error between item 14 and item 16 was .19; the correlated error between item 15 and item 16 was .33.

Nutrition Knowledge Scale

The item means for the nutrition knowledge scale ranged from .27 to .90 and the item-to-total correlations ranged from .14 to .44. The skewness and kurtosis for these items listed in Table 25. A one-factor model was specified for the nutrition knowledge items. Model did not perfectly fit the data, $\chi^2_{S\text{-}B}$ (N=450, df = 41) = 783.29, p<.01; however, it had adequate fit with *CFI* of .94 and perfectly fit with *RMSEA* of .04. The standardized loadings, which were significant, ranged between from .28 and .79 suggesting that the one-factor was indicative of nutrition knowledge. (See Figure 17).

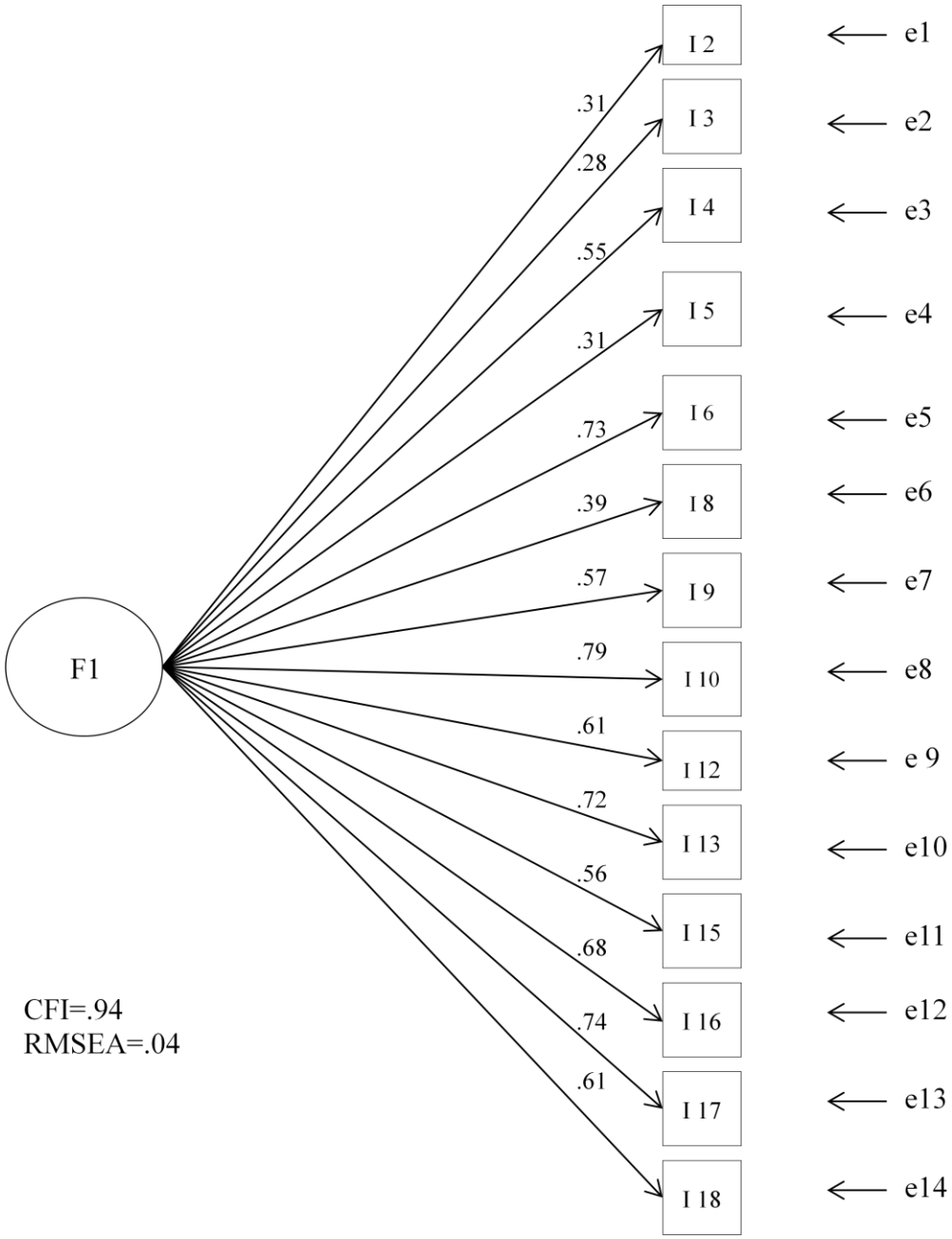
Table 25

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Nutrition Knowledge Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	People need to drink 2 large glasses of milk per day (8 ounce glass)	453	0.57	0.50	-0.30	-1.92	0.14
2	It is a good idea to have fruit juice at every meal	449	0.51	0.50	-0.02	-2.01	0.25
3	Whole milk is healthier than skim milk.	446	0.27	0.44	1.06	-0.89	0.16
4	Ice cream is healthier for you than low fat frozen yogurt	448	0.72	0.45	-0.98	-1.05	0.36
5	Pretzels are higher in fat than potato chips	447	0.26	0.44	1.09	-0.82	0.17
6	French fries are a good vegetable choice	448	0.90	0.30	-2.75	5.60	0.34
7	It is better to broil foods than to fry them	453	0.58	0.50	-0.34	-1.90	0.19
8	Eating chicken with skin on it is healthier than eating chicken without skin	448	0.50	0.50	0.00	-2.01	0.25
9	A fruit rollup is a good fruit choice	450	0.61	0.49	-0.46	-1.80	0.35
10	It is a good thing to add salt to food	449	0.87	0.34	-2.22	2.94	0.44
11	Consuming a lot of fruit juice can lead to cavities in your teeth	453	0.50	0.50	-0.01	-2.01	0.20

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
12	White bread has as much fiber in it as wheat bread	448	0.59	0.49	-0.38	-1.86	0.38
13	Pop is just as good of a drink choice as carbonated bottled water	449	0.80	0.40	-1.54	0.36	0.43
14	The amount of salty food someone eats can cause high blood pressure	453	0.57	0.50	-0.30	-1.92	0.19
15	Fruit Loops are just as healthy as Raisin Bran cereal	447	0.40	0.49	0.43	-1.83	0.35
16	Canned soups have a healthy amount of salt in them	450	0.68	0.47	-0.75	-1.44	0.43
17	Dried soups (for example, Ramen noodles) are a healthy choice for lunch or snack	450	0.90	0.31	-2.60	4.76	0.37
18	Packaged peanut butter crackers are a better snack than yogurt	450	0.61	0.49	-0.44	-1.82	0.41
19	One serving size of meat should be the size of a deck of cards	453	0.30	0.46	0.88	-1.24	0.21
20	People eat more when they are bored than when they are busy	453	0.59	0.49	-0.38	-1.86	0.15

Figure 17. CFA of Factor loadings for Nutrition Knowledge Scale



Activity Knowledge Scale

The item means for the activity knowledge scale ranged from .43 to .92 and the item-to-total correlations ranged from -.03 to .39. The skewness and kurtosis for these items listed in Table 26. A one-factor model was specified for the activity knowledge items. The model did not perfectly fit the data, $\chi^2_{S\text{-}B}$ (N=453, df = 22) = 371.75, p<.01; however, it had adequate fit with *CFI* of .81 and marginal fit with *RMSEA* of .08. The standardized loadings, which were significant, ranged between from .44 and .75 suggesting that the one-factor was indicative of activity knowledge. (See Figure 18).

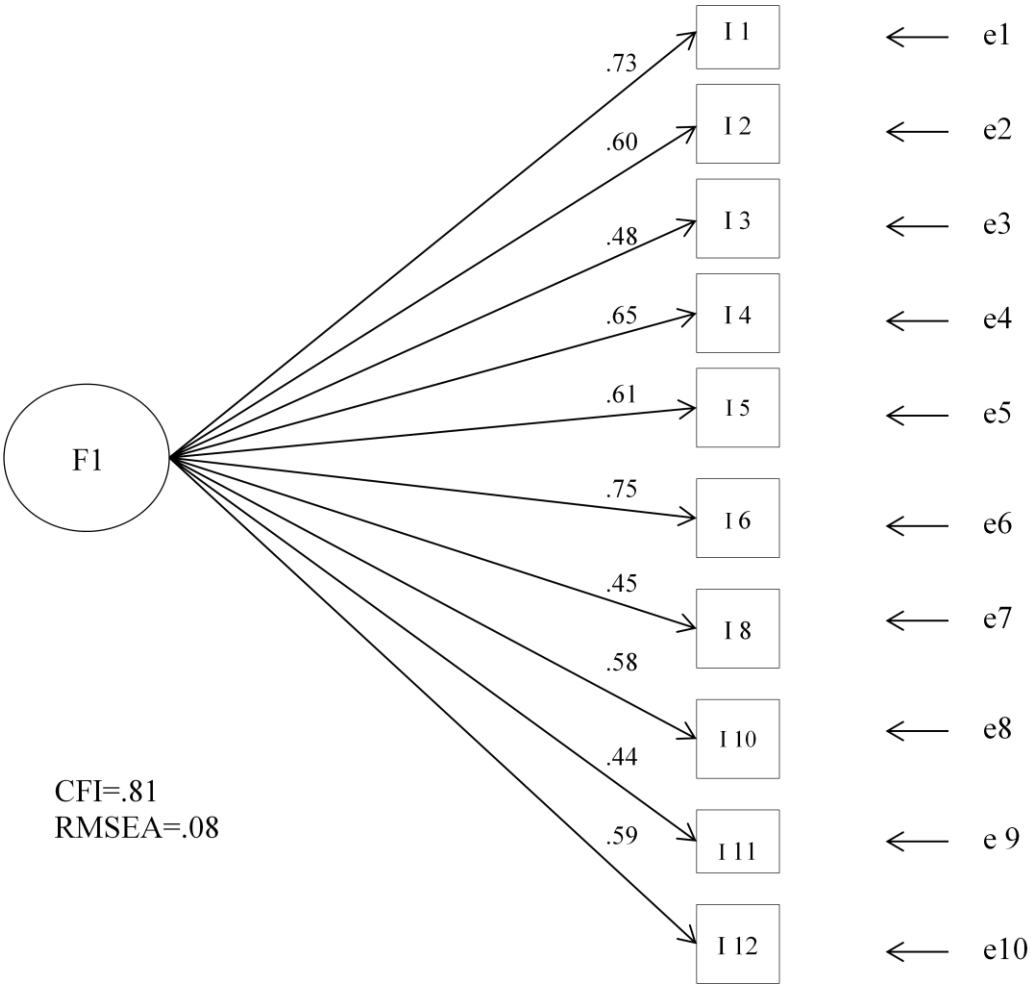
Table 26

Mean, Standard Deviation, Skewness, Kurtosis, and Correlation for Activity Knowledge Scale

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
1	Exercise helps to reduce stress	451	0.92	0.28	-3.00	7.05	0.35
2	People who are very active are healthier than people who are not	453	0.92	0.26	-3.24	8.51	0.27
3	Being active can give you more energy	453	0.81	0.40	-1.55	0.41	0.22
4	Being active can lower your blood pressure	452	0.67	0.47	-0.73	-1.48	0.39
5	Exercise can help to prevent diabetes	452	0.49	0.50	0.04	-2.01	0.31
6	Regular exercise can make you feel happy	451	0.82	0.38	-1.68	0.81	0.39
7	Running is better for you than walking	453	0.19	0.39	1.62	0.64	-0.03
8	Dancing is exercise	452	0.90	0.30	-2.64	5.01	0.20
9	Being out of breath and dizzy when you exercise is a sign of a good workout	452	0.55	0.50	-0.21	-1.97	0.16
10	People who exercise 3 or more times each week burn more calories every day than people who do not	452	0.79	0.41	-1.44	0.09	0.36
11	Children whose parents exercise tend to be more active than children whose parents do not exercise	453	0.43	0.50	0.29	-1.92	0.23

	Item	n	Mean	SD	Skewness	Kurtosis	Correlation with Total
12	It is good to stretch out and do some slow activities before exercise	453	0.95	0.22	-4.21	15.83	0.29

Figure 18. CFA of Factor loadings for Activity Knowledge Scale



Theoretical Path Model

Included in the path model (see Figure 1), were the exogenous variables of physical knowledge, nutrition knowledge, healthy lifestyle beliefs, and perceived difficulty; the endogenous variables of healthy lifestyle behaviors and physical activity, and body mass index (BMI); and the moderating variables of depression, anxiety, self-concept, and gender. Healthy lifestyle beliefs and healthy lifestyle behaviors were correlated at r =.81($p<.01$) and dealing with lifestyle beliefs and perceived difficulty were negative correlated at r =-.73($p<.01$). Perceived difficulty and healthy lifestyle behaviors were negative correlated at r =-.84 ($p<.01$). There were several statistically significant correlations among the variables of the path model and the significant correlations ranged from .12 to .84 (see Table 27).

Table 27

Correlation Matrix between Variables in the Conceptual Path Model

	Variables	1	2	3	4	5	6	7	8	9	10	11
1	Activity Knowledge	1										
2	Nutrition Knowledge	**.39****	1									
3	Healthy Lifestyle Beliefs	**.37****	**.19****	1								
4	Perceived Difficulty	**-.25****	-.09	**-.73****	1							
5	Healthy Lifestyle Behaviors	**.29****	**.12***	**.81****	**-.84****	1						
6	Physical Activity	.042	.04	**-.10***	.05	-.028	1					
7	Depression	**-.13****	.02	**-.52****	**.39****	**-.44****	-.03	1				
8	Anxiety	-.09	.09	**-.35****	**.29****	**-.33****	-.05	**.83****	1			
9	Self-Concept	**.28****	**.16****	**.69****	**-.49****	**.57****	**-.13***	**-.42****	**-.30****	1		
10	Gender	-.07	**.19****	.02	**-.12***	**.17****	-.07	.08	**.14****	-.05	1	
11	BMI	.03	-.05	-.02	.08	-.05	.00	.06	.04	.01	**-.23****	1

Note. Male is the reference group; ** $p<.01$.* $p<.05$.

Path Model

The path model specified the hypothesized relations among the observed constructs. As shown in figure 2, the path model demonstrates relations among these predictors (i.e., physical/nutrition knowledge, perceived difficulty, and healthy lifestyle beliefs), mediating variables (i.e., healthy lifestyle behaviors and physical activity) mediate outcome variable (i.e., BMI), and moderators (i.e., depression, anxiety, self-concept, and gender) moderate the relationships between mediators and outcome variable.

For this model, the standardized path coefficients are reported in Figure 2. The Satorra-Bentler chi-square was 426.82, with 22 degree of freedom, and a *p* value less than .01. The *CFI* of .62 and the *RMSEA* of .20 (with 90% *CI* from .19 to .22), indicated the model had a less than adequate fit. Results for the aims of conceptual model are described below.

Specific aim 1. Examine the role of variables in the CBT model in predicting the behavior variables of healthy lifestyle behaviors and physical activity in Taiwanese middle adolescents.

Healthy lifestyle beliefs had a significant positive effect on healthy lifestyle behaviors (β= .41, p <.01) and healthy lifestyle beliefs also had a significant effect on physical activity (β= -.18, p <.05). Furthermore, there was a significant negative relationship between perceived difficulty and healthy lifestyle behaviors (β= -.54, p < .01) and there was a significantly negative relationship between perceived difficulty and physical activity (β= -.42, p <.01). However, a

non-significant path was found between activity knowledge and healthy lifestyle behaviors (β= -.01, $p > .05$). There was no relationship between activity knowledge and physical activity (β= .09, $p > .05$). In addition, the path between nutrition knowledge and healthy lifestyle behaviors was not significant (β= .00, $p > .05$).

Specific aim 2. Examine the role of variables in the CBT model in predicting BMI in Taiwanese middle adolescence.

The relationship between healthy lifestyle behaviors and BMI was not significant (β= .01, $p > .05$) and the relationship between physical activity and BMI was not significant (β= .02, $p > .05$).

Specific aim 3. Explore behavior variables (e.g. healthy lifestyle behaviors and physical activity) that may mediate the relationships in the theoretical framework regarding BMI.

Healthy lifestyle behaviors did not mediate the relationship predictors (i.e., activity knowledge, nutrition knowledge, healthy lifestyle beliefs, and perceived difficulty) and BMI. Furthermore, physical activity also did not mediate the relationship predictors (i.e., activity knowledge, nutrition knowledge, healthy lifestyle beliefs, and perceived difficulty) and BMI (see Table 28).

Specific aim 4. Explore variables (e.g. depression, anxiety, self-concept and gender) that may moderate the relationship between healthy lifestyle behaviors and BMI in Taiwanese adolescents.

Depression moderated the relationship between physical activity and BMI (β= -.24, $p < .05$) and one standard deviation above mean of depression was significant (β= -.65, $p < .05$); however, anxiety (β= .19, $p > .05$), self-concept (β= -.07, $p > .05$), and gender (β= .02, $p > .05$) did not moderate the relationship between physical activity and BMI. Furthermore, depression (β= .11, $p > .05$), anxiety (β= -.13, $p > .05$), self-concept (β= -.01, $p > .05$), and gender (β= .09, $p > .05$) did not moderate the relationship between healthy lifestyle behaviors and BMI (see Figure 19).

Figure 19.

Standardized parameters estimates of conceptual path model demonstrates relations among activity/nutrition knowledge, perceived difficulty, healthy lifestyle beliefs/behaviors, physical activity, depression, anxiety, self-concept, gender, and BMI. (-) Signifies an inverse relation between the variables.

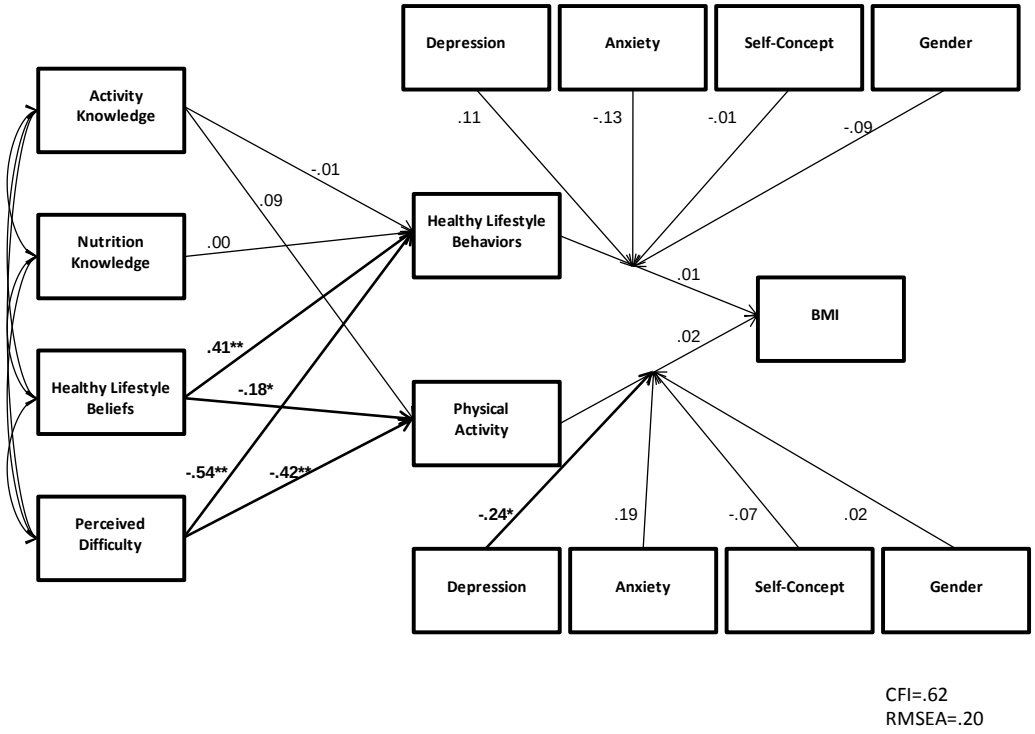


Table 28

Bootstrap Analysis of Magnitude and Statistical of Indirect Effects

Independent variable	Mediator variable	Dependent variable	*B* (Unstandardized path coefficient)	95% confidence interval for mean indirect effect
Activity knowledge	Healthy lifestyle behaviors	BMI	.00	-.01 to .01
Nutrition knowledge			.00	-.01 to .01
Healthy lifestyle beliefs			.00	-.03 to .03
Perceived difficulty			-.00	-.05 to .05
Activity knowledge	Physical activity	BMI	.00	-.03 to .03
Healthy lifestyle beliefs			-.00	-.01 to .01
Perceived difficulty			-.00	-.03 to .03

Note. These values are based on unstandardized path coefficients.

This 95% confidence interval includes zero and therefore is nonsignificant at $p>.05$.

Alternative Path Model

After testing the conceptual path model, the conceptual model did not have an adequate fit. In an attempt to improve the fit of model, one variable was dropped at a time from the model. Dropping the variable of gender from the model, the results indicated that it in fact was an adequate fit to the data (χ^2 (23, 453) =33.75, p> .05; *CFI*= .98; *RMSEA*= .03) (see Figure 20).

Healthy lifestyle beliefs had a significant effect on healthy lifestyle behaviors (β= .41, p <.01) and healthy lifestyle beliefs also had a significant effect on physical activity (β= -.15, p <.05). Furthermore, there was a significantly negative relationship between perceived difficulty and healthy lifestyle behaviors (β= -.54, p < .01) and there was a significantly negative relationship between perceived difficulty and physical activity (β= -.41, p <.01). In addition, depression moderated the relationship between physical activity and BMI (β= -.22, p < .05) (see Figure 20).

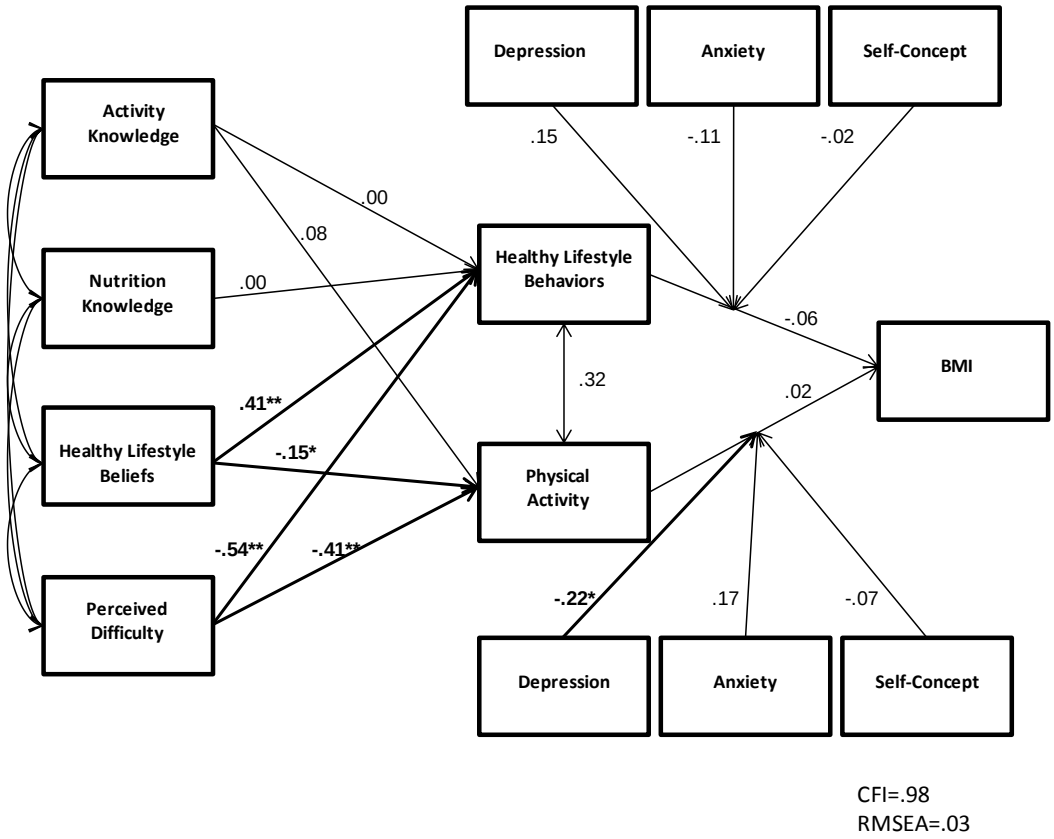


Figure 20

Standardized parameters estimates of alternative path model demonstrates relations among activity/nutrition knowledge, healthy lifestyle beliefs/behaviors, physical activity, depression, anxiety, self-concept, gender, and BMI. (-) Signifies an inverse relation between the variables.

Multi-Group Path Model across Gender

For examining gender difference, a multiple group model analysis was used to test for invariance of the alternative model across gender. The analysis steps include (1) free estimate all parameters in the model; (2) constrain all parameters for assuming all parameters are equal for males and females; (3) free each same path in two groups (males and females) at a time for testing gender difference; (4) testing chi-square difference between fully unconstrained model and fully constrained model. The results showed that the free estimated model was a better fit than the fixed one, indicating that there were no gender differences in the model (see Table 29).

Table 29

Model Fit Statistics for Systematically Multi-group Analysis across Gender

Model	Specifications	χ^2	*df*	χ^2 *diff*	*df diff*	*p*
1	All parameters free	52.591	46			
2	All parameters are constrained	71.287	61	18.70	15	.23
3	Free path between BMI and healthy lifestyle behaviors	69.35	60			.19
4	Free depression moderates the path between BMI and healthy lifestyle behaviors	70.83	60			.16
5	Free anxiety moderates the path between BMI and healthy lifestyle behaviors	71.28	60			.15
6	Free self-concept moderates the path between BMI and healthy lifestyle behaviors	65.50	60			.29
7	Free path between BMI and physical activity	71.24	60			.15
8	Free depression moderates the path between BMI and physical activity	70.71	60			.16
9	Free anxiety moderates the path between BMI and physical activity	71.27	60			.15
10	Free self-concept moderates the path between BMI and physical activity	69.62	60			.19
11	Free path between physical knowledge and healthy lifestyle behaviors	70.75	60			.16
12	Free path between nutrition knowledge and healthy lifestyle behaviors	66.17	60			.27
13	Free path between healthy lifestyle beliefs and healthy lifestyle behaviors	71.13	60			.15
14	Free path between perceived difficulty and healthy lifestyle behaviors	71.28	60			.15
15	Free path between physical knowledge and physical activity	71.26	60			.15
16	Free path between healthy lifestyle beliefs and physical activity	69.04	60			.20
17	Free path between perceived difficulty physical activity	69.82	60			.18

Note. Men were the reference group; χ^2 =chi-square; *df* = degree of freedom; χ^2 *diff*= difference in chi-square log likelihood test; *df diff*= difference in degree of freedom; *p*= probability of the difference.

Chapter 5

DISCUSSION

This study produced three significant findings in Taiwanese adolescents. First, adolescents who have a higher level of healthy lifestyle beliefs have more healthy lifestyle behaviors; however, adolescents who have a higher level of healthy lifestyle beliefs have less physical activity. Second, adolescents who perceived more difficulty in leading a healthy lifestyle reported less healthy behaviors and less physical activity. Third, Taiwanese adolescents with high level of depression who increased their physical activity decreased their BMI.

Healthy Lifestyle Beliefs, Healthy Lifestyle Behaviors and Physical Activity. As expected, adolescents who have a higher level of healthy lifestyle beliefs engage more in healthy lifestyle behaviors, which is consistent with findings from a study with American adolescents Jacobson & Melnyk (2011). However, adolescents who have a higher level of healthy lifestyle beliefs also have less physical activity, which is inconsistent with our hypothesis. Even though Taiwanese adolescents had positive impressions about doing physical activity, the adolescents were not more active because of feelings of discomfort after doing exercise (Lee, Lai, Chou, Chang, & Chang, 2009). Given this finding, schools providing low levels of physical activity and designing a short (30 minutes or less) and interesting exercising program might be able to increase adolescents motivation for doing exercise.

Internet use has become a part of popular activities among Taiwanese adolescents and time spent of using internet may affect Taiwanese adolescents for doing physical activity. Ko, Yen, Chen, Chen, and Yen (2005) reported that 81.8% of Taiwanese male adolescents played online gaming. Another study revealed that 11.7% of Taiwanese adolescents have developed an internet addition (Lin & Tsai, 2002). Taiwanese adolescents over use of internet have poor time management; which can impair school performance, psychological well-being, and less time to do physical activity (Tsai & Lin, 2003). These factors can decrease a Taiwanese adolescents' motivation for doing physical activity. Hence, school nurses should consider limiting adolescents' time-spent using internet during school and encouraging adolescents to do physical exercise outside of campus.

In traditional Chinese culture, academic achievement is one of most important points of success. Taiwanese adolescents focus on studying and gaining good grades in the school are considered the most important things for Taiwanese parents. This can lead to some Taiwanese parents that over emphasize academic performance adolescents' grades over engaging in physical activity (Lee et al., 2009). In addition, Taiwanese adolescents spend many hours studying at school during the daytime and many, if not most of adolescents attend an intensive class after school (Yi & Wu, 2004). Because of stressful learning schedule during the day, Taiwanese adolescents have little energy left for physical activity. However, a study found that overweight and/or obese adolescents were associated with

poorer levels of school performance so parents and school teachers should encourage adolescents to be more active (Taras & Datema-Potts, 2005).

Another factor is peer influence, where peer influence of doing physical activity has been found to be greater than parent influence, with peer influences associated with the amount of time spent in physical activity (Wu, Pender, & Noureddie, 2003). Peers' social support for physical activity may increase or decrease adolescents of doing physical activity depending on their peers are more active or inactive (Wu et al., 2003).

Perceive Difficulty, Physical Knowledge, Healthy Lifestyle Behaviors and Physical Activity. Adolescents who perceived more difficulty in leading a healthy lifestyle reported less healthy behaviors and less physical activity, which were consistent with findings from studies with American adolescents (Heitzler, Lytle, Erickson, Barr-Anderson, Sirard, & Story, 2010; Melnyk et al., 2006). Furthermore, a direct effect positive relationship between activity knowledge and physical activity, indicating increased knowledge about activity would increase physical activity, was not supported. Wu et al. (2003) indicated that Taiwanese female adolescents reported fewer benefits and more perceived barriers to being more physically active. In addition, Lee et al. (2009) indicated that Taiwanese adolescents had positive impressions about doing physical activity, but adolescents would not be more active because of feelings of discomfort after doing exercise.

In addition, one factor influencing Taiwanese adolescents' physical activity is the availability of physical space to exercise. Taiwan is an island and the space is extremely small compared to China or America. The population density of Taiwan is approximately 642 persons/km^2 (DOH, 2011) and availability of space might one of barriers of doing physical activity for Taiwanese adolescents.

Nutrition knowledge, Healthy Lifestyle Behaviors, Physical Activity and BMI. The findings of this study did not support our hypothesis that increasing knowledge about activity and nutrition would increase healthy lifestyle behaviors. The development of healthy lifestyle behaviors is influenced many factors. Knowledge is considered one of important factors to the intentional performance of healthy lifestyle behaviors and changing attitude is critical as well (Lin et al., 2007). Lin et al. (2007) indicated that 4^{th} to 6^{th} graders in Taiwan answered 71.4% of nutrition knowledge questions correctly so teaching attitudes might be more important for the development of healthy lifestyle behaviours.

Even though Taiwanese adolescents have nutritional knowledge, the adolescents might not necessarily perform healthy lifestyle behaviors. If Taiwanese adolescents do not have positive attitudes toward healthy lifestyle behaviors, there is little possibility for them to perform healthy lifestyle behaviors. One study found that school children chose food based on their preferences and that there was no need to make oneself unhappy by eating healthy (Lin et al., 2007). Health providers and school nurses in Taiwan should educate

school children about the benefits of eating healthy. Fu, Cheng, Tu, & Pan (2007) showed that eating good quality of food can increase overall performance in school.

The hypothesis that Taiwanese adolescents who perform more healthy lifestyle behaviors and physical activity would decrease BMI was not supported in this study. This might have resulted from the fact that the majority of the participants were underweight (35.1%) or had normal BMIs (45%), so there was little variance in the BMI data.

Moderators (e.g., depression, anxiety, self-concept, and gender) and Mediators. The model path between activity knowledge and healthy lifestyle behaviors, between nutrition knowledge and healthy lifestyle behaviors, and between activity knowledge and physical activity, were not significant, which cancelled out any possible mediating relationship between activity knowledge and healthy lifestyle behaviors, between nutrition knowledge and healthy lifestyle behaviors and between activity knowledge and physical activity, and BMI.

As expected, depression moderated the relationship between physical activity and BMI. Basically, losing weight is most influenced by increased physical activity and decreased intake of high calorie food. However, findings of this study showed that it was Taiwanese adolescents with high level of depression who increased their physical activity and decreased their BMIs. Depression moderating the relationship between physical activity and BMI in Taiwanese adolescents should be explored further because it is important to establish the

level of depression and obesity in Taiwanese adolescents (Wit, Straten, Herten, Phoenix, & Cuijpers, 2009). According to the DSM-IV, depression is associated with both increased or decreased physical activity, and increased or decreased intake of food (DSM IV-TR; American Psychiatric Association, 2004). Wit et al. (2009) indicated that a positive U-shaped trend in the association between depression and BMI so that the findings could provide indirect support that findings of this study needs to be further examined by looking at quadratic trends with BMI category.

The results of this study suggested that depression, anxiety, self-concept, and gender did not moderate the relationship between healthy lifestyle behaviors and BMI, which was inconsistent with the theoretical hypothesis. Anxiety, self-concept, and gender did not moderate the relationship between physical activity and BMI, which was also inconsistent with the theory. These findings may be due to the invariance of moderators (e.g., depression, anxiety and self-concept), rather than a failure of the theory.

However, the results from the test of the theoretical model suggested that the model did not have an adequate fit to the data, and there were some modifications needed to be made to enhance the strength of the model. First, gender was deleted from the theoretical model. The results suggested that the model had an adequate fit when gender was taken out from the theoretical model. Gender difference in Taiwanese adolescents has been indentified in studies (Chu, 2010; Chou & Pei, 2010; Hsu, Chen, Tsai, & Hsiao, 2011). Once the final model

was identified, a multiple group to test for invariance across gender was examined. The findings from the chi-square difference test suggested there were no differences in each path across gender. This could be due to peer influences being important for adolescents, so maybe both boys and girls have similar variances with these predictors (e.g., healthy lifestyle behaviors et al.) in the full model. One study showed that both male and female adolescents in Taiwan seldom skipped breakfast and spent more time in TV watching associated with unhealthy lifestyle behaviors, including more intake of sweetened beverages and snacks (Chou & Pei, 2010). Wu & Jwo (2005) found that both Taiwanese male and female adolescents decreased in physical activity when they prepared for the high school entrance examinations. However, gender differences have been found in Taiwanese adolescents. Taiwanese female adolescents performing less physical activity compared to males (Wu et al., 2003). One study revealed that female adolescents in Taiwan reported higher level of psychological distress, mainly anxiety and depression (Hong et al., 2005). Therefore, gender difference in Taiwanese adolescents needs to be examined further in future studies.

Cultural Perspectives: U.S. vs. Taiwan

Methodology and Theory. The decision to use path analysis may hinge on sample size considerations. A structure equation modeling (SEM) makes greater demands on sample size, as there are many more parameters. The sample size for this study was considered as modest so that path analysis was chosen than SEM even though measurement models had been tested. Some items were deleted from

several scales in pilot study. Ignoring of EFA outcomes to use full scales for primary study was done to enhance the comparability and generalizability of the findings. The EFA helped to verify that the items were indeed loading on the number of factors that theory suggests. Having established that, which items need to be dropped out or being retained can depend on other things, such as theory. In addition, some scales used in different populations might retain some of weak items, especially if the Chronbach's alpha for these scales are adequate and acceptable (Jacibson & Melnyk, 2011; Melnyk et al., 2006; Melnyk et al., 2007).

Re-structuring people's cognitions is a major point for cognitive behavior skills building (Melnyk & Moldenhaurer, 2006). Findings from this study revealed that the beliefs related to health of Taiwanese adolescents were associated to their healthy lifestyle behaviors. Furthermore, lower level of perceived difficulty in engaging in healthy lifestyle behaviors would increase adolescents' healthy lifestyle behaviors in their daily life. These results were similar to previous study, which was conducted with western adolescents (Melnyk et al., 2006). However, findings for this study revealed that Taiwanese adolescents, who had higher level of healthy lifestyle beliefs and performed healthy lifestyle behaviors in their life, did not decrease their BMIs. These crucial findings will help future scholars and school nurses in Taiwan design and conduct interventions with Taiwanese adolescents. Future interventions with Taiwanese adolescents should add enjoyable and interesting physical activity into interventions. An interesting physical activity intervention will decrease

Taiwanese adolescents perceived feelings of discomfort after doing exercise. Future interventions with Taiwanese adolescents should be based on cognitive behavioral skills building that will strengthen their healthy lifestyle beliefs and reduce their difficulty about engaging in healthy lifestyle behaviors. Taiwanese adolescents who have a stronger beliefs in engaging in healthy lifestyle behaviors and less perceived difficulty about doing a healthy lifestyle should help adolescents having confidence/ability to maintain their healthy lifestyle behaviors.

Knowledge, healthy lifestyle behaviors, and BMI. The findings in this study did not support that increased Taiwanese adolescents' nutrition knowledge would increase their healthy lifestyle behaviors and decreased BMI, which were inconsistent with a previous western study (Melnyk et al., 2009). Baranowaski, Cullen, Nicklas, Thompson, and Baranowaski (2003) indicated that only knowledge was not enough to promote behavioral change. Knowledge might be an important component for behavioral change but Taiwanese adolescents focus more on school performance. Even though Taiwanese adolescents have knowledge about nutrition and physical activity, it does not mean that adolescents are willing to do health-related choice or activity in their daily life.

Limitations & Strengths

This study provided adequate support for my hypothesis; however, a number of limitations should be acknowledged. First, generalizability is limited because this sample consisted of only Taiwanese adolescents. Second, even though structure equation methods were used to test casual influences, the data

collected was cross-sectional and, that is, cannot provide evidence of actual causation. Therefore, longitudinal models are needed for a more detailed and advanced examination. Third, adolescents' height and weight were obtained from school records, which might decrease their reliability. Fourth, this was the first time many of scales were used in Taiwanese adolescents. While the scales had adequate reliability in this study, more work needs to be done on the validity of the scale for Taiwanese adolescents. Finally, the sample in this study was a convenience sample, which might limit external validity.

The strengths of this study include (1) a large sample size that provides sufficient power for statistical influences; (2) dealing with missing data are taken into account in this study to ensure quality of the results; (3) the testing of a theoretical model.

Implications and Future Research Directions

The results of this study suggest there are several directions in which nursing practice and research could proceed. For future nursing practice, nurses who work with middle-school students in Taiwan may facilitate students' healthy lifestyle behaviors by promoting their beliefs in healthy lifestyle. Furthermore, facilitating middle-school Taiwanese students' healthy lifestyle behaviors can be done by reducing the perceived difficulty in performing healthy lifestyle.

For the future, a longitudinal study would be beneficial in understanding casual relationships of key predictors that contribute to Taiwanese adolescents' healthy lifestyle behaviors and BMI. Intervention studies based on cognitive-

behavioral therapy (CBT) for overweight adolescents have been tested in western population and have decreased adolescents' weights and BMI (Melnyk et al., 2007; Tsiros et al., 2008; Bernnan et. al., 2009). Findings for this study did not decrease Taiwanese adolescents' BMI so that future researchers might need to add physical activity into interventions. Second, most interaction effects do not find in this study so suggests moderators may moderate different paths in the model. Fourth, future researchers can create BMI categories to test the model so that studies may provide different findings than this study. Fifth, the generalizability of the results should be examined in different age groups (e.g., college) and areas (e.g., north of Taiwan) in Taiwan. Finally, given that this is one of a very few studies incorporating these variables (e.g., healthy lifestyle beliefs/behaviors and perceived difficulty in engaging in healthy lifestyle) in Taiwanese adolescents, so conclusions must remain tentative for the present, until the results of this study are replicated in future studies.

Conclusion

This study makes a contribution on Taiwanese adolescents because it investigates healthy lifestyle in Taiwanese adolescents. The study findings found that increased Taiwanese adolescents' healthy lifestyle beliefs would promote Taiwanese adolescents' engaged in healthy lifestyle behaviors. School nurses in Taiwan should focus on increasing adolescents' beliefs in healthy lifestyle, and on decreasing perceived difficulty in performing healthy lifestyle behaviors; since these may facilitate adolescents' healthy lifestyle behaviors. Future researchers

should create BMI categories as a different outcome variable and look at moderators in different paths of the model.

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APPENDIX A

TABLE OF CONCEPTS ANALYSIS AND PREDICTIVE STUDIES ON ADOLESCENTS

Table A1

ICD-10: Systems of depression

Main Symptoms	Additional Symptoms	Symptoms of the Somatic Syndrome
• Depressed mood • Loss of interest, anhedonia • Loss of energy, fatigue	• Decreased concentration • Low self-esteem and self-confidence • Depression regularly worse • Negative and pessimistic thoughts about the future • Suicidal ideation or Suicidal attempts • Sleep disturbance • Decrease in appetite • Decreased libido	• Lack of reactivity to usually pleasurable stimuli • Early morning awakening • Guilt and feelings of worthlessness in the morning • Psychomotor retardation or agitation • Significant anorexia or weight loss

Note. ICD-10: The International Classification of Mental and Behavioral Disorders.

Table A2

DSM-IV-TR criteria for Major Depression Episode

Criteria for Major Depression Episode
Five (or more) of the following symptoms have been present during the same 2-week period and represent a change from previous functioning; at least one of the symptoms is either (1) depressed mood or (2) loss of interest or pleasure. • Depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad or empty) or observation made by others (e.g., appears tearful). • Markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated either subjective account or observation made by others). • Significant weight loss when not dieting or weight gain (e.g., a change of more than 5% of body weight in a month), or decrease or increase in appetite nearly every day. • Insomnia or hypersomnia nearly every day. • Psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down). • Fatigue or loss of energy nearly every day. • Feelings of worthlessness or excessive or inappropriate guilt (which may

be delusional) nearly every day (not merely self-reproach guilt about being sick).

- Diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others).
- Recurrent thoughts of dead (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide.

Table A3

Hopelessness versus Hopelessness Depression Attributes

Hopelessness	Hopelessness Depression
• Negative feelings and expectations about one's future. • Negative thoughts and feelings toward changing one's future.	• Depressed mood or loss of interest or pleasure in activities.
<u>Symptoms</u>	<u>Symptoms</u>
• Thoughts of a dark, vague, or uncertain future. • Lack of hope, enthusiasm, or faith • Expectation of limited choices • Verbal cues such as "I can't" • Expectation of not being able to make things better.	• Sadness • Apathy • Indecision • Lack of energy and fatigue, or sleep disturbances • Lack of initiation of voluntary responses • Psychomotor retardation • Hopelessness (as antecedent and subsequent symptom) • Suicidality

Table A4

The Predictive Studies on Adolescents

Authors	Aim	Design	Sample size	Findings
Fonseca et al. (2005)	To identify psychosocial indicators those distinguish obese and overweight adolescents from their peers, and key explainers of body image among obese and overweight adolescents.	A cross-sectional descriptive design	6903 adolescents	There was a significant difference in physical activity between obese and non-obese adolescents. Obese adolescents had less physical activity than non-obese adolescents.
Blum et al. (2005)	To determine changes in beverages in beverage consumption and associations between beverages consumed and BMI in teens.	A 2-years longitudinal study	164 teens	Increases in diet soda consumption were significantly greater for overweight and teens who gain weights compared to normal weight teens.
Yang et al. (2006)	To evaluate the relationships among irregular breakfast eating, health status, and health promoting behavior for Taiwanese adolescents.	A cross-sectional descriptive design	1609 adolescents	Irregular breakfast eating significantly associated with overweight status.
Melnyk et al. (2006)	To determine the relationships among mental/cognitive	A descriptive correlational design	23 overweight Adolescents	1. Adolescents with higher state and

Authors	Aim	Design	Sample size	Findings
	variables and healthy attitudes, choices, and behaviors in overweight teens.			trait anxiety and depressive symptoms as well had less healthy lifestyle beliefs. 2. Adolescents with higher self-esteem had stronger beliefs about their ability to engage in a healthy lifestyle. 3. Adolescents who perceived health lifestyles difficult had less healthy behaviors.
Judith et al. (2009)	To determine the relationships among perceived and actual weight, depression, anxiety, anger, disruptive behavior and self-concept in teens.	A descriptive correlational design	33 adolescents	There was a significant between BMI and self-concept. Adolescents with higher BMI percentiles had lower self concept.

Authors	Aim	Design	Sample size	Findings
Liou et al. (2010)	To investigate the association between various risk factors and obesity among adolescents.	A cross-sectional descriptive design	8640 adolescents	1. Time spent viewing such as using computer or internet surfing was associated with a higher prevalence of obesity. 2. Adolescents who slept for less 7.75 hours/day at weekends had a significantly greater risk of obesity.

APPENDIX B

ENGLISH VERSION MEASURES

Date of Today:

Demographic Information

1. Class:

2. School ID:

3. Date of Birth (month/year):

4. Age:

5. Gender: ○ Male ○ Female

6. Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day ?

○ 1 day ○ 2 days ○ 3 days ○ 4 days ○ 5 days ○ 6 days ○ 7 days

7. Over a typical or usual week, on how many days were you physically active for a total of at least 60 minutes per day?

○ 1 day ○ 2 days ○ 3 days ○ 4 days ○ 5 days ○ 6 days ○ 7 days

Beck Depression Scale

		0	1	2	3
1.	I think that my life is bad	Never	Sometimes	Often	Always
2.	I have trouble doing things	Never	Sometimes	Often	Always
3.	I feel that I am a bad person	Never	Sometimes	Often	Always
4.	I wish I were dead	Never	Sometimes	Often	Always
5.	I have trouble sleeping	Never	Sometimes	Often	Always
6.	I feel no one loves me	Never	Sometimes	Often	Always
7.	I think bad things happen because of me	Never	Sometimes	Often	Always
8.	I feel lonely	Never	Sometimes	Often	Always
9.	My stomach hurts	Never	Sometimes	Often	Always
10.	I feel like bad things happen to me	Never	Sometimes	Often	Always
11.	I feel like I am stupid	Never	Sometimes	Often	Always
12.	I feel sorry for myself	Never	Sometimes	Often	Always
13.	I think I am doing things badly	Never	Sometimes	Often	Always
14.	I feel bad about what I did	Never	Sometimes	Often	Always
15.	I hate myself	Never	Sometimes	Often	Always
16.	I want to be alone	Never	Sometimes	Often	Always
17.	I feel like crying	Never	Sometimes	Often	Always
18.	I feel sad	Never	Sometimes	Often	Always
19.	I feel empty inside	Never	Sometimes	Often	Always
20.	I think my life will be bad	Never	Sometimes	Often	Always

Beck Anxiety Scale

		0	1	2	3
1.	I worry someone might hurt me at school	Never	Sometimes	Often	Always
2.	My dream scare me	Never	Sometimes	Often	Always
3.	I worry when I am at school	Never	Sometimes	Often	Always
4.	I think about scary things	Never	Sometimes	Often	Always
5.	I worry people might tease me	Never	Sometimes	Often	Always
6.	I am afraid that I will make mistakes	Never	Sometimes	Often	Always
7.	I get nervous	Never	Sometimes	Often	Always
8.	I am afraid I might get hurts	Never	Sometimes	Often	Always
9.	I worry I get bad grades	Never	Sometimes	Often	Always
10.	I worry about the future	Never	Sometimes	Often	Always
11.	My hands shake	Never	Sometimes	Often	Always
12.	I worry I get crazy	Never	Sometimes	Often	Always
13.	I worry people might get mad at me	Never	Sometimes	Often	Always
14.	I worry I might lose control	Never	Sometimes	Often	Always
15.	I worry	Never	Sometimes	Often	Always
16.	I have problems sleeping	Never	Sometimes	Often	Always
17.	My heart pounds	Never	Sometimes	Often	Always
18.	I get shaky	Never	Sometimes	Often	Always
19.	I am afraid that something bad might happen to me	Never	Sometimes	Often	Always
20.	I am afraid that I might get sick	Never	Sometimes	Often	Always

Beck Sept-concept Scale

		0	1	2	3
1.	I work hard	Never	Sometimes	Often	Always
2.	I feel strong	Never	Sometimes	Often	Always
3.	I like myself	Never	Sometimes	Often	Always
4.	people want to be with me	Never	Sometimes	Often	Always
5.	I am just as good as the other kids	Never	Sometimes	Often	Always
6.	I feel normal	Never	Sometimes	Often	Always
7.	I am a good person	Never	Sometimes	Often	Always
8.	I do things well	Never	Sometimes	Often	Always
9.	I can do things without help	Never	Sometimes	Often	Always
10.	I feel smart	Never	Sometimes	Often	Always
11.	People think I am good at things	Never	Sometimes	Often	Always
12.	I am kind to others	Never	Sometimes	Often	Always
13.	I feel like a nice person	Never	Sometimes	Often	Always
14.	I am good at telling jokes	Never	Sometimes	Often	Always
15.	I am good at remenbering things	Never	Sometimes	Often	Always
16.	I tell the truth	Never	Sometimes	Often	Always
17.	I feel proud of the things I do	Never	Sometimes	Often	Always
18.	I am a good thinker	Never	Sometimes	Often	Always
19.	I like my body	Never	Sometimes	Often	Always
20.	I am happy to be me	Never	Sometimes	Often	Always

Healthy Lifestyles Belief Scale

	Please fill in the circle for your response. *(Mark one answer for each item.)*	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1.	I am sure that I will do what is best to lead a healthy life.	1 O	2 O	3 O	4 O	5 O
2.	I believe that exercise and being active will help me to feel better about myself.	1 O	2 O	3 O	4 O	5 O
3.	I am certain that I will make healthy food choices.	1 O	2 O	3 O	4 O	5 O
4.	I know how to deal with things in a healthy way that bother me.	1 O	2 O	3 O	4 O	5 O
5.	I believe that I can reach the goals that I set for myself.	1 O	2 O	3 O	4 O	5 O
6.	I am sure that I can handle my problems well.	1 O	2 O	3 O	4 O	5 O
7.	I believe that I can be more active.	1 O	2 O	3 O	4 O	5 O
8.	I am sure that I will do what is best to keep myself healthy.	1 O	2 O	3 O	4 O	5 O
9.	I am sure that I can spend less time watching TV.	1 O	2 O	3 O	4 O	5 O
10.	I know that I can make healthy snack choices regularly.	1 O	2 O	3 O	4 O	5 O
11.	I can deal with pressure from other people in positive ways.	1 O	2 O	3 O	4 O	5 O
12.	I know what to do when things bother or upset me.	1 O	2 O	3 O	4 O	5 O
13.	I believe that my parents and family will help me to reach my goals.	1 O	2 O	3 O	4 O	5 O
14.	I am sure that I will feel better about myself if I exercise regularly.	1 O	2 O	3 O	4 O	5 O
15.	I believe that being active is fun.	1 O	2 O	3 O	4 O	5 O
16.	I am able to talk to my parents/family about things that bother or upset me.	1 O	2 O	3 O	4 O	5 O

	Please fill in the circle for your response. *(Mark one answer for each item.)*	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1.	I am sure that I will do what is best to lead a healthy life.	1 O	2 O	3 O	4 O	5 O
2.	I believe that exercise and being active will help me to feel better about myself.	1 O	2 O	3 O	4 O	5 O
3.	I am certain that I will make healthy food choices.	1 O	2 O	3 O	4 O	5 O
4.	I know how to deal with things in a healthy way that bother me.	1 O	2 O	3 O	4 O	5 O
5.	I believe that I can reach the goals that I set for myself.	1 O	2 O	3 O	4 O	5 O
6.	I am sure that I can handle my problems well.	1 O	2 O	3 O	4 O	5 O
7.	I believe that I can be more active.	1 O	2 O	3 O	4 O	5 O
8.	I am sure that I will do what is best to keep myself healthy.	1 O	2 O	3 O	4 O	5 O
9.	I am sure that I can spend less time watching TV.	1 O	2 O	3 O	4 O	5 O
10.	I know that I can make healthy snack choices regularly.	1 O	2 O	3 O	4 O	5 O
11.	I can deal with pressure from other people in positive ways.	1 O	2 O	3 O	4 O	5 O
12.	I know what to do when things bother or upset me.	1 O	2 O	3 O	4 O	5 O
13.	I believe that my parents and family will help me to reach my goals.	1 O	2 O	3 O	4 O	5 O
14.	I am sure that I will feel better about myself if I exercise regularly.	1 O	2 O	3 O	4 O	5 O
15.	I believe that being active is fun.	1 O	2 O	3 O	4 O	5 O
16.	I am able to talk to my parents/family about things that bother or upset me.	1 O	2 O	3 O	4 O	5 O

Perceived Difficulty Scale

Directions: Please answer the following questions. How hard or easy is it to do the following things? Please fill in the circle for your response. *(Mark one answer for each item.)*	Very hard to do	Fairly hard to do	Neither hard nor easy to do	Fairly easy to do	Very easy to do
1. Eat healthy.	1 O	2 O	3 O	4 O	5 O
2. Not eat unhealthy foods that I like.	1 O	2 O	3 O	4 O	5 O
3. Exercise regularly.	1 O	2 O	3 O	4 O	5 O
4. Exercise instead of watching TV, relaxing, or using the computer.	1 O	2 O	3 O	4 O	5 O
5. Buy healthy foods to eat.	1 O	2 O	3 O	4 O	5 O
6. Find a safe place to exercise.	1 O	2 O	3 O	4 O	5 O
7. Have exercise equipment at home (for example, jump rope, weights, sneakers).	1 O	2 O	3 O	4 O	5 O
8. Take the time to buy healthy foods.	1 O	2 O	3 O	4 O	5 O
9. Take the time to help plan and prepare healthy meals.	1 O	2 O	3 O	4 O	5 O
10. Take the time to exercise regularly.	1 O	2 O	3 O	4 O	5 O
11. Take the time to plan an exercise schedule.	1 O	2 O	3 O	4 O	5 O
12. Cope/Deal with stress.	1 O	2 O	3 O	4 O	5 O

Nutrition Knowledge Scale

Directions: Please answer the following questions to the best of your ability. Please fill in the circle for your response. *(Mark one answer for each item.)*		Yes	No	Don't Know
1.	People need to drink 2 large glasses of milk per day (8 ounce glass).	1	0	0
2.	It is a good idea to have fruit juice at every meal.	1	0	0
3.	Whole milk is healthier than skim milk.	1	0	0
4.	Ice cream is healthier for you than low fat frozen yogurt	1	0	0
5.	Pretzels are higher in fat than potato chips.	1	0	0
6.	French fries are a good vegetable choice.	1	0	0
7.	It is better to broil foods than to fry them.	1	0	0
8.	Eating chicken with skin on it is healthier than eating chicken without skin.	1	0	0
9.	A fruit rollup is a good fruit choice.	1	0	0
10.	It is a good thing to add salt to food.	1	0	0
11.	Consuming a lot of fruit juice can lead to cavities in your teeth.	1	0	0
12.	White bread has as much fiber in it as wheat bread.	1	0	0
13.	Pop is just as good of a drink choice as carbonated bottled water.	1	0	0
14.	The amount of salty food someone eats can cause high blood pressure.	1	0	0
15.	Fruit Loops are just as healthy as Raisin Bran cereal.	1	0	0
16.	Canned soups have a healthy amount of salt in them.	1	0	0
17.	Dried soups (for example, Ramen noodles) are a healthy choice for lunch or snack.	1	0	0
18.	Packaged peanut butter crackers are a better snack than yogurt.	1	0	0
19.	One serving size of meat should be the size of a deck of cards.	1	0	0
20.	People eat more when they are bored than when they are busy.	1	0	0

Activity Knowledge Scale

Directions: Please answer the following questions to the best of your ability. Please fill in the circle for your response. *(Mark one answer for each item.)*

		Yes	No	Don't Know
1.	Exercise helps to reduce stress.	1	0	0
2.	People who are very active are healthier than people who are not.	1	0	0
3.	Being active can give you more energy.	1	0	0
4.	Being active can lower your blood pressure.	1	0	0
5.	Exercise can help to prevent diabetes.	1	0	0
6.	Regular exercise can make you feel happy.	1	0	0
7.	Running is better for you than walking.	1	0	0
8.	Dancing is exercise.	1	0	0
9.	Being out of breath and dizzy when you exercise is a sign of a good workout.	1	0	0
10.	People who exercise 3 or more times each week burn more calories every day than people who do <u>not.</u>	1	0	0
11.	Children whose parents exercise tend to be more active than children whose parents do <u>not</u> exercise.	1	0	0
12.	It is good to stretch out and do some slow activities before exercise.	1	0	0

APPENDIX C

CHINESE VERSION MEASURES

日期:

基本資料

1. 班級:

2. 座號:

3. 生日:　年　月

4. 年齡:

5. 性別:　○ 男　　○ 女

6.過去七天當中, 有多少天會持續運動至少一個小時？(請勾選)

○ 1 天 ○ 2天○ 3天○ 4天○ 5天○ 6天○ 7天

7.一個禮拜當中,有多少天會持續運動至少一個小時？(請勾選)

○ 1天○ 2天○ 3天○ 4天○ 5天○ 6天○ 7天

憂鬱量表

1	我覺得我過的不好	從未	偶爾	經常	總是
2	我沒有辦法做事	從未	偶爾	經常	總是
3	我覺得我是一個壞人	從未	偶爾	經常	總是
4	我希望我死了	從未	偶爾	經常	總是
5	我有睡眠障礙	從未	偶爾	經常	總是
6	我覺得沒有人愛我	從未	偶爾	經常	總是
7	我認爲因爲我所以有不好的事情發生	從未	偶爾	經常	總是
8	我感到寂寞	從未	偶爾	經常	總是
9	我胃痛	從未	偶爾	經常	總是
10	我感到不好的事情發生在我的身上	從未	偶爾	經常	總是
11	我覺得我很傻	從未	偶爾	經常	總是
12	我覺得對不起自己	從未	偶爾	經常	總是
13	我覺得我做不好事情	從未	偶爾	經常	總是
14	我對我的所做的事感到討厭	從未	偶爾	經常	總是
15	我憎恨我自己	從未	偶爾	經常	總是
16	我想獨自一人	從未	偶爾	經常	總是
17	我覺得想哭	從未	偶爾	經常	總是
18	我很傷心	從未	偶爾	經常	總是
19	我覺得內心空虛	從未	偶爾	經常	總是
20	我覺得我將來不會有好的日子過	從未	偶爾	經常	總是

焦慮量表

1	在學校時, 我擔心有人會傷害我	從未	偶爾	經常	總是
2	我會做惡夢	從未	偶爾	經常	總是
3	當我在學校時, 我會擔心	從未	偶爾	經常	總是
4	我會想到讓我害怕的事情	從未	偶爾	經常	總是
5	我擔心有人可能會取笑我	從未	偶爾	經常	總是
6	我擔心我會做錯事	從未	偶爾	經常	總是
7	我會緊張	從未	偶爾	經常	總是
8	我擔心我可能會受到傷害	從未	偶爾	經常	總是
9	我擔心我可能會得到不好的成績	從未	偶爾	經常	總是
10	我擔心我的未來	從未	偶爾	經常	總是
11	我的手會顫抖	從未	偶爾	經常	總是
12	我擔心我可能會發瘋	從未	偶爾	經常	總是
13	我擔心有人會對我生氣	從未	偶爾	經常	總是
14	我擔心我可能會失控	從未	偶爾	經常	總是
15	我會焦慮	從未	偶爾	經常	總是
16	我有睡眠障礙	從未	偶爾	經常	總是
17	我心跳,跳的很快	從未	偶爾	經常	總是
18	我感覺我在發抖	從未	偶爾	經常	總是
19	我害怕有不好的事可能會發生在我身上	從未	偶爾	經常	總是
20	我擔心我可能會生病	從未	偶爾	經常	總是

自我概念量表

1	我努力工作	從未	偶爾	經常	總是
2	我感覺我很堅強	從未	偶爾	經常	總是
3	我喜歡我自己	從未	偶爾	經常	總是
4	人們想要和我在一起	從未	偶爾	經常	總是
5	我剛好和其它孩子一樣好	從未	偶爾	經常	總是
6	我覺得我很正常	從未	偶爾	經常	總是
7	我是一個好人	從未	偶爾	經常	總是
8	我事情做得很好	從未	偶爾	經常	總是
9	我做事不用他人幫忙	從未	偶爾	經常	總是
10	我覺得我是聰明的	從未	偶爾	經常	總是
11	人們認爲我辦事能力好	從未	偶爾	經常	總是
12	我待人親切	從未	偶爾	經常	總是
13	我覺得自己是個好人	從未	偶爾	經常	總是
14	我擅長講笑话	從未	偶爾	經常	總是
15	我記憶力好	從未	偶爾	經常	總是
16	我說實話	從未	偶爾	經常	總是
17	我爲我自己所作的事感到驕傲	從未	偶爾	經常	總是
18	我擅於思考	從未	偶爾	經常	總是
19	我喜歡我自己的身體	從未	偶爾	經常	總是
20	我很高興做我自己	從未	偶爾	經常	總是

健康生活型態行爲量表

1	我選擇健康的食物	1	2	3	4	5
2	我規律的運動	1	2	3	4	5
3	我定期與朋友或父母一起運動	1	2	3	4	5
4	我每天看電視和電玩將限制在2 小時之內	1	2	3	4	5
5	我吃新鮮水果和蔬菜類的點心	1	2	3	4	5
6	我每天會對父母和朋友說一些正向的事	1	2	3	4	5
7	我吃低脂肪的食物	1	2	3	4	5
8	我每天只喝一瓶含糖飲料 (例如: 汽水或果汁	1	2	3	4	5
9	我每天會至少一次選擇喝白開水代替含糖飲	1	2	3	4	5
10	我設立我可以完成的目標	1	2	3	4	5
11	我每週至少會與父母一起共餐三次	1	2	3	4	5
12	我不會在我的食物中多添加鹽	1	2	3	4	5
13	我吃燒烤或烘焙食品，而不是油炸食品	1	2	3	4	5
14	每天我都會談談我的憂慮和壓力	1	2	3	4	5
15	我盡我所能過健康的生活	1	2	3	4	5
16	我以健康的方式來解決我的憂慮和壓力	1	2	3	4	5

感覺困難度量表

1	吃得健康	1	2	3	4	5
2	不吃我喜歡的不健康食物	1	2	3	4	5
3	規律運動	1	2	3	4	5
4	運動而不是看電視，放鬆，或使用電腦	1	2	3	4	5
5	買健康食物吃	1	2	3	4	5
6	找一個安全的地方運動	1	2	3	4	5
7	在家裡有運動器材（例如：跳繩，體重計，運動鞋）	1	2	3	4	5
8	花時間來買健康食物	1	2	3	4	5
9	花時間來幫助規劃和準備健康飲食	1	2	3	4	5
10	花時間規律運動	1	2	3	4	5
11	花時間來計畫運動時間表	1	2	3	4	5
12	調節壓力	1	2	3	4	5

營養知識量表

1	人們每天需要喝兩大杯牛奶（240 cc的杯子）	正確	不正確	不知道
2	每餐都喝果汁對人體有好處	正確	不正確	不知道
3	全脂牛奶比脫脂牛奶更健康	正確	不正確	不知道
4	冰淇淋比低脂優格更健康	正確	不正確	不知道
5	蝴蝶圈比薯片脂肪量更高	正確	不正確	不知道
6	薯條是一個很好的蔬菜選擇	正確	不正確	不知道
7	烤食物比炸食物要健康	正確	不正確	不知道
8	吃帶皮的雞肉比吃不帶皮的雞肉要健康得多	正確	不正確	不知道
9	乾燥水果是一個很好的水果選擇	正確	不正確	不知道
10	在食物中多放鹽是健康的	正確	不正確	不知道
11	喝大量的果汁會導致蛀牙	正確	不正確	不知道
12	白麵包與全麥麵包所含食物纖维一樣多	正確	不正確	不知道
13	汽水與碳酸水是一樣健康的	正確	不正確	不知道
14	吃太鹹的食物可以引起高血壓	正確	不正確	不知道
15	水果口味麥片與葡萄乾麥片一樣健康	正確	不正確	不知道
16	罐頭湯中食鹽量是健康的	正確	不正確	不知道
17	泡麵是健康的午餐或點心選擇	正確	不正確	不知道
18	花生夾心餅乾是比優格更好的零食選擇	正確	不正確	不知道
19	一份肉的量應是一副紙牌的大小	正確	不正確	不知道
20	人無聊時比他們忙時吃得更多	正確	不正確	不知道

運動知識量表

1	運動有助於減輕壓力	1	0	0
2	經常運動的人比不運動的人健康	1	0	0
3	運動可以給你更多的能量	1	0	0
4	活動有助於降低你的血壓	1	0	0
5	運動可以幫助預防糖尿病	1	0	0
6	規律運動可以使你感到快樂	1	0	0
7	跑步比走路好	1	0	0
8	跳舞是運動的一種	1	0	0
9	在運動時呼吸急促和頭暈表示運動量足夠	1	0	0
10	每週健身3次或三次以上的人比不運動的人每天消耗更多的熱量	1	0	0
11	父母會運動的孩子往往比父母不運動的孩子運動得多	1	0	0
12	在運動前做一些伸展和缓慢活動是好的	1	0	0

APPENDIX D

APPROVALLETTER FROM THE INSTITUTIONAL REVIEW BOARD

ASU Knowledge Enterprise Development

Office of Research Integrity and Assurance

To:	Michael Belyea NHI
From:	Carol Johnston, Chair Biosci IRB
Date:	09/22/2011
Committee Action:	**Expedited Approval**
Approval Date:	09/22/2011
Review Type:	Expedited F7
IRB Protocol #:	1109006862
Study Title:	Predictors of overweight/obesity in Taiwanese adolescents
Expiration Date:	09/21/2012

The above-referenced protocol was approved following expedited review by the Institutional Review Board.

It is the Principal Investigator's responsibility to obtain review and continued approval before the expiration date. You may not continue any research activity beyond the expiration date without approval by the Institutional Review Board.

Adverse Reactions: If any untoward incidents or severe reactions should develop as a result of this study, you are required to notify the Biosci IRB immediately. If necessary a member of the IRB will be assigned to look into the matter. If the problem is serious, approval may be withdrawn pending IRB review.

Amendments: If you wish to change any aspect of this study, such as the procedures, the consent forms, or the investigators, please communicate your requested changes to the Biosci IRB. The new procedure is not to be initiated until the IRB approval has been given.

Please retain a copy of this letter with your approved protocol.

APPENDIX E

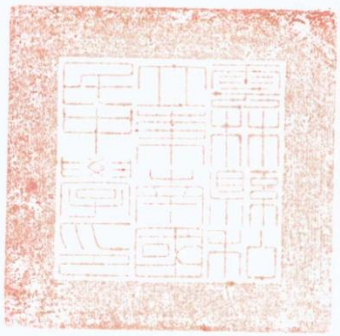
SCHOOL CONSSENT FORMS FROM THE SCHOOLS IN TAIWAN

SCHOOL CONSSENT

雲林縣私立東南國民中學

School of 雲林縣私立東南國民中學 permits with Shu-Min Chan, doctoral student at Arizona state university, doing data collection for her dissertation.

Signature: 校長劉盛華 Liu Sheng hua Date: 2011.09.09



SCHOOL CONSSENT

School of 西螺國中 permits with Shu-Min Chan, doctoral student at Arizona state university, doing data collection for her dissertation.

Signature: 林彩玲 西螺國中 校長 林彩玲 Date: 2011.09.08

同　　意　　書

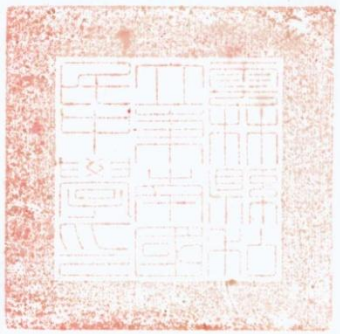
雲林縣私立東南國民中學

本校 雲林縣私立東南國民中學 同意亞利桑那州立大學 詹淑敏 博士生

至本校進行論文研究資料收集。

簽名: 雲林縣私立東南國民中學 校長 劉盛華 劉盛華

日期: 2011.09.09



同　　意　　書

本校 西螺國中 同意亞利桑那州立大學 詹淑敏 博士生至本校進行論文研究資料收集。

簽名: 林彩玲　　日期: 2011、09、08

西螺國中 校長 林彩玲