UNIVERSITY OF CYPRUS

DEPARTMENT OF PSYCHOLOGY

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SELF-REGULATORY AND SOCIAL FACTORS INFLUENCING THE EATING BEHAVIOR OF ADOLESCENTS

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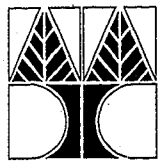

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Η αυτοδιαχείριση και η επίδραση κοινωνικών παραγόντων στην διαμόρφωση της διατροφικής συμπεριφοράς των εφήβων

ΠΕΡΙΛΗΨΗ

Η παρούσα έρευνα εξετάζει τους προσωπικούς παράγοντες (πεποιθήσεις και ικανότητες αυτοδιαχείρισης) και διαπροσωπικούς παράγοντες (οικογενειακό περιβάλλον και επίδραση των φίλων) ως προς την υγιεινή και ανθυγιεινή διατροφική συμπεριφορά των εφήβων. Συγκεκριμένοι στόχοι είναι:

1. Να διερευνήσει αν υπάρχουν διαφορές ως προς την επίδραση των προσωπικών και διαπροσωπικών παραγόντων στην επίτευξη του στόχου που αφορά στην υγιεινή διατροφική συμπεριφορά.
2. Να εξετάσει τις διαφορές ως προς την επίδραση των πιο πάνω παραγόντων στην υγιεινή αλλά και ανθυγιεινή διατροφική συμπεριφορά.

Στην έρευνα συμμετείχαν 799 έφηβοι με μέσο όρο ηλικίας 16.6 (τυπική απόκλιση: 4.8). Εξαιτίας του σχεδιασμού της έρευνας (διαχρονική) οι συμμετέχοντες συμπλήρωσαν ερωτηματολόγια σε δυο φάσεις (με τη δεύτερη φάση να ακολουθεί έξι μήνες μετά). Στη πρώτη φάση συμπληρώθηκαν ερωτηματολόγια που αφορούσαν τις πεποιθήσεις αυτοδιαχείρισης, τη συχνότητα κατανάλωσης υγιεινών και ανθυγιεινών τροφών, την επίδραση που δέχονται από φίλους οι έφηβοι ως προς την διατροφική τους συμπεριφορά και την επίδραση του οικογενειακού περιβάλλοντος. Στη δεύτερη φάση οι συμμετέχοντες απάντησαν σε ερωτηματολόγια που αφορούσαν τις δεξιότητες αυτοδιαχείρισης, την συχνότητα κατανάλωσης υγιεινών και ανθυγιεινών τροφών, μια κλίμακα που αφορούσε τα σωματικά συμπτώματα και μια κλίμακα που αφορούσε το βαθμό κόπωσης (κούρασης) τους. Τέλος και στις δυο φάσεις ανέφεραν το ύψος και τα κιλά τους και με βάση τις πληροφορίες αυτές υπολογίστηκε η συνολική μάζα του σώματος τους (BMI).

Για τις αναλύσεις των δεδομένων χρησιμοποιήθηκαν κυρίως τα μοντέλα δομικών εξισώσεων καθώς και αναλύσεις πολυμεταβλητής διακύμανσης.

Τα σημαντικότερα αποτελέσματα της έρευνας έχουν ως εξής:

Ο σημαντικότερος παράγοντας πρόβλεψης της υγιεινής διατροφικής συμπεριφοράς είναι οι πεποιθήσεις και οι δεξιότητες αυτοδιαχείρισης. Επίσης, το οικογενειακό περιβάλλον

φαίνεται να επιδρά στην υγιεινή διατροφική συμπεριφορά των εφήβων δια μέσου των πεποιθήσεων αυτοδιαχείρισης. Αντίθετα, οι φίλοι φαίνεται να επηρεάζουν θετικά την ανθυγιεινή διατροφική συμπεριφορά. Επίσης, η ανθυγιεινή διατροφική συμπεριφορά έχει σημαντική θετική σχέση με τα σωματικά συμπτώματα.

Όσων αφορά τώρα στις διαφορές μεταξύ ομάδων, η έρευνα δείχνει ότι τα αγόρια επηρεάζονται περισσότερο από τους φίλους τους ως προς την διατροφική τους συμπεριφορά συγκριτικά με τα κορίτσια. Παρουσιάζονται επίσης, να καταναλώνουν περισσότερες ανθυγιεινές τροφές σε σχέση με τα κορίτσια της ηλικίας τους. Τέλος, οι έφηβοι που απέτυχαν στην επίτευξη του στόχου τους ανέφεραν περισσότερα αισθήματα και συμπτώματα κούρασης από αυτούς που πέτυχαν τον στόχο τους ή συνέχιζαν ακόμη την προσπάθεια για επίτευξη του.

Η παρούσα έρευνα δίνει μια ξεκάθαρη εικόνα για το πως ο κάθε ένας από τους πιο πάνω παράγοντες επηρεάζει την διατροφική συμπεριφορά των εφήβων. Μελλοντικές έρευνες θα μπορούσαν να βασιστούν στα πιο πάνω αποτελέσματα εξετάζοντας κατά πόσο παρεμβατικά προγράμματα τα οποία σκοπό έχουν την διδασκαλία δεξιοτήτων αυτοδιαχείρισης όντως προάγουν την αλλαγή της διατροφικής συμπεριφοράς των εφήβων.

Self-regulatory and social factors influencing the eating behavior of adolescents

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To the two men of my life, Orpheas and Stelios

Self-regulatory and social factors influencing the eating behavior of adolescents

Executive Summary

The present study tried to avoid limitations of earlier research in the area of healthy eating behavior by grounding its method on a sound theoretical framework, namely self-regulation theory and test simultaneously both personal and interpersonal parameters of healthy eating behavior. Based on this, the study proposed a theoretical model describing the interrelation of all the relevant factors and tested the extent to which the data fit the model. Further, this study applied a longitudinal design and collected the data in two phases, six months apart from each other.

The main purpose was to verify those factors that contribute to healthy eating goal accomplishment in adolescents. The most specific aims were:

- To investigate whether there is a difference between internal (self-regulation) and socially imposed factors in successful accomplishment of healthy eating behavior;
- To investigate whether there is a difference between internal and socially imposed factors in healthy eating and risky eating behavior;
- To investigate whether there is a difference in healthy eating behavior between those who had healthy eating as a goal and those who did not.

The present study focuses on the role of motivated cognitions which involve personal goals in the adoption of health behaviors.

A large representative sample of adolescents (N=799), mean age 16.6 (*SD* = 4.8) participated. The main data collection instruments were the following:

Phase I

- Goal Elicitation Procedure
- Self-regulation cognitions scale
- Food Frequency Scale
- Peer Influence Scale
- Family Environment Scale

Phase II

- Goal Elicitation Procedure
- Self-regulation skills scale
- Food Frequency Scale
- Somatic Symptoms Scale
- Checklist Individuals Strength

In the exploratory factor analysis a number of factors were extracted defining the main constructs of the study. The most important factors were:

- Self-regulation cognitions (Goal commitment and persistence, Goal efficacy, Self-determination)
- Healthy eating (Carbohydrates, Vegetables, Fruits and White meat)
- Risky eating (Sweets, Red meat)
- Peers Influence (Peers approval of eating behavior, Adaptation to peers eating patterns, Peers attitudes towards eating)
- Family environment (Family cohesion, Family control, Family independence)
- Self-regulation skills (Self-criticism skill, Planning skill, Self-efficacy skill, Self-reward skill, Emotional control skill, Attention /stimulus control skill)
- Somatic symptoms (Headaches, Body aches)
- Individual strength (Subjective feeling of fatigue, Lack of energy, Motivation)

Confirmatory factor analysis was used and verified that factors themselves were well defined. After testing the fit of the measurement models the data were further statistically processed again in structural equation modeling. A multiple group model was used, with the following three groups: adolescents who had healthy eating as a goal, adolescents who had physical exercise as a goal and adolescents who had quitting smoking as their goal. The goodness of fit statistic of this model can be considered as excellent (χ^2/df = 2065.969/ 1042=1.98, p<001, CFI=.99, RMSEA =.06).

In addition, to the structural equation modeling procedure, a series of other computations were performed such as: Bivariate Correlation Matrix (pearson *r)* Multivariate Analysis of Variance (MANOVA) and t-tests.

The most notable findings of the present study were the following:

- Self-regulation skills is the most important parameter of healthy eating goal accomplishment. Self-regulation skills had a strong positive relation with goal approximation that in turn had a strong positive relation with healthy eating;
- Family environment had a strong indirect relation with healthy eating through self-regulation cognitions and peer influence;
- Family environment had a strong positive relation with self-regulation skills;
- Peer influence had a direct positive relation with adolescents eating behavior and especially risky eating behavior;
- Peer influence had a negative relation with both self-regulation cognitions and self-regulation skills;
- Risky eating had a strong relation with somatic symptoms such as soreness of muscles, trouble getting breath, hot or cold spells and numbness or tingling in parts of the body;
- Male adolescents appeared to be influenced by their peers and adapt their peers eating behaviors more compared to female adolescents;
- Adolescents who failed to pursue their goal and stopped trying reported more fatigue feelings, lack of energy and less motivated compared to those who have successfully accomplished their goal or they are still pursuing it;
- Male adolescents engaged more in risky eating behavior compared to female adolescents;

The present study gave a clear view of the impact that each of these parameters (personal and interpersonal) has on healthy eating behavior. This research increases knowledge about the role of specific predictors of eating behavior among adolescents, thus providing potential targets for clinical intervention. Future research needs to build on these findings by testing whether interventions that target these predictors and especially self-regulation skills produce actual and sustainable behavioral change.

1. INTRODUCTION

1.1. The problem

The dominant lifestyle in the western type of culture and the conditions that exist within the contemporary family (time pressure, tendency for seeking easy ways and solutions to everyday problems) affect drastically the eating behavior of the average individual and lead to unhealthy diet. Adolescents are particularly influenced by this situation. As Barr (1994) points out, a high intake of saturated fat and a low consumption of vitamins, fruits and vegetables are typical of an adolescent's diet. We could say that adolescents are at a high risk concerning their dietary habits, because they are at a stage in their development where they formulate a life-style that is very difficult to change later on. It is very important to detect and control the psychosocial factors that contribute to the development of individual healthy eating behavior, because once a pattern of healthy eating habits is established during adolescence, the risk of major chronic diseases including cardiovascular disease and cancer can be reduced (Keenan & Abusablha, 2001). Health reports on eating behavior from around the so-called developed countries say that unhealthy diet (fast-food, salty snacks and sweets) is the rule and healthy food seems to be only the exception. If the current picture remains unchanged, then many undesirable consequences will follow.

Understanding the broad range of factors that form adolescents' eating pattern is important for developing intervention programs to address poor eating habits. Thus, this study focuses on the factors that may affect eating behavior. These factors can be distinguished into two general categories: those that are internal to the individual and those that are externally imposed. Examples of the first category are the individuals' motivation and determination to control their diet, to set up and successfully attain goals for losing weight and controlling dietary intakes etc. Examples of the second category are social and environmental factors such as family and peer relations with the adolescents and the impact of these relations on consuming healthy or unhealthy substances. Both groups of factors should be examined in order to understand the process of developing and controlling eating behavior. Studies on self-regulation show that people who are managing their weight, report a significantly higher number of self-regulation strategies (Clark & Zimmerman, 1990; Kitsantas, 2000). Also, many studies on social environmental factors (for example, De Bourdeaudhuij & Van

Oost, 2000) argue that for understanding the dietary behavior of the individual, the family context cannot be ignored. Moreover, other studies underline the impact of peers on eating behaviors and specifically the association of peers with the intake of foods rich in saturated fats (Monge-Rojas, Nunez, Garita & Chen-Mok, 2002).

1.2. What is missing?

Even though great progress has been made during the past decades in understanding and altering eating behavior, there are still some gaps in the relevant literature. The existing social-cognition models and stage models that explain the individuals' behavior are quite limited. There is a need for a new integrative approach within which motivated cognitions, personal goals and self-regulation skills will be examined. Therefore, this study operates within the framework of the motivational systems theory (Ford, 1992). It is essential to identify the factors – both internal and external to the individual - that contribute to healthy eating behavior, especially in the transitional period between adolescence and adulthood. Also, it is important to measure actual behavior and not intentions, as some studies have done so far. It should be noted that there are no studies at present measuring personal variables such as self-regulation skills and social influence on healthy eating behavior. Furthermore, there are no longitudinal studies at present combining personal and interpersonal skills for healthy eating behavior. Finally, there is also an unanswered question "What are the consequences when the goal attainment of healthy eating behavior is influenced by the environment and what are the consequences when the above behavior is influenced by internal factors and especially self-regulation?"

The present study tries to fill the above gaps by combining the self-regulation theory with contextual frameworks that describe the influence exerted on individual eating behavior. That is, the present study incorporates self-regulation skills such as goal setting, persistence etc, and other interpersonal factors such as family and peer influence to build a model of interactions between all the relevant factors. Thus, the present study attempts to contribute to the literature by avoiding some of the identified limitations of earlier studies.

1.3. The study

The aim of the present study is to examine the factors, personal and interpersonal, that influence healthy eating behavior of adolescents. This study expands upon the existing body of the literature and develops a structural equation model that describes the interdependence of all the relevant variables and provides further explanations on the association between the factors.

1.3.1. Cypriot adolescents and eating behavior

There is a very little research in the area of healthy eating in Cyprus population. Additionally, data concerning psychological factors contributing to healthy eating behavior are lacking. Thus, there are only few studies investigating the eating behavior and this is mainly based on epidemiology of paediatric obesity in Cyprus. For instance, a research on the increased frequency of multiple cardiovascular risk factors in children 11-23 years old in Cyprus indicated that 20.3% of boys and 18.1% of girls are overweight (Tornaritis, Savva, Shamounki, Kourides, & Hadjigeorgiou, 2001). Furthermore, a study by Savva, Ierodiakonou, Tornaritis, Epiphaniou-Savva, Georgiou, Eleftheriou, and Skordis (1999) showed that children`s BMI (aged 10 to 18 years old) was strongly correlated to serum leptin levels, both in boys ($r = 0.704$, $p<0.001$) and girls ($r = 0.741$, $p<0.001$). Leptin is a protein hormone, derived from the adipose tissue and implicates in the pathogenesis of obesity.

Furthermore, the prevalence of childhood obesity in Cyprus is similar to the other developed countries (Kourides, Tornaritis, Kourides, Savva, Hadjigeorgiou, & Shamounki, 2000). As it was previously mentioned, there is no research on psychological parameters that influence obesity and eating behavior in Cyprus population in general. There only two studies that investigate other parameters in correlation with eating behavior. More specifically, the first study examined the relationship of television viewing to cardiovascular risk factors in Cyprus children (Kourides, Tornaritis, Kourides, Savva & Hadjigeorgiou, 2001). In this study, the children were divided into three groups based on the time spend on television viewing (Group 1<14, Group 2 < 14-28, Group 3< 28 hours per week). It was found that Group 3 consumed more calories per day in relation to Group 1, and especially girls appeared to had increased weight compared to Group 1 girls, increased triceps skinfold thickness and increased serum total cholesterol. Therefore, this study

suggests that excessive television viewing is associated with an increase in the prevalence of certain cardiovascular risk factors in children.

The second study investigates the prevalence and socio-demographic associations of undernutrition and obesity among preschool children in Cyprus (Savva, Tornaritis, Hadjigeorgiou, Kourides, Savva, Panagi, Christodoulou, & Kafatos, 2005). The findings of this study presents that the prevalence of obesity was higher in rural (16.1%) than urban children (12.8%;p=0.046). Also, obesity in preschool children was associated with paternal and maternal obesity.

The present study is the first study in Cyprus examining the personal and interpersonal factors influencing the eating behavior of adolescents.

1.3.2. Healthy eating behavior in adolescents

The dependent variable of this study is the healthy eating behavior of individuals who are still in their developmental process. Healthy eating behavior is defined as a balanced diet low in fat, high in fiber (fruit and vegetables) and limited in salt and sugar-rich foods such as soft drinks, snacks and sweets. Eating behavior is emerging as one of the major aspects of modern lifestyle that influence the risk of death from cancer and cardiovascular disease (World Health Organization, 1990; Ulbricht & Southgate, 1991; Doll & Peto, 1981). In a recent survey conducted in the United States 15,3% of children aged 6-11 years and 15.5% of children aged 12-19 years were found to be overweight (Center for Disease Control and Prevention-CDC, 2003). This represents a 48% increase among adolescents aged 12-19 years and 35% increase among children aged 6-11 years compared to the previous survey completed in 1995 (CDC, 2003). Further, an analysis of adolescents' food intakes from 1965 to 1996 showed that the nutritional and health status of adolescents may be compromised. Specifically, during this period the total fat intake of adolescents increased, but intake of raw fruit, vegetables and milk consumption was decreased (Cavadini, Siega-Riz, & Popkin, 2000).

There is evidence showing socio-demographic variations upon eating patterns of adolescents. For instance, females skip breakfast more frequently than males do (Shaw, 1998). Also, in another study a large percentage of female adolescents were at

risk for inadequate intakes of fruits and vegetables (Pesa & Turner, 2001). On the other hand, regionally specific samples provide inconsistent findings. Black adolescents are at greater risk than Whites for poor vegetable, but not for poor fruit consumption (Beech, Rice, Myers, Johnson, & Nicklas, 1999). Additionally, Asian adolescents and Hispanic females are more likely to report low intake of dairy products (Neumark-Sztainer, Story,& Dixon, 1997).

Adolescence is a crucial life stage for the development of adult obesity (Dietz, 1997). The development of healthy eating patterns in which an adequate fruit and vegetable intake is included, is particularly important at this rapid period of growth and development, and may lead to continue these eating patterns during adulthood (Kelder, Perry, Klepp, & Lytle, 1994). Studies have shown that adolescents' vegetable and fruit intakes are well below the recommended amounts (Wiecha, Fink, Wiecha, & Hebert, 2001). Further, in a large population study of eating patterns among adolescents, fruits, vegetables, grains and low fat food intake was considerably lower than the "*Healthy People 2010 Recommendations"* (Neumark-Sztainer, Story, Hannan, & Moe, 2002). Additionally, a study of Munoz, Kreb-Smith, Ballard-Barbash, and Cleveland (1997) indicated that the intake of fats and added sugars makes up 40% of the total energy intake of adolescents, thus adding to the concern for obesity among adolescents. Another study showed that adolescents who ate fewer meals reported that they ate more snacks. Further, 80% of adolescents reported eating snacks between meals that usually consisted of processed "junk food" and high fat "fast food". These snacks account for one third of adolescents' daily food intake (Dwyer, Evans, Stone, Feldman, Lytle, & Hoelscher, 2001). Moreover, in another study on weight management goals and practices among adolescents it was found that, based on their lifestyle choices, adolescents are placing their health at risk. This lifestyle involves insufficient physical activity and unhealthy food choices which in turn can result in a high prevalence of obesity. Specifically, based on adolescents self-reports, one out of every four high school students (that is, 25%) is either already overweight (11%) or at risk for becoming overweight (14%) (Lowry, Galuska, Fulton, Wechsler, & Kann, 2002).

It is important to note that the relationship between adolescent diet and adult chronic disease risk is based on the premise that eating behaviors develop in childhood and continue into adulthood (Lytle, 2002). Further, during adolescence teens can acquire as much as 15% of their adult height and 50% of their adult weight, plus a significant percentage of their peak bone mass (Chicoye, Jacobson, Landry, & Starr, 1997). Thus, interventions at this phase are important because individuals start to develop heightened autonomy and begin making their own decisions about eating (World Health Organization, 1998). Studies have shown that college students who took an introductory nutrition class presented increased nutrition knowledge but little positive change in eating behaviors (Shannon & Chen, 1988). Therefore, proactive strategies such as training for the development of self-regulation skills and behavioral training (e.g. goal setting, self-monitoring, self-evaluation etc) must be examined and be included in intervention programs for healthy diet (Corwin, Sargent, Rheaume, & Saunders, 1999).

1.3.3. Factors influencing eating behavior

The argument of the present study is that the dependent variable – healthy eating behavior - is influenced by, and can be determined from a chain of independent variables. The independent variables can be distinguished into two general groups: those that come from the person himself (intra-personal) and those that are based on the interaction with people from the social environment (interpersonal).

The era in which the individuals could rely on health care systems is over. The current trend is to move away from dependency on institutions and towards more autonomy. The contemporary individuals need to be able to make responsible decisions regarding health and illness and take control of their own life. Therefore, this study focuses on endogenous variables such as personal goals, self-regulation cognitions and skills. The self-regulation cognitions examined in the present study are: commitment and persistence, goal efficacy, and self-determination. The self-regulation skills are: ownership, self-efficacy, need for feedback, help seeking, social comparison, planning, self-monitoring, self-criticism, self-reward, attention/ stimulus control, coping with problems, self-efficacy enhancement and emotion control (Karoly, Ruhlman, Maes, De Gucht & Heiser, 2006).

Hence, the interpersonal variables are the following: (a) Peers' influence on healthy eating (such as: food beliefs transmitted by peers, approval of new eating habits by peers and adaptation to the eating pattern of peers). (b) Family influence on healthy eating (such as: family members' relationships–cohesion, parental monitoring/ control, independence and autonomous function within the family setting).

To summarize, the present study examines the influence of self-regulation skills and other, social factors such as family and peers on adolescents' healthy eating behavior. Its purpose is to build upon the existing theoretical framework on self-regulation parameters and to contribute to the relevant literature by proposing and testing a structural equations model able to describe the interrelation of all the above factors.

The theoretical framework of this study will be presented and discussed in the following Chapter. After that, the relevant literature will be reviewed.

2. THEORETICAL FRAMEWORK

2.1. Models explaining health behavior

A variety of theoretical models, set within a social cognitive framework, have been proposed both to explain and to facilitate health behavior change. The influence of these models is described in the following sections. The primary purpose of this section is to offer an overview of the models, rather than to present an exhaustive critique of them. The intention models will be discussed first, followed by the stages of change models. Emphasis will be given to self-regulation models, since they provide the theoretical framework of the present study.

2.1.1. Intention Models

The following models have been successful in explaining part of the variance of the intention to adopt a new behavior. However, they have been very weak in predicting actual behavior. The models assume that individuals, based on their expectancies, intent to change a behavior. The models basically examine the factors that shape intention, and intention can be perceived as the first phase of self-regulation, that is, goal setting. Although, they focus on the importance of goals in predicting behavior, the goals in these models are not set by the individuals. Additionally, these models fail to describe the process of reaching the health behavior goals.

The Health Belief Model (HBM) (Janz & Becker, 1984; Rosenstock, 1974). Four components are included in the model: perceived susceptibility to a health threat; perceived severity of the threat; perceived benefits of the behavior change; and perceived barriers to the behavior change. Additionally, internal and external cues to action (e.g. symptom perception), and the level of available social support are important factors in determining the likelihood for action.

The Theory of Planned Behavior (Ajzen, 1988, 1991) is a development of Fishbein and Ajzen's (1980) Theory of Reasoned Action to which a third element (perceived behavioral control) was added to explain difficult behavior. The assumption of this theory is that people make rational decisions about their behavior based on beliefs about behavior and its consequences. Intentions are formed by a function of attitudes

and perceived social norms toward the behavior, and perception relating to ease or difficulty of performing the behavior. Perceived behavioral control may also influence behavior directly if it is not under complete volitional control.

Protection Motivation Theory (Rogers, 1975). The theory focuses on processes of decision-making to protect against, or prevent, harmful events, and also has been applied as a model of coping (Rippetoe & Rogers, 1987). It is demonstrated by the inclusion of two primary cognitive mediating processes; threat (or fear) appraisal, and coping appraisal. It involves an evaluation of one's perceived vulnerability to a specific health danger and the perceived severity of that danger. On the other hand, coping appraisal is involved in evaluating the factors influencing engagement with a positive factor. Further, it involves an appraisal of one's efficacy for performing a behavior and an estimation of effectiveness of the behavior.

Social Cognitive Theory (Bandura, 1986). The theory argues that self-efficacy and outcome expectancies which are distinguished in situation and action outcome expectancies are the main determinants of behavior. The so called situation-outcome expectancies are defined as the consequences which derive from the environment and not from the personal control. Action-outcome expectancies are perceived as the consequences emerged from individual's own actions and control. Self-efficacy is the belief of ones ability to perform a behavior and produce a positive outcome (Bandura, 1997).

2.1.2. Stages of Change Models

The argument of these models is that in order to reach their goals individuals need to go through a stage process. Although the following models have tried to describe the process aspect, they ignored the content aspect by focusing on one single goal target (e.g. quitting smoking). Furthermore, both social cognitive models and stages of change models do not focus on affective and cognitive processes. However, each stage mentioned in the following models can be considered as part of the process of self-regulation.

The *Action Control Theory* (Kuhl, 1981, 1985). The ACT was the first to distinguish between motivational and volitional aspects of behavior. It was the forerunner of stage models that distinguished between the formation of an intention to act, and the implementation of the action. Fuhrmann and Kuhl (1998) proposed a refined theory of volition that specifies two different volitional models: (1) self-regulation, as autonomy oriented mode aimed at preserving and integrating self and (2) self-repressive mode aimed at maintaining and enacting goals that are appropriate and compatible to the self.

The *Transtheoretical Model* of behavior change (DiClemente & Prochaska, 1982, 1985). The theory proposes that behavior change is a dynamic process. Its main feature is that different types of cognitions are important at five distinct stages of behavior change. These stages are: (1) Precontemplation (no intention), (2) Contemplation (thinking of quitting an undesirable habit, eg. smoking) (3) Preparation (developing a plan) (4) Action (quitting) (5) Maintenance (after 6 months of quitting).

Health Action Process Approach (Schwarzer, 1992; Schwarzer & Fuchs, 1995). In this model there are two principal processes that are hypothesized to account for the adoption, initiation, and maintenance of health behavior: motivation and volition (the latter consists of the subprocesses of planning, action, and maintenance). At the motivation phase self-efficacy and outcome expectancies are the major predictors of intention. In the action phase, the relationship between intention and behavior varies according to a set of cognitive, behavioral, and situational factors. Planning and goal setting are important in the initial stages. Metacognitive activity is essential in order to protect against premature disengagement with one's plan and to ensure persistence in the pursuit of one's goal. Strategies such as the ability to delay gratification and self-reinforcement plus situational cues are important in the action phase. Thus, intention becomes a series of steps to perform, depending on perceived competence (self-efficacy).

Precaution Adoption Process Model (Weinstein, 1988). In this model there are seven stages that indicate an individual's movement from complete lack of awareness of a health issue, through awareness, engagement (or contemplation), commitment,

change, and maintenance. After becoming aware of relevant issues, the person may decide not to engage in a behavior, and this is the seventh stage of the model.

2.1.3. Limitations of the most frequently used models

From the above mentioned models, the Theory of Planned Behavior (TPB)(developed out of the earlier Theory of Reasoned Action) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) is the most frequently used for the identification of the factors influencing eating behavior. The TPB basically indicates the proximal influences of individual's intention to change a behavior. Intention is described as the motivation that pushes the person towards making an effort to perform a particular behavior. Further, intention is determined by attitudes (positive/negative evaluation of behavior), subjective norms which is the individuals' perception of social pressure on the certain behavior and perceived behavioral control which is the individual's perception on how much control they can have on the performance of the certain behavior or how difficult or easy it is to be implemented (Conner, Norman & Bell, 2002). It seems that this additional "perceived behavioral control variable had a crucial contribution in predicting intentions to change a certain behavior. For instance, in a meta-analytic review of TPB, after examining several applications including attitudes and subjective norms, Armitage and Conner (1999b) found that perceived behavioral control accounted for the 39% of the variance in intention to change behavior.

The food – related behaviors which have been studied using the TPB include reduction of fat intake (Paisley, Lloyd, Sparks & Mela, 1995; Paisley & Sparks, 1998); skimmed milk consumption (Raats, Shepherd & Sparks, 1995); organic vegetable consumption (Sparks & Shepherd, 1992); chip consumption (Towler & Shepherd, 1991/2); biscuit and wholemeal bread consumption (Sparks, Hedderley & Shepherd, 1992); health related eating behaviors (Ajzen & Timko, 1986); and healthy eating (Povey, Conner, Sparks, James & Shepherd, 2000).

The most widely used stage model in health promotion is The Transtheoretical Model (TTM) (Prochaska & DiClemente, 1983; Prochaska & Velicer, 1997). Basically, the TTM defines five stages of change. In the first stage, called precontemplation, the

individual has no intention to change the risky behavior within the next six months. It is noted that the TTM assumes that six months is the duration needed for a person to plan to alter a behavior (Velicer, Hughes, Fava & Prochaska, 1995). In the second stage, contemplation, there is an intention by the individual to change behavior within six months, but not within 30 days. At the third stage, preparation, the individual is ready to make this change within 30 days. The action stage follows in which the individual has already changed the risky behavior to a healthy behavior. Finally, at the maintenance stage individuals should maintain this new behavior for at least six months.

The TTM has been applied during the last decade for the promotion of dietary behavior change, such as: dietary fat reduction (Curry, Kristal, Bowen, 1992), adopting healthy diets (Glanz, Patterson, Kristal, Feng, DiClemente, Heimendinger, Linnan, & McLerran, 1994), reducing dietary fat to 30% of energy or less (Greene, Rossi, Reed, Willey, & Prochaska, 1994), intake of dietary fat in African-American women (Hargreaves, Schlundt, Buchowski, Hardy, Rossi, & Rossi, 1999), long-term reduction of dietary fat intake in nutrition intervention group program (Finckenor, & Byrd-Bredbenner, 2000) and the assessment of stages of change for fruit and vegetable in young adults (Ma, Betts, Horacek, Georgiou & White, 2003). Further, De Nooijer, Van Assema, De Vet and Brug, (2005) examined stage stability for nutrition behavior such as fat, vegetable and fruit. Also, De Vet, Nooijer, De Vries and Brug (2005) examined stages of change in fruit intake.

However, the TPB and other similar theories such as the Health Belief Model, Bandura's Social Learning Theory and Protection Motivation Theory examined people's intention rather than behavior and therefore they have been quite successful in explaining some of the variance of the intention toward the new health behavior. But their weaknesses lie first on the fact that the target health behavior is considered in an external way and not as an existing personal goal. Secondly, they measure intention and not actual behavior and thirdly, they fail to describe the process in approaching the health behavior goals (Maes & Gebhardt, 2000). In other words, the weaknesses of the stage of change models are firstly, the fact that these models suggest a fixed sequence that all the individuals must go through and secondly, these

models concentrate on behavior rather than on determinants or operative mechanisms that contribute to the accomplishment of the personal goal (Bandura, 1997).

Thus, because of the pre-mentioned limitations of the intentional and the stages of change models it is important not only to identify the exact parameters that influence healthy eating but also to understand the process of approaching such a goal. Even though the Latin root of the word "motivation" means "to move", thus to take action, little research has been conducted so far to examine holistically the processes that lead to the accomplishment of a personal goal called "healthy diet". There is a need for theoretical integration in the area of healthy eating behavior. A theory is needed that will incorporate determinants such as: the personal goals, the process of goal attainment (both cognitive and affective) plus the complex interactions of all these processes with the environment the individuals live in.

2.2. Self-regulation and eating behavior: An integrative theory

Eating is part of a well-regulated system. The eating behavior cycle (that is, feeling of hunger - food consumption - feeling of satiation) is more or less mechanical and should not pose any problems for the organism. However, obesity still exists and individuals still try to regulate the amount and the quality of their food intake. Thus, it seems that the function of hunger and satiety is not as efficient as it appears to be. Self-regulation emerges when automatic regulation fails on individual's goal accomplishment (Herman & Polivy, 2004). Self-regulation is contained in goal setting theory, because the setting of goals and their transformation into action is a volitional process (Binswanger, 1991). Thus, self-regulation can function as the core for examining motivation. Goals are "internal representations of desired states, where states are broadly construed as outcomes, events, or processes" (Austin & Vancouver, 1996, p.338).

There are several important theories in the area of physical health goal setting and processes of goal implementation. For the purpose of this study the following theories will be presented: (a) Carver and Scheier's (1998, 2000) Control Systems Model, (b) the Common-Sense Model (Brownlee, Leventhal & Leventhal, 2000; Leventhal, Leventhal, & Contrada, 1998), (c) the Self-Determination Theory of Deci and Ryan

(2000), and (d) the Motivational Systems Theory (Ford, 1992). The present study will draw mainly from the MST because this theory integrates the derived concepts from several self-regulation theories into a more comprehensive formation of the self-regulatory processes.

2.2.1. Control Systems Model (CSM) (Carver & Scheier, 1998, 2000)

The CSM is a system of four elements: (a) an input function which operates as a sensor (for instance a perception of the current condition), (b) a reference value which functions as additional information to the input function (for instance a standard, set-point, or goal), (c) a comparator (the device that makes comparisons between input and reference value), (d) an output function (behavior). If the comparison indicates that two values (input and reference) have no discrepancy, thus no difference, the output function remains as it was. If the comparator informs the system that there is a discrepancy between the two values, then the output changes (Carver & Scheier, 1998, 2000). The existence of feedback loops in the system facilitates the goal accomplishment. More specifically, there are two kinds of feedback loops corresponding to two kinds of goals. In the case of negative, discrepancy-reducing loop, the output function is to reduce the discrepancy between input and reference value, and thus facilitate the attempt to approach or attain a valued goal (e.g. starting a diet).

The second kind of feedback loop is a positive one. Thus, the need here is not to approach but to avoid the reference value, something like an anti-goal (e.g avoiding a behavior). The avoidance of behaviors undoubtedly result in the approach of other behaviors. Figure 1 presents the Control System Model and Figure 2 presents the negative loop (approach) and the positive loop (avoid).

Figure 1. *Control Systems Model* (CSM) (Carver & Scheier, 2000).

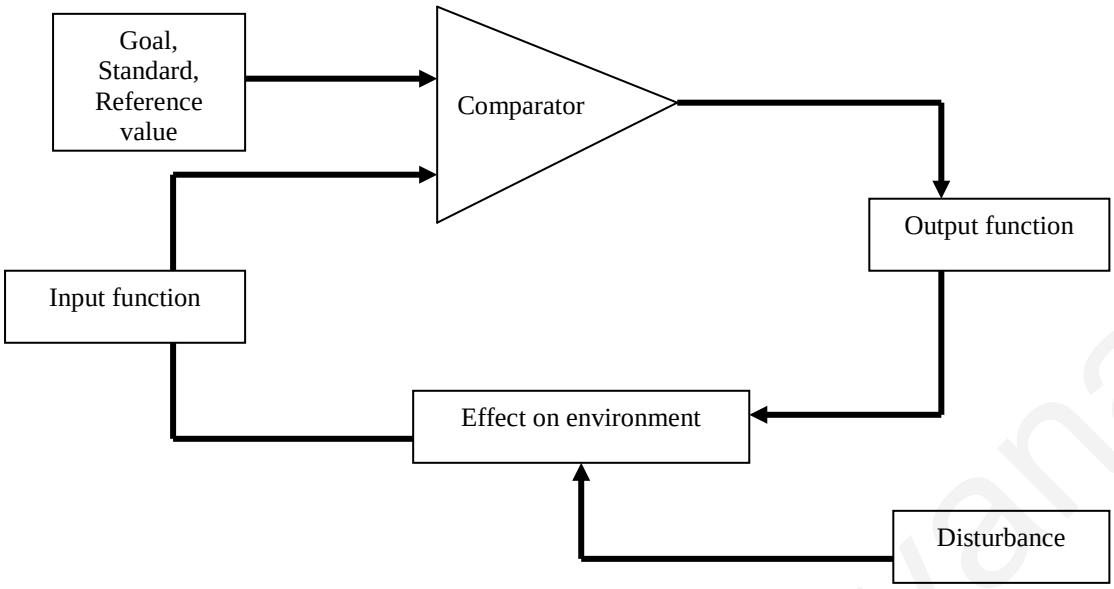
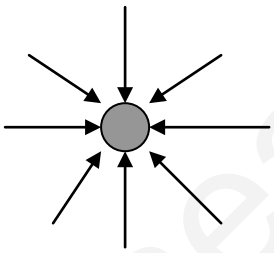
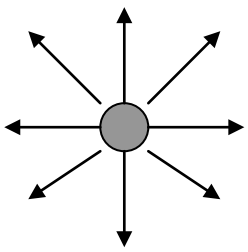


Figure 2. A positive loop results in the movement of value away from the undesired condition and then moves towards its desired condition under the influence of a negative loop (Carver & Scheier, 1998).



Negative feedback loop
(discrepancy reducing)
(approach)



Positive feedback loop
(discrepancy enlarging)
(avoid)

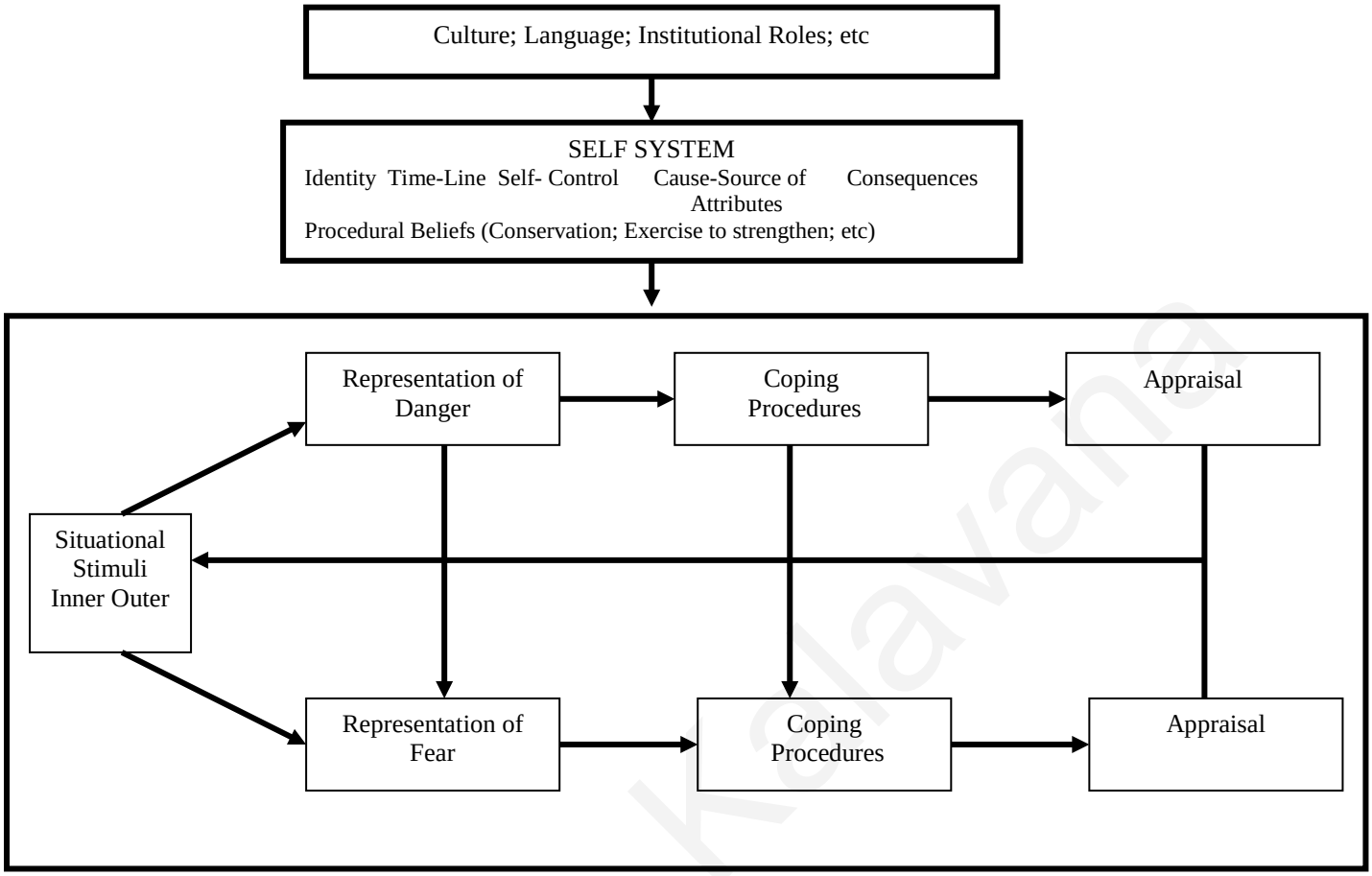
2.2.2. The Common-Sense Model (Brownlee, Leventhal & Leventhal, 2000; Leventhal, Leventhal, & Contrada, 1998).

This model focuses on health threats and their representations. More specifically, these representations have two properties: the content and organization. (I) The content representations involve the nature of health threats which can be discriminated into five dimensions. These are: (a) the label of the threat (e.g. hypertension); (b) the time needed for the disease to develop, the duration of this disease and the time for recovery; (c) the cause (e.g risky diet, luck of physical exercise), (d) the disease consequences both real and imagined (e.g. surgery, sudden death); (e) control or cure of the disease. Within the content representations the goals and reference values are defined and thus, the regulation processes are generated.

(II) The representations are organized based on schemata or psychological representations. Thus, individuals form a mental model based on their situations' reality representations. Individuals treat their condition (disease) according to the level of their organized representations (how they labeled their disease). Representations facilitate the selection of specific treatment procedures needed which in turn influences the selection and maintenance of procedures and setting criteria for efficacy appraisal (Brownlee, Leventhal, & Leventhal, 2000).

The individuals' actions unfold within the IF-THEN rules, whereas IF is considered as the content of the representations and THEN as the actions. Leventhal and colleagues (1998) indicated three types of outcomes: (a) goal relevance concerns the beliefs which formulate the responses associated with the identified threat (b) time-lines concerns the time period needed for the actions' effects (c) dose-response beliefs concerns the actions selected based on the severity of the threat. Figure 3 presents the Common Sense Model, a mental model for solving health and illness problems.

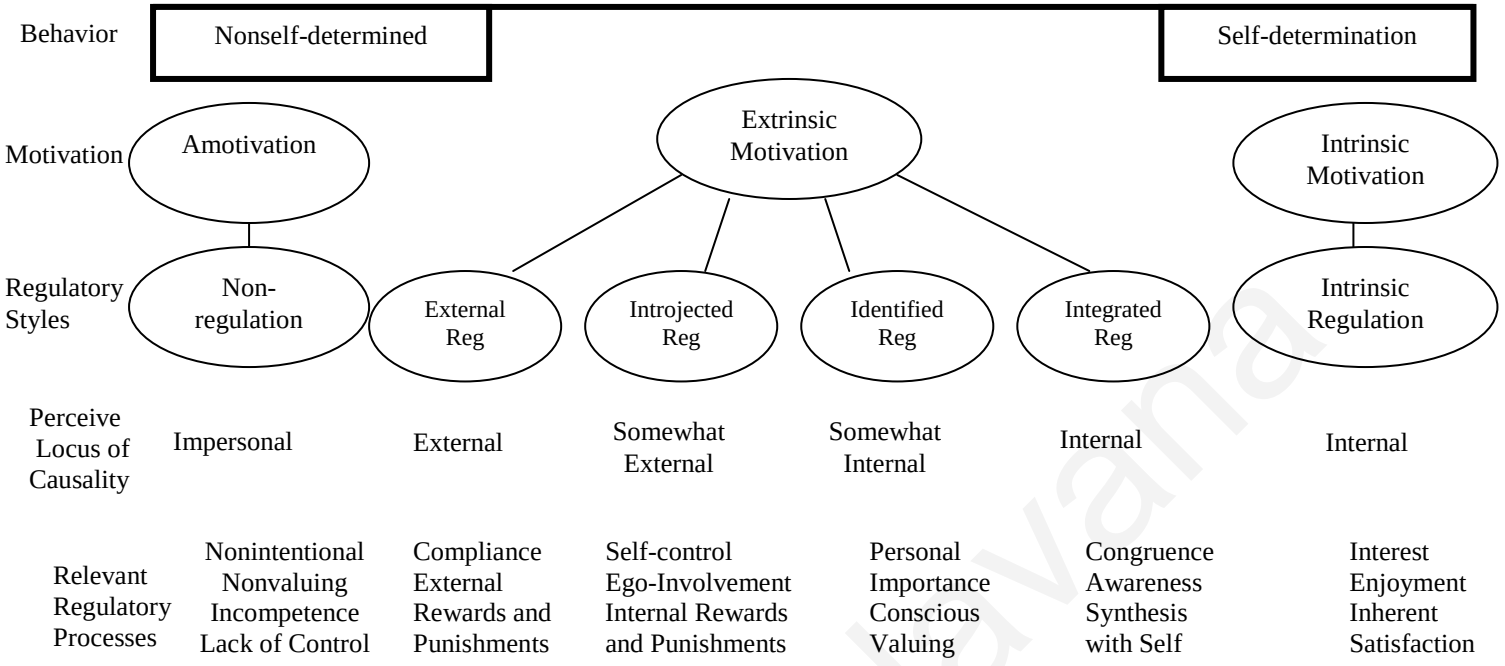
Figure 3. *Common Sense Model* (Brownlee, Leventhal, & Leventhal, 2000)



2.2.3.Self-Determination Theory (SDT) (Deci and Ryan, 1985)

Deci and Ryan (1985) integrate in SDT two perspectives on human motivation: (a) individuals are motivated to maintain an optimal level of stimulation and (b) individuals have basic needs for competence and self-determination. Intrinsic motivation is maintained only when actors feel competent and self-determined. When external control is exerted and negative feedback is given then the intrinsic motivation decreases. Further they argued that the basic needs for competence and self-determination have an impact on more extrinsically motivated behavior (Deci, Koestner, Ryan, 1999). Cognitive Evaluation Theory (CET) (Deci & Ryan, 1985), a subtheory of SDT, indicates the required processes of transferring the regulation of behavior from outside to inside (see Figure 4).

Figure 4. *The Self-Determination Continuum* (Deci and Ryan, 2000)



According to CET, social-context events can facilitate intrinsic motivation only when the individual has the opportunity to experience feelings of autonomy and self-determination. Deci and Ryan (2000) defined several levels in the process of going from external to internalized regulation. These are: (a) external (regulation coming from outside the individual); (b) introjected (internal regulation based on feelings that one has to do the behavior); (c) identified (internal regulation based on the utility of that behavior); (d) integrated (regulation based on what the individual thinks is valuable and important to the self).

2.2.4. Motivational Systems Theory

Aspects of motivation for the healthy eating behavior can be examined comprehensively based on self-regulation theories. Even though there are different self-regulation theories, no model has been holistically tested in the area of healthy eating behavior. Self-regulation refers to any effort made by an organism to alter its own responses. More specifically, self-regulation is defined as a goal-guidance process that contributes to the accomplishment and maintenance of personal goals (Maes & Karoly, 2005). Within the health-related behaviors, self-regulation refers to the capability of the individual to act in order to prevent unhealthy consequences or to

restore one's health when illness or health problems have already occurred (Purdie & McCrindle, 2002).

A major argument of the Motivational Systems Theory (MST) is that motivation is the principle aspect in producing variability and behavior change. MST is a comprehensive theory that represents "how motivational processes interact with biological, environmental, and nonmotivational psychological and behavioral processes to produce effective or ineffective functioning in the person as a whole" (Ford, 1992, p12).

Humans are goal directed and self-organized creatures. Goals are defined as desired end states individuals try to attain through the cognitive, affective, and biochemical regulation of their behavior (Ford, 1992; Ford & Nichols, 1987). These personal goals are basically representations of the consequences to be accomplished or to be avoided. Furthermore, goals are only one part of motivation, which is defined as the product of goals, emotions and personal agency beliefs.

Even though Ford and Nichols (1987) have proposed an extensive taxonomy of goals, they have focused more on the classification of these goals. Thus, they distinguished between within-person goals (desired within person consequences) and person-environment goals (desired relationship between the person and their environment). The within-person goals incorporate affective goals such as happiness, cognitive goals such as exploration and subjective organization goals such as unity. Further, the person-environment goals include self-assertive goals such as self-determination and independence. Social relationship goals (e.g. social responsibility, belonging) can be also perceived as person-environment goals (Ford, 1992; Ford & Nichols, 1987).

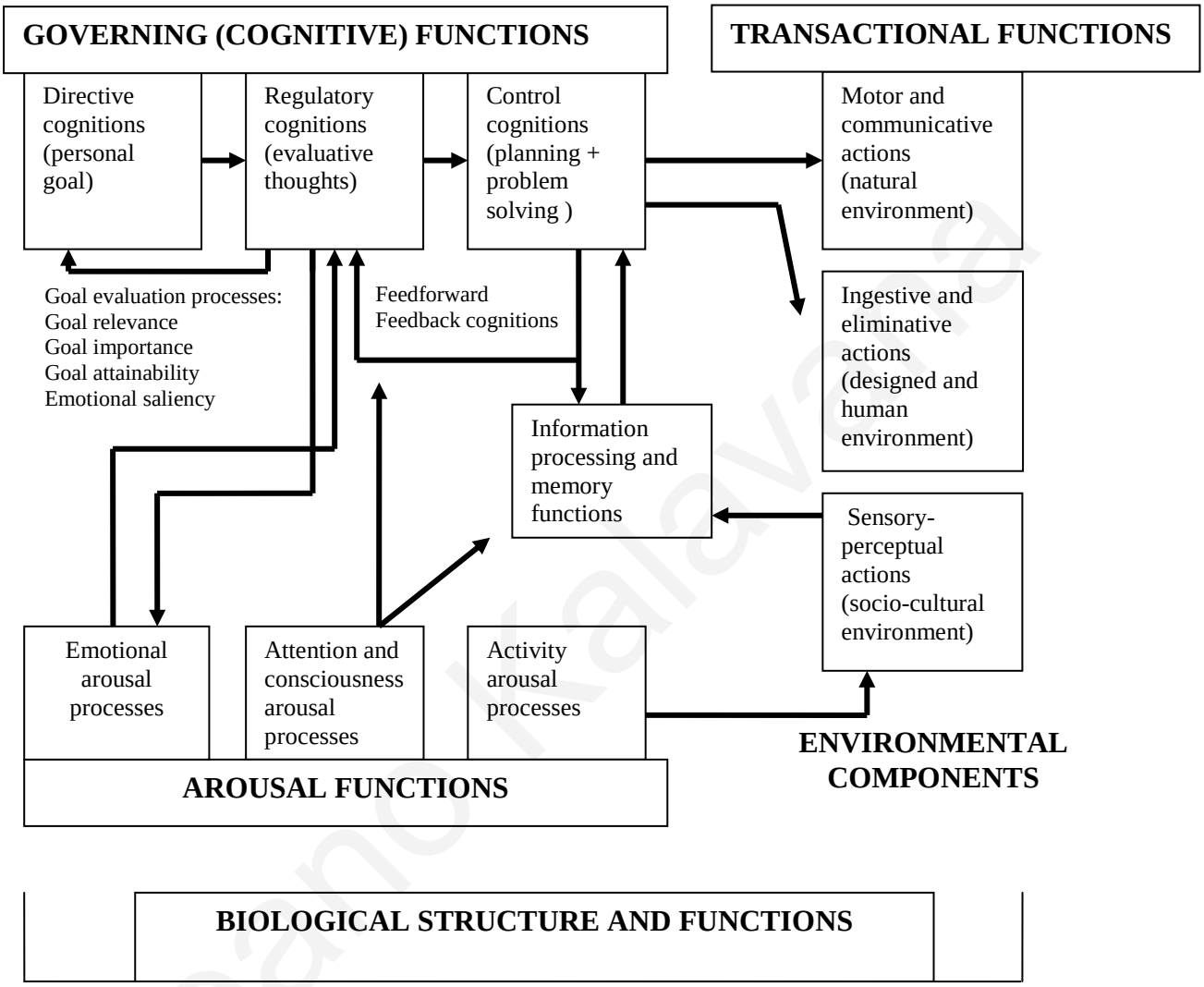
Within the framework of MST there is a hierarchical structure in which goals are formed. The goal hierarchies are distinguished in two ways: firstly, there are subgoals (short-term goals) that function as the medium for the accomplishment of the overall goal (long-term goals), and secondly, as a value hierarchy, whereas individuals ordered their personal goals based on their importance. Of course, adequate strategies should be generated by the individual for the attainment of subgoals. A systematic sight of the ultimate goals is also required. Another important issue that facilitates the

enhancement of motivation is the alignment of multiple goals. For instance, when the attainment of a single goal leads to a variety of desired outcomes, and thus the individual has several reasons for accomplishing this goal (Ford, 1992).

There are four human functional components (see Figure 5): (a) biological functions (e.g. growth, maintenance, energy production etc); (b) transactional functions such as eliminative actions, sensory-perceptual actions, motoric actions and communicative actions; (c) governing functions which incorporate directive, regulatory and control cognitions plus information and memory processes; (d) arousal functions in which attention, consciousness, activity, emotional arousal are included.

As it was already mentioned earlier, goals are thoughts for desired (or undesired) outcomes that an individual would try to accomplish (or avoid). Cognitive regulation refers to evaluative thoughts, which facilitate the choice among different goals, plans and actions. The control cognitions processes define the way a goal can be achieved. More specifically, these processes link the new information about the goal to the individual's already existing knowledge, abilities and skills. This procedure evolves in three steps which can either occur sequentially or simultaneously. These steps are: problem formulation, problem solving / plan formulation and plan execution. The arousal functions involve attention and consciousness arousal, activity arousal, and emotional arousal. Finally, the environmental components (natural, designed, human and socio-cultural) belong to the transactional processes. These processes involve the individual's interactions and relations with the environment (Ford, 1992).

Figure 5. *Motivational Systems Theory*: *Human's functions* (Ford, 1992)



In terms of cognitive regulation processes three mechanisms can be recognized: (a) feedback mechanisms which imply monitoring and evaluating of the goals progress (b) feedforward mechanisms which are the outcome expectancies that are influenced from personal abilities and context and (c) the control processes that are energized to plan and control the goals' fulfillment and therefore ensuring the maintenance of the progress independently from barriers and other goals (Ford & Nichols, 1991). In terms of the regulatory process of emotions, positive emotions associated with behavior can facilitate the maintenance of the behavior, and block the behavior that is associated with negative emotion. Furthermore, negative emotions can motivate the

individual to modify the circumstances that caused negative emotions (Ford & Nicholas, 1991).

Further on the MST and goal setting, Ford and Nichols (1987) indicated different dimension that individuals may adopt in their general orientation to goal setting. These are: (a) active-reactive (the extent to which goals are directed by the person himself or the current events); (b) approach-avoidance (the extent to which an individual perceives the goal as a positive outcome to be achieved or a negative outcome to be avoided); (c) maintenance-change (the extent to which an individual demonstrates a stability-maintenance orientation or attempt to change).

Two concepts are underlined for defining effective functioning, which is central in the MST. Within the situational level of analysis, the first is the concept of achievement which is defined as "the attainment of a personally or socially valued goal in a particular context" (Ford, 1992, p 66). At the personality level of analysis, effective functioning is represented by the concept of competence. Competence is defined as "the attainment of relevant goals in specified environments, using appropriate means and resulting in positive developmental outcomes" (Ford, 1992, p 67). It is noted that achievement in one domain can be also regarded as an individual's competence only if the desired outcomes are being achieved by using moral, legal ways. Overall, effective functioning requires the combination of aspects such as: an individual who is motivated and has the necessary skills, who is also biologically and behaviorally capable for specific interactions with the context that provides the needed information and resources for facilitating the goal attainment. As a consequence, successful goal attainment requires the completion of the following tasks: the individuals must first turn their desires into binding goals, and then to attain the set goal. These tasks benefit from self-regulation strategies.

3. REVIEW OF THE LITERATURE

3.1. Self-regulation-Introductory remarks

Self-regulation and healthy dietary behavior

Self-regulation literature describes the process and distinguishes the factors that contribute to the attainment of a goal. These are: goal setting, planning, goal striving on the one hand and monitoring, attainment, revision and persistence on the other (Austin & Vancouver, 1996). Furthermore, self-regulation theory focuses on the following mechanisms: (a) goal selection and representation, (b) goal level setting, (c) goal monitoring (d) planning (e) progress evaluation (f) problem-solving (g) emotion and action modulation. These mechanisms evolve in 3 phases: (1) goal selection, setting and construal / representation, (2) active goal pursuit and (3) goal attainment, maintenance, and disengagement.

Prior research has shown that self-determination, self-efficacy and social influence are the most dominant factors in predicting the commencement, change and maintenance of health behavior (Gochman, 1997). Therefore, the variables in the present study emerge from models that consider not only goals but the process of goal accomplishment as important in predicting behavior.

Personal goals and healthy dietary behavior

Research on goal setting for dietary change indicates that personal goal setting processes and goal implementation are likely to lead to change (Cullen, Baranowski, & Smith, 2001). Even though there are many research studies in the area of psychosocial factors influencing eating behavior, there is little research focusing on a holistic examination of goal processes. Thus, the present research examines self-regulation extensively. Within the literature effort was made to identify those studies that focus on the predictive strength of goal setting processes in relation to healthy eating behavior. However it should be noted that each of these studies examined not more than three to four goal processes, whereas the present study examined thirteen (such as: ownership of the goal, self-efficacy, feedback, help seeking, social comparison, planning, self-monitoring, self-criticism, self-reward, attention/ stimulus control processes, coping with problems, self-efficacy enhancement and emotion

control). Examining the self-regulatory processes involved in dietary behavior is important because research has shown that regulation processes can play a major role in motivational strength, task persistence and successful goal pursuit.

The online database literature searches were conducted through PsychInfo, Science Direct, Gale Group-Expanded Academic Research-ASAP. Key words were "nutrition", "diet interventions", "self-regulation" and "goal setting". The studies found were reviewed in order to determine the extent to which self-regulation and goal setting components were identified and whether or not they were related to outcome. The following criteria were taken under consideration for the studies selection: (a) the goals had to be personal goals; (b) studies included were both cross-sectional and longitudinal and mostly based on intervention programs and (c) studies had to investigate the association between personal goals and eating related behaviors The studies covered a period of twenty years (1986-2006).

3.1.1. Overview of the self-regulation studies

Supporting the importance of goal setting, a study on the relationship of weight-related perceptions, goals and behaviors with fruit and vegetable consumption in young adolescents (Nystrom, Schmitz, Perry, Lytle, & Neumark-Sztainer, 2005) indicated that weight-related goals were positively associated with fruit and vegetable intake. In the same line, a study by Lovibund, Birrell, and Langeluddecke (1986) indicated that participants who had set a goal (established a goal), reported greater weight loss, reduction in blood pressure, serum cholesterol, and triglycerides; and increased aerobic capacity compared with a control group who had not engaged in any goal setting processes. Moreover, the participants of the above study reported that goal setting and self-monitoring were important for their success.

Another study involving a single-session intervention showed that goal-setting reduced the intake of indulgence foods and increased significantly the intake of cereal foods (Smith, Owen, & Baghurst, 1997). Similarly, a study of Howard-Pitney, Winkleby, Albrigh, Bruce, and Fortmann (1997) with participants who had set a six weekly goals evaluated the goal-setting activities in the intervention program as very helpful, also, they reported greater reductions of the dietary fat intake, and greater self-efficacy compared to the participants who received a general nutrition program.

Moreover, in a study of innovative newsletter interventions in order to improve fruit and vegetable consumption, participants who had set a goal reported higher fruit and vegetable intake compared to those who did not set a goal (Lutz, Ammerman, Atwood, Campbell, DeVellis, & Rosamond , 1999).

White and Skinner (1988) had adolescents participate in an intervention goal setting program, involving three: recognizing the need to change behavior, establishing a goal, and self-monitoring strategies. It was found that this intervention caused participant improvement of their diet. Also, participants reported that activities such as keeping food records, evaluating personal intake, implementing solutions, and attending follow up classes were the most helpful. Another intervention program in which a comprehensive approach to goal setting education was used indicated significant positive effects and improvement on participants' dietary behavior. The program involved the following processes: setting specific proximal change goals, monitoring progress, solving problems and self-rewarding successes (Killen, Robinson, Telch, Saylor, Maron, Rich, & Bryson, 1989). A study about the effects of goal-setting on nutrition-related behaviors (Berry, Danish, Rinke, & Smiciklas-Wright, 1989), concluded that enhanced attention to goal setting showed more success compared with the control group.

Schnoll and Zimmernan (2001) indicate that goal setting and self-monitoring within self-regulation training on dietary fiber consumption, enhances significantly dietary behavior change. More specifically, goal setting had a significant main effect on dietary fiber self-efficacy and on dietary fiber consumption. It was also found that students who only reported their daily fiber intake without setting goals did not directly change their behavior or their self-efficacy perceptions. Thus, setting a goal is prerequisite for self-monitoring.

Studies on individuals who have successfully maintained weight loss have shown that these individuals self-monitor their diet (usually measured as written record keeping to measure progress toward certain goal), use more strategies to control dietary fat intake, have greater self-efficacy and have more social support compared to those who regained weight (McGuire, Wing, Klem, & Hill, 1999; Wing & Hill, 2001).

Furthermore, studies focusing on self-monitoring showed that self-monitoring was strongly related to increased weight loss (Baker & Kirschenbaum, 1993; Boutelle & Kirschenbaum, 1998). On the other hand, Kitsantas, Gilligan, and Kamata (2003) argue that self-regulation can have a negative impact on weight control when the individual is not able to set appropriate and realistic goals. More specifically, these researchers found that individuals with eating disorders reported a greater number of self-regulatory strategies such as planning, seeking information to keep weight down, self-monitoring and keeping records, requesting social assistance and self-consequating.

In a study assessing psychological and social factors predicting 12-month changes in fruit and vegetable consumption achieved by 271 men and women from low-income population which were randomized to brief behavioral and nutrition education program, it was found that short-term changes in psychological factors predicted long-term changes in fruit and vegetable intake. More clearly, increases in fruit and vegetable intake over 12 months were predicted by 8-week increases in encouragement from close other, self-efficacy and anticipated regret (controlling the regret feelings if they do not engage in fruit and vegetable consumption). Furthermore, these psychological factors were affected by the intervention program (Steptoe, Perkins-Porras, Rink, Hilton, & Cappuccio, 2004).

Another study by Bagozzi and Edwards (2000) on the regulation of body weight and on the enactment of relatively easy-to-implement and relatively difficult-to implement goal intentions in 141 males and females, demonstrated that goal directed behaviors such as self-efficacy, outcome expectancy and the emotional consequences of engaging in goal pursuit were sufficient for the performance of dieting activities. Also, the analysis of this study showed that self efficacy had about twice the impact on dieting as either outcome expectancy or affect towards the means, which in turn, had equal effects on dieting. Further on self-efficacy, a study involving counseling for dietary fat reduction in adults with high blood cholesterol, indicated that fat intake was associated with lower self-efficacy (Steptoe, Doherty, Kerry, Rink, & Hilton, 2000).

A group of scientists (Havas, Treiman, Langenberg, Ballesteros, Anliker, Damron, & Feldman, 1998) analyzed results obtained from the *Maryland Women, Infants, and Children 5-a-Day Promotion Program*, a special supplemental nutrition program for women, infants and children. In this program, fruit and vegetable consumption and psychosocial parameters were recorded at baseline. Eight months later, the researchers noted that changes in social support and self-efficacy were positively associated with changes in fruit and vegetable intake. Furthermore, self-efficacy compared to the other variables examined, emerged as the strongest predictor of fruit consumption, even though the applied regression analyses did not verify that social support was strongly predictive of fruit and vegetable consumption in this population. Similarly, a study about obesity related beliefs that predicted weight loss after an 8-week low calorie diet on forty-eight men, indicated that self-efficacy with respect to eating behavior turned out to be a better predictor of weight loss than other parameters such as psychological consequences and time line (Wamsteker, Geenen, Iestra, Larsen, Zelissen, & Van Staveren, 2005). Also, in the same study controllability also explained a significant amount of variance in weight-loss scores. The researchers argued that that the more specific belief of self-efficacy with respect to eating behavior turned out to be a better predictor of weight loss than the more general belief of controllability of obesity.

Evidence coming from a study on food selection and eating patterns among people with Type 2 Diabetes Mellitus, showed that the dietary social support, time management and self-efficacy, were the mediating variables that influenced dietary behaviors (Savoca & Miller, 2001). More specifically, social support defined as the participants' relationships with their spouses had a major impact on food selection and meal planning. About time management was a common problem among participants. Thus, planning was a necessary skill in choosing what to eat. Self-efficacy was one of the strategies established in order to support their self-management effort to promote healthy dietary practices. Additionally, other research findings showed that self-confident clients of healthy diet intervention programs were less likely than other clients to relapse into previous unhealthy diet (Bagozzi & Edwards, 1998; Brug, Hospers, & Kok, 1997; Fuhrmann & Kuhl, 1998; Gollwitzer & Oettingen, 1998).

In addition, in their investigations of the attributes of successful approaches to weight loss and control Foreyt and Goodrick (1994) indicated that weight loss is positively related to self-monitoring, goal setting, social support, and length of treatment. More specifically they reported that self-monitoring such as recording dietary intake is the cornerstone of behavioral treatment and was also correlated successfully with loosing weight. Goal setting in terms of eating and weight goals has been also successfully correlated with loosing weight. The length of treatment was also predictive of weigh loss. Social influence processes from therapist contact and peer support were partly responsible for loosing weight. Also, the same authors argued that regain of weight was associated with life stress, negative coping style and emotional patterns. Furthermore a study on the mediating effect of eating self-efficacy on the relationship between emotional arousal and overeating in 632 females and 254 males who participated in a residential weight control and lifestyle change program showed that negative emotions appears to directly induced overeating (Costanzo, Reichmann, Friedman, & Musante, 2001). Similar evidence on positive and negative affect in adolescents' strategies to lose weight showed that positive affect predicted strategies to lose weight, and negative affect predicted body dissatisfaction and cognitions associated with losing weight (McCabe & Ricciardelli, 2003).

Dohm, Beattie, Aibel, and Striegel-Moore (2001) examined the differences between successful and unsuccessful weight-loss maintainers and found that coping responses help people deal successfully with dietary lapses. Also, seeking help from others was an ineffective way of coping with a dietary relapse. Moreover, two studies focusing on coping with dietary relapses showed that dieters who used at least one coping strategy such as using positive thoughts were able to overcome the temptations to overeat precipitated by mealtime situations, emotional upsets (e.g. anxiety) or eating while alone (Grilo, Schiffman & Wing, 1989,1993). Furthermore, regarding emotional control skills, it was found that unsuccessful weight-loss maintainers were more likely to eat more, sleep more, or wish whatever was causing the stress would go away; in contrast, successful weight-loss maintainers confronted directly the source of the stress (Kayman, Bruvold, & Stern, 1990).

A study on self-regulatory cognitions, social comparisons, and perceived peers' behaviors as predictors of nutrition among adolescents in Hungary, Poland, Turkey and the USA, indicated (a) that strong general optimistic beliefs were related to more frequent choice of healthy food; (b) that participants who had a strong tendency to compare themselves with others choose healthy diet more frequently; (c) the consideration of future consequences were significantly related to health-promoting behaviors (Luszczynska, Gibbons, Piko, & Tekozel, 2004). Also, findings from a study by Holt and Ricciardelli (2002) showed that social comparison is related to nutrition behavior in children. More specifically, girls who had higher scores on the utilization of social comparison practices were associated with higher levels of healthy dieting. On the other hand, one third of the male participants reported engaging in social comparison practices, but this was not associated to their dieting.

A few studies have investigated the effect of feedback interventions alone on dietary behavior. For instance, a study by De Bourdeaudhuij, Brug, Vandelanotte, and Van Oost (2002) in which they investigated the impact of tailored nutrition intervention on the reduction of fat intake and on psychosocial determinants of fat intake indicated that tailored fat feedback resulted in significantly more positive psychosocial determinants of fat intake. It was also indicated that among respondents with high fat intake resulted to a significant reduction in per cent energy from fat. Further, in a study that investigated the use of tailored nutrition education letters in families, it was found that tailored feedback resulted in stronger awareness of personal fat intake and awareness of fat intake of family members (De Bourdeaudhuij & Brug, 2000).

Also, in another study which examined the effect of dietary fat feedback showed that participants who were told that their diet was high in fat reported stronger negative emotional reactions and stronger intentions to change than those participants who were assigned into the categories of moderate and low percentage of calories from fat (Fries, Bowen, Hopp & White, 1997). Greene, Rossi and Reed (1993) indicated that participants with a diet higher in fat were more likely to report intentions to reduce the calories from fat after receiving feedback. Moreover, during a follow-up, it was found that those with higher fat diets were more likely to have adopted low-fat behaviors.

Finally, studies on the self-determination theory (Deci & Ryan, 2000) and a program for loosing weight indicated that participants whose motivation for loosing weight was autonomous (integrated regulation) attended the program more frequently and lost more weight within the program's duration (Williams, Grow, Freedman, Ryan, & Deci, 1996). Further on this theory, evidence from a study on self-determination and the risk of experiencing bulimic symptoms have shown that self-determination was negatively linked to bulimic symptomatology (Pelletier, Dion & Levesque, 2004).

Table 1. *Overview of Empirical Studies on Self-regulation*

Empirical studies	Goal related Variables	Comparable variables MST supported by the empirical findings	Outcomes
1. Nystrom, Schmitz, Perry, Lytle, Neumark-Sztainer (2005)	Goal setting	Directive cognitions	Higher fruit and vegetable intake
2. Lovibund, Birrell, and Langeluddecke (1986)	Goal setting and self-monitoring	Directive cognitions Regulatory cognitions	Greater weight loss, reduction in blood pressure, serum cholesterol, triglycerides, and increased aerobic capacity
3. Smith, Owen, & Baghurst (1997)	Goal setting	Directive cognition	Reduction of indulgence foods the intake and increased significantly the intake of cereal foods
4. Howard-Pitney, Winkleby, Albrigh, Bruce, and Fortmann (1997)	Goal setting and self-efficacy	Directive cognition Regulatory cognitions	Greater reductions of the dietary fat intake
5. Lutz, Ammerman, Atwood, Campbell, DeVellis, & Rosamond (1999)	Goal setting	Directive cognition	Higher fruit and vegetable intake
6. White & Skinner (1988)	Goal setting, self-monitoring and implementing solutions	Directive cognitions Regulatory cognitions Control Cognitions	Dietary improvement
7. Killen, Robinson, Telch, Saylor, Maron, Rich, & Bryson (1989)	Setting specific proximal change goals, monitoring progress, solving problems and self-rewarding successes	Directive cognitions Regulatory cognitions Emotional arousal	Significant positive effects and improvement on their dietary behavior

8. Berry, Danish, Rinke, & Smiciklas-Wright (1989)	Goal setting and enhanced attention to goal setting	Directive cognitions Attention arousal	Success in nutrition-related behaviors
9. Schnoll & Zimmernan (2001)	Goal setting, self-monitoring and self-efficacy	Directive cognitions Regulatory cognitions	Enhances significantly dietary behavior change
10. McGuire, Wing, Klem, & Hill, (1999); Wing & Hill (2001)	Goal setting, self-monitoring, control, self-efficacy, social support	Directive cognitions Regulatory cognitions	Successfully maintained weight loss
11. Steptoe, Perkins-Porras, Rink, Hilton & Cappuccio (2004).	Encouragement, self-efficacy and anticipated regret	Regulatory cognitions Emotional arousal	Long-term changes in fruit and vegetable intake
12. Bagozzi & Edwards (2000)	Self-efficacy, outcome expectancy, affect towards means	Regulatory cognitions Emotional arousal	Regulation of body weight and performance of dieting activities
13. Havas, Treiman, Langenberg, Ballesteros, Anliker, Damron, & Feldman (1998)	Social support and self-efficacy	Regulatory cognitions	Changes in fruit and vegetable intake
14. Savoca & Miller (2001)	Self-efficacy, social support and time management	Regulatory cognitions Control cognitions	Dietary behaviors
15. Foreyt & Goodrick (1994)	Goal setting, self-monitoring, social support, length of treatment, stress, negative coping style and emotional patterns	Directive cognitions Regulatory cognitions Emotional arousal Activity arousal	Weight loss

16. Costanzo, Reichmann, Friedman, & Musante (2001)	Negative emotions	Emotional arousal	Overeating
17. McCabe & Ricciardelli (2003)	Positive and negative affect	Emotional arousal	Lose weight
18. Dohm, Beattie, Aibel, & Striegel-Moore (2001)	Coping responses, seeking help	Control cognitions Transactional actions	Dietary lapses
19. Luszczynska, Gibbons, Piko, & Tekozel (2004)	Optimistic beliefs, social comparison and the consideration of future consequences	Directive cognitions Regulatory cognitions Emotional arousal	Choice of healthy food
20. Holt & Ricciardelli (2002)	Social comparison	Regulatory cognitions	Nutrition behavior
21. De Bourdeaudhuij, Brug, Vandelanotte, & Van Oost (2002)	Feedback	Regulatory cognitions	Reduction in per cent energy from fat
22. De Bourdeaudhuij & Brug (2000)	Feedback	Regulatory cognitions	Awareness of personal fat intake
23.Fries, Bowen, Hopp & White (1997)	Feedback, negative emotional reactions, intention to change	Directive cognitions Regulatory cognitions Emotional arousal	Effect of dietary fat feedback

24. Greene, Rossi & Reed (1993)	Feedback	Regulatory cognitions	Intentions to reduce the calories from fat
25. Kayman, Bruvold, & Stern (1990)	Emotional control skills	Activity arousal	Weight-loss maintenance
26. Grilo, Schiffman & Wing (1989, 1993)	Used of positive thoughts	Activity arousal	Coping with dietary relapses
27. Williams, Grow, Freedman, Ryan, & Deci (1996)	Autonomous (integrated regulation)	Directive cognitions	Lost more weight

3.1.2. Summary and direction for the present study

The studies reviewed above examined the effects of having a personal goal on diet related behaviors. Some of them were cross-sectional and some longitudinal. The general finding was that several goal constructs and processes were powerful predictors of diet related behaviors. A conclusion with great importance was that goal variables explained a significant percentage of variance (Nystrom, Schmitz, Perry, Lytle, & Neumark-Sztainer, 2005; Smith, Owen, & Baghurst, 1997; Lovibund, Birrell, & Langeluddecke,1986).

However, many of the above reviewed studies have some limitations. These are: (a) the absence of a clear theoretical framework (e.g. goal theories instead of social cognitive variables or psychosocial factors) and especially theory based goal measuring instruments (e.g. instruments based on self-regulation theory instead of initial instruments measuring different strategies); (b) inadequate description of the processes involved in goal accomplishment; (c) limited attention to goal content. Additionally, the reviewed studies have not examined the effect of goal hierarchy. Thus, they did not focus on the relationship between motives and the different goal levels.

Nevertheless, considering the findings of the empirical studies, the following inferences can be made: (a) goals are positively related to dietary change; (b) goal accomplishment generates personal goal processes towards dietary change. Thus, goal accomplishment can be considered as the medium between goal processes and dietary change; (c) it is emphasized that setting a goal is prerequisite for control cognitions such as self-monitoring (Schnoll & Zimmernan, 2001); (d) goals that are autonomous seem to be more positively correlated with personal effort and goal attainment than goals that are externally imposed (Williams, Grow, Freedman, Ryan, & Deci ,1996).

It is, therefore, clear that the studies reviewed lead to the conclusion that goal-setting procedures promote dietary change. The present study tries to overcome the above mentioned limitations and to describe in a comprehensive manner the processes used, and the varied components of the goal setting process that are involved in healthy eating behavior. Also, the present study takes into account and examines (a) gender

differences on personal goals; (b) the differences between groups' hierarchy of personal goals and goal accomplishment (c) and the relationship between the self-regulation processes used by the groups that have attained their personal goals and the self-regulation processes used by those who failed to attain their goal.

3.2. Family Environment-Introductory remarks

Studies on family interaction suggest that early adolescence is a time during which teenagers begin to have a more forceful role in the family. However, parents do not realize this change and fail to acknowledge this input from their children. In middle adolescence, teenagers act more like adults and they are also treated as such. Consequently, they have more influence over the decisions taken within the family.
Also, the family's functions change dramatically during period of adolescence. For instance, during infancy and childhood, the functions of the family are limited to the following: nurturance, protection and socialization. Beside the fact that these functions are still important during adolescence, teenagers have more need for support, guidance and direction (Grotevant, 1997). There are studies showing that many families, parents and children live in different realities and perceive their everyday experiences in a very different way (Larson & Richards, 1994a).

Various studies demonstrated that family relationships change during adolescence, with conflict increasing between adolescents and their parents and with the closeness between the two parts diminishing (Grotevant, 1997; Holmbeck, 1996). Montemayor (1986) argued that the disagreements between parents and teenagers are more likely to take the form of bickering over day-to-day issues. Also, the diminished closeness is more likely to be transformed in an increased need for privacy on the part of the adolescents. In any case, the signs of physical affection between parents and adolescents do not indicate the absence of relevant feelings.

Usually, this distance between parents and adolescents is not associated with family crisis. Laursen, Coy, and Collins (1998) point out that conflict within parents and adolescents, is not dramatically higher than the one they had before or after the onset of adolescents. A study by Smetana (1989), on adolescents' cognitive abilities

showed that changes in the ways that adolescents view family rules and regulations may contribute to the increased conflict between them and their parents.

The present study examines the relationship between parents and adolescents and the process by means of which this relationship influences the eating behavior of adolescents. In order to address this relationship it is essential to outline three concepts that are related to family life. Although the aim of the present study is to examine adolescents' behavior as the result of their parents' behavior, it is useful to keep in mind that socialization is actually a two-way street. That is, adolescents are both influenced by their parents and at the same time they are influencing them (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000).

3.2.1. Parenting Styles

According to Baumrind (1978, 1991) and Maccoby and Martin (1983) in this vein two aspects of the parent's behavior toward adolescent are critical: parental responsiveness and parental demandingness. Parental responsiveness is the degree to which parent responds to the child's needs in an accepting, supportive manner. Parental demandingness is the extent to which the parent expects and demands mature, responsible behavior from the child. There are various combinations of these two dimensions because parental responsiveness and demandingness are more or less independent of each other (e. g. a parent can be very demanding without being responsive). Thus, the four styles emerging are:

(I). Authoritative parents are warm but firm. They set standards for the child's conduct but form expectations which are consistent with their child's abilities. Parents who are authoritative place a high value on the development of autonomy and self-direction. They deal with their child in a rational, issue-oriented manner, engaging in discussion and explanation with their children over matters of discipline

(II). Authoritarian parents place high value on obedience and conformity. They tend to favor more punitive, absolute, and forceful disciplinary measures. The belief of authoritarian parents is that the child should accept without question the rules and standards established by the parents. Thus, they do not encourage independent behavior, and tend to restrict the child's autonomy.

(III). Indulgent parents behave in an accepting, benign, and somewhat more passive way in matters of discipline. They place relatively few demands on the child's behavior, giving the child a high degree of freedom. These parents believe that control is an infringement on their child's freedom and may cause later problems on their child's development.

(IV). Indifferent parents are considered as the parents that have little time and energy devoted in interaction with their child. They know little about their child's activities and rarely consider their child's opinion when taking decisions. The indifferent parents structure their home life around their own needs and interests.

The four parenting styles appear on Figure 6.

Figure 6. *A scheme for classifying parenting styles* (Maccoby & Martin, 1983)

		DEMANDINGNESS	
		HIGH	LOW
RESPONSIVENESS	HIGH	AUTHORITATIVE STYLE	INDULGENT STYLE
	LOW	AUTHORITARIAN STYLE	INDIFFERENT STYLE

This fourfold categorization provides a useful way of examining some of the relations between parenting practices and adolescent psychosocial development. Evidence shows that adolescents raised in authoritative households are more psychosocially competent than peers who have been raised in authoritarian, indulgent or indifferent homes. Furthermore, adolescents raised in authoritative homes are more responsible, more self-assured, more adaptive, more creative, more curious, more socially skilled and more successful in school.

In contrast, adolescents raised in authoritarian homes, are more dependent, passive, less socially adept, less self-assured, and less intellectually curious. Moreover,

adolescents raised in indulgent households are often less mature, more irresponsible, more conforming to their peers, and less able to assume positions of leadership. Also, many adolescents raised in indifferent homes are often impulsive and more likely to be involved in delinquent behavior and in precocious experiments with sex, drugs and alcohol (Fuligni & Eccles, 1993; Lamborn, Mounts, Steinberg, & Dornbusch, 1991; Steinberg, Lamborn, Darling, Mounts, & Dornbusch, 1994; Steinberg, 2001)

3.2.2. Attachment styles

In recent years, a perspective on intimacy during adolescence has emerged that draws on theories of the development of the attachment relationship during infancy (e.g. Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969). Attachment style refers to the way in which individuals behave in their intimate interpersonal relations and to the emotional characteristics of these relations. Hazan and Shaver (1987) propose that adults maintain the attachment style that they developed with their mother and use it in the intimate relations that they enter later in life. Carrying this argument a step further, Barholomew and Horowitz, (1991) propose a taxonomy of attachment style on two dimensions: one is anxiety due to relationships and the other is the tendency to avoid these relationships. This taxonomy produces four different attachment styles: secure, insecure (or preoccupied), fearful and dismissing.

(I). Fearful attachment: The people who belong to this style do not feel comfortable being emotionally attached to other people. They have difficulty trusting others and depend on them. They worry very much that if they allow themselves to depend on others or be emotionally attached to them, these other people will betray or abandon them, and they will be hurt.

(II). Dismissing attachment: The people who belong to this style do not feel the need for intimate relations or for emotional attachment. They value their independence very much and prefer not to depend on others or having others depend on them.

(III). Secure attachment: The people who belong to this style can be emotionally attached to others without worrying that others will reject them. They feel comfortable depending on others and having others depend on them.

(IV). Insecure attachment: The people who belong to this style seek close emotional relations with other people, but worry that other people avoid them and do not return

the desire for a relationship. They feel bad when they are alone without someone to be attached to. At the same time they also complain that others do not appreciate them as much as they deserve to be appreciated. The four attachment styles appear in Figure 7.

Figure 7. *Attachment styles: the four categories* (Barholomew and Horowitz, 1991)

		ANXIETY BECAUSE OF RELATIONS	
		HIGH	LOW
AVOIDANCE OF RELATIONS	HIGH	**FEARFUL STYLE**	**DISMISSING STYLE**
	LOW	**INSECURE STYLE**	**SECURE STYLE**

Based on the above theoretical model, it can be deduced that parents who use the secure attachment in their intimate relations will tend to develop an authoritative parenting style. That is, they will mildly supervise their child's behavior without excess control and at the same time they will report to the child's emotional needs, especially during adolescence. In contrast, parent who use the fearful or the insecure attachment style may be authoritarian in their everyday interaction with their children and they will not facilitate the child's autonomy and individuation. Further, adolescents who are permitted to assert their own opinions within a family context that is secure and loving develop higher self-esteem and more mature coping abilities. Adolescents whose autonomy is squelched are at risk for developing feelings of depression, and those who do not feel connected are more likely than their peers to develop behavior problems (Allen, Hauser, Bell, & O'Conner, 1994; Allen, Hauser, Bell, Eickholt, & O'Conner, 1994). Furthermore, as Grotevant and Cooper (1986)

argue adolescents appear to do best when they grow up in a family atmosphere that permits the development of individuality against a backdrop of close family ties.

3.2.3. Parental Involvement

Parental involvement is defined as the degree to which parents are involved in their children's educational process and in their lives in general. It can include activities that occur at school and activities that occur at home. Regarding the involvement at school, Brito & Waller, (1994) point out that individual parents can be placed on a continuum ranging from very low (or non-existent) to very active involvement. That is, involvement can range from an impersonal visit to school once a year, to frequent parent-teacher consultations to active school governorship. Tomlinson (1991), notes that parental involvement in schools may take one of four forms: exchange of information (via letters, circulars, reports, visits); personal involvement in educational matters (home-work or class-work); informal involvement in administrative matters via the Parent Association; formal involvement in school governing. Fullan (1982) identifies four forms of parent involvement: instruction at school, instruction at home, school governance and community service.

Epstein (1992) describes six types of involvement. The first two types refer to the basic obligations of the two institutions separately. Families are responsible for providing for children's health and safety, and for building acceptable home conditions for learning. Schools are responsible to communicate with the families of their students to inform them about policies, programs, rules and regulations, and to advise them about the children's achievement and conduct. Types 3 and 4 include some involvement of the parents in the educational process of their children. The former has to do with involvement in non-educational activities in the school (for example volunteering) and the latter has to do with parental involvement in their children's home-work and with organizing educational activities at home. The last two types have to do with more active participation in school matters.

Georgiou (1997) points out that parental involvement is a complex, multi-level construct that can be analyzed into more concrete and meaningful behaviors. His research has identified the following such behaviors: Helping with homework,

motivating the child to strive for higher achievement, maintaining close contact with the school, widening the child's interest scope, and getting involved in the child's personal (non-school) life. This last set of behaviors refers to the parent's involvement in dress code and appearance, diet and choice of friends.

Campbell & Mandel (1990) argue that only some aspects of parental behavior - those that are perceived by the child as psychological support - lead directly to adjustment. Other types of behavior, such as unsolicited parental help and pressure on the child may have the opposite effect. Iverson & Walberg (1982) compared the accumulated evidence from a number of previous studies and reported that functional characteristics of the family, such as the existing intellectual stimulation at home, are better predictors of social and educational success than structural characteristics of the family, such as socio-economic status, parental educational levels etc. Identical were the results of a cross-cultural study conducted by Campbell & Wu (1994). A study conducted in Cyprus (Georgiou, 1995) has found significant relationship between school achievement and family cohesion. This concept, which is in essence a functional characteristic of the family, can be perceived as an aspect of parental involvement in the child's life at home. In addition to demographics (family socio-economic status, parent gender, child's age) the degree of parental involvement is affected by attitudes such as attributions. For example, Georgiou, (1999) found that parents who thought that they had an important role to play in their child's life tended to be more vigilant concerning the child's behavior at home.

3.2.4. Family context: An important parameter in adolescence health

Despite of all the diversity that exists among families with adolescents, no other factor has been found to influence adolescents' adjustment more than the quality of their relationships with their parents. In a comprehensive study of the lives, behavior and health of 90,000 adolescents Blum and Rinehart (2000) argued that across all of the health outcomes examined, the most important factor in protecting adolescents from harm was family and the home environment. Thus the adolescents' feeling of connectedness with parents and family emerged consistently as a protective factor.

Parents start adjusting their supervisory practices to allow more freedom and independent decision-making by adolescents as the children mature and gain independence (Dishion & McMahon, 1998). Research has suggested that open lines of communication and knowledge of an adolescent's whereabouts (i.e. parental monitoring) are important in reducing high-risk behaviors (Li, Stanton, & Feigelman, 2000; Li, Feigelman, & Stanton, 2000).

Family characteristics such as family climate, communication and organization (power, rules, autonomy) were found to influence health behaviors in families. More specifically, several studies indicated a negative association between family cohesion, a supportive family climate or bonding on the one hand and risk-behavior in adolescents on the other (Andersen & Henry, 1994; Cumsille & Epstein, 1994). For example, Doherty and Allen (1994) argued that the poorer the quality of family relationships is the more adolescents are apt to adopt a negative health habit or behavior. Thus, parents play a critical role in helping children to become well-adjusted adults; this may include minimizing problem behaviors and maximizing self-efficacy and emotional, personal and cognitive development (Maccoby, 1984).

The following studies reviewed were selected from different Journal databases (PsychInfo, Science Direct, Gale Group-Expanded Academic Research-ASAP). The covered period was twenty years (1986-2006). Key words were "family influence and eating behavior", "family and adolescents behavior". The studies found were reviewed in order to determine the extent to which family influence components were identified and related to adolescents eating related behaviors.

3.2.5. Overview of family influence on adolescents' eating behaviors

The family is a major influence on children's eating behavior. The family influences children's dietary patterns in two distinct ways: (a) the family is mainly the provider of food and (b) the family influences food attitudes, preferences and values that have an impact on lifetime eating habits. Thus, as the adolescents move to greater independence and autonomy (young adults), their food habits reflect the changing role of parental influence on food choices.

Although many studies have examined the influence of family on eating behavior, it is admitted that there are no clear models or theories that explain how the family influences eating behaviours in particular or health behavior in general (De Bourdeaudhuij & Van Oost, 2000). However, in the literature two levels are often considered as family determinants: (a) general family characteristics (e.g. family climate, communication and organization) and (b) specific family interactions that are related to health behavior (this can range from participation of family members in the different daily meals to decision-making power regarding food) (De Bourdeaudhuij & Van Oost, 1998b).

Family studies have indicated that parents do attempt to influence their children's eating (Striegel-Moore & Kearney-Cooke, 1994) and to encourage dieting (Benedikt, Wertheim & Love, 1998; Thelen & Cormier, 1995). According to the family reciprocal determinism model, dietary behaviors are affected by the mechanics of food production in the household, family supportive behavior and family functioning (Baranowski & Hearn, 1997). Considerable evidence suggests that highly controlling and restrictive parental feeding strategies contribute to positive energy balance and higher body mass index by interfering with children's ability to self-regulate energy intake (Fisher & Birch, 1999).

Furthermore, a study by Young and Fors (2001) indicated that students consuming healthy breakfast, healthy lunches, and more fruits and vegetables had better communication with parents on serious issues, they were closely monitored by their parents, live with one or both parents, and spend less time in the house without other adults. Other studies showed that positive relationships with parents appear to protect young adolescents from the development of eating problems (Swarr & Richards, 1996).

It has been proposed that family environments perceived as high in conflict and low in cohesion and warmth contribute to adolescents' perception of their own body image and dieting problems. For instance, girls' perceptions of more negative family relations significantly predicted problematic dieting behavior concurrently and one year later (Byely, Archibald, Graber, & Brooks-Gunn, 2000). Similarly, girls who had

just been dieting, as compared to those who had never dieted, identified their fathers as being less supportive (Huon & Walton, 2000). A study by Cachelin, Weiss and Garbanati (2003) on dieting and its relationship with family environment in Asian and Hispanic adolescents have demonstrated that chronic dieting was related to reports of poorer family functioning. Further, these authors have found that less positive family environment contributes to the initiation and maintenance of dieting behaviors.

On the other hand, family variables such as the degree of family cohesion and adaptability of the family structure were found to be associated with the development of eating disorders (Paikoff, Carlton-Ford, & Brooks-Gunn, 1993). De Bourdeaudhuij and Van Oost (1998a) examined general family characteristics such as family cohesion and adaptability and numerous health behaviors (smoking, alcohol use, food choice, sleeping Body Mass Index and physical activity). Using cluster analysis, they found that adolescents in the healthiest clusters reported consistently the highest levels of family cohesion. Thus, adolescents' behavior seems to be most healthy in families characterized by high level of emotional bonding between family members, stability and regularity in roles, rules and power structure.

Moreover, research on family functioning and eating attitudes showed that family functioning was correlated with adolescent's eating attitudes and behaviors. Especially self-control and negative coping were demonstrated to mediate this relationship (Dinsmore & Stormshak, 2003). More specifically, self-control and increased use of negative coping were associated with higher levels of weight concern, problematic eating attitudes and behaviors. Thus, it is assumed that one way that family functioning may be linked to eating problems is through its role in promoting the development of self-control and coping. Deficits in both self-control and coping may contribute to the development of maladaptive eating patterns (Lacey & Moureli, 1986). Also, research findings suggest that the families of individuals with anorexia nervosa exhibit problematic patterns of communication. For instance, several studies examining families of anorexic adolescents have noted a familial emphasis on achievement and success, a strong emphasis on appearance and weight, and less encouragement of self-expression and autonomy. All of these parental attitudes and

practices lead to compliance and the underdevelopment of self-reliance in the anorexic child (Humphrey, 1989).

Additionally, research on family interventions for weight reduction which were based on the premise that parental support, family functioning, and home environment are important determinants of treatment outcomes, showed that more success on children's weight reduction was associated with supportive, interactive families demonstrating parental skills aimed at the child's development of responsibility and positive self-image (Epstein, 1996; Epstein, Myers, Raynor, & Saelens, 1998). In a research with obese Israeli children aged 6-11, in which parents were targeted as the primary mediators of change, showed greater weight loss, increased behavioral change and presented better reactions of achievements (Golan, Fainaru, & Weizman, 1998). Further on parents as mediators in the treatment of child obesity. It has been reported that excluding the obese child from the direct intervention was associated with greater weight loss and higher consumption of healthy foods compared with interventions in which children were the main agents of change (Golan, Weizman, Apter, & Fainaru, 1998). Parents in the above two studies served as a source of authority and as role models for their children, providing an environment with less obesogenic factors and more self-regulation and healthy practice.

There are only few studies published on the relationship between parenting style and eating and activity behaviors. Kremers, Pruga, Hein de Vriesa, and Rutger (2003) reported that fruit consumption and fruit-specific cognitions (attitude, subjective norm, social support, social modeling, self efficacy) were most favorable among 643 adolescents with an average of mean age 16.5, who were being raised with an authoritative parenting style. Schmitz, Lytle, Phullips, Murray, Birnbaum, and Kubik (2002) indicated among 3798 seventh grade students that girls who reported that their mothers are responsive to their needs and rights, while setting clear expectations of behavior (authoritative parenting style), reported more healthy behaviors such as physical activity and eating.

Research on parenting styles has demonstrated that the best predictor of children's ability to regulate energy intake was parental control. Mothers who were more

controlling of their children's food intake had children who showed less ability to self-regulate energy intake (Johnson & Birch, 1994). Parental control in this study was also linked to the parent's dieting and weight history, with mothers who were more restrained eaters using more control. Also, in a study by Birch and Fisher (2000) with 197 families in which they examined the effects of mothers' feeding practices on their daughters' eating and overweight. It was found that a mother's effort to control her own weight, as measured by dietary restraint, in combination with her perceptions of her daughter's risk of overweight, predicted maternal child-feeding practices which in turn predicted daughters' eating and relative weights.

Furthermore, in a 3-year longitudinal study on accounting for differences in dieting status among female adolescents it was found that familial context variables showed that fathers' attachment and low levels of conflict or family hassles were negatively associated with dieting status. More specifically, stronger perceived father care combined with lower overprotectiveness were associated with lower levels of dieting, whereas more positive familial contexts were associated with greater skills to resist social pressure regarding diet and less vulnerability to succumbing to those pressures (Huon, Hayne, Gunewardene, Strong, Lunn, Piira, & Lim, 1999).

In the literature, there is evidence showing that parents may influence their adolescents' eating disturbances through direct transmission of weight-related attitudes and opinions. Rieves and Cash (1996) found that daughters' eating disturbances were related to their perceptions of maternal concern with appearance and preoccupation with being overweight. Also, mother's and fathers' encouragement of weight control was related to daughters' desire to be thinner, daughters' weight and dieting behaviors (Thelen & Cormier, 1995).

The *Framingham Children's study* (Striegel-Moore, 1995) suggested that parents who display high levels of disinhibited eating (especially when coupled with high dietary restraint) might foster the development of excess body fat in their children. This association might be mediated by direct parental role in modeling unhealthy eating behaviors, or by other indirect behavioral consequences such as suppression of the child's innate regulation of dietary intake. Also, both girls and boys who reported that

their thinness/ lack of fat were important to their father were more likely than their peers to become constant dieters (Field, Camargo, Taylor, Berkey, Robert, & Colditz, 2001). Thus, parents have great influence on the development of weight concerns and frequent dieting among preadolescent and adolescent boys and girls.

Table 2. *Overview of Empirical Studies on Family Environment*

Empirical studies	Family relationship related Variables	Comparable variables to the family relationship theories	Outcomes
1. Fisher & Birch (1999)	Controlling and restrictive parental feeding strategies	Authoritarian style	Energy balance and higher body mass index
2. Young & Fors (2001)	Communication and parental monitoring	Authoritative style Secure attachment	Healthy breakfast, lunches, more fruits and vegetables
3. Swarr & Richards (1996)	Positive relationships	Authoritative style Secure attachment	Eliminate eating problems
4. Byely, Archibald, Graber, & Brooks-Gunn (2000)	Negative family relations	Indifferent Dismissing	Problematic dieting behavior
5. Cachelin, Weiss & Garbanati (2003)	Less positive family environment	Indifferent Dismissing	Dieting behavior
6. Paikoff, Carlton-Ford, & Brooks-Gunn (1993)	Low Family cohesion and adaptability	Authoritarian style Dismissing	Development of eating disorders
7. De Bourdeaudhuij & Van Oost (1998a)	High Family cohesion and adaptability	Authoritative style Secure attachment	Healthier behaviors including eating behavior

8. Dinsmore & Stormshak (2003)	Deficits in self-control and negative coping	Authoritarian or Indifferent	Eating problems
9. Lacey & Moureli (1986)	Deficits in self-control and negative coping	Authoritarian or Indifferent	Maladaptive eating patterns
10. Humphrey (1989)	Emphasis on achievement, less encouragement of self-expression and autonomy	Authoritarian	Anorexia
11. Epstein (1996)	Supportive, interactive families parental skills	Authoritative style Secure attachment	Weight reduction
12. Epstein, Myers, Raynor, & Saelens (1998)	Supportive, interactive families parental skills	Authoritative style Secure attachment	Weight reduction
13. Golan, Fainaru, & Weizman (1998)	Parents as source of authority and as a role model	Authoritative style	Weight loss, behavioral change and presented reactions of achievements
14. Golan, Weizman, Apter, & Fainaru (1998)	Parents as source of authority and as a role model	Authoritative style	Weight loss and higher consumption of healthy foods
15. Kremers, Pruga, Hein de Vriesa, Rutger (2003)	Authoritative parenting style	Authoritative style	Fruit consumption and fruit-specific cognitions

16. Schmitz, Lytle, Phullips, Murray, Birnbaum, & Kubik (2002)	Responsive and setting clear expectations of behavior	Authoritative style Secure attachment	Healthy behaviors such as physical activity and eating
17. Johnson & Birch (1994)	Parental control	Authoritative style	Ability to regulate energy intake
18. Huon, Hayne, Gunewardene, Strong, Lunn, Piira, & Lim (1999)	Stronger perceived father care combined with lower overprotectiveness	Insecure attachment	Lower level of dieting
19. Rieves and Cash (1996)	Perceptions of maternal concern with appearance and preoccupation with being overweight.	Indifferent Insecure attachment	Eating disturbances
20. Thelen & Cormier (1995)	Encouragement of weight control	Authoritative style	Desire to be thinner, daughters' weight and dieting behaviors
21. Striegel-Moore (1995)	High levels of disinhibited eating	Authoritarian	Excess body fat
22. Field, Camargo, Taylor, Berkey, Robert, & Colditz (2001)	Importance of thinness/ lack of fat	Authoritarian	Constant dieters

3.2.6. Summary and direction for the present study

Several conclusions could be drawn on the basis of the reviewed studies examining family influence on adolescents' eating behavior allow. First, considerable empirical support has been found for the different family characteristics in terms of their power to predict eating behavior. Secondly, the theoretical framework of these studies was limited. One explanation of this is the fact that there are no clear models or theories that explain how the family influences healthy behavior in general or eating habits in particular. Thus, researcher tried to relate the different family constructs emerged from these studies into the equivalent theoretical frameworks that were presented for the purpose of the present study.

Thirdly, another issue that has been neglected in the reviewed studies with an exception of the De Bourdeaudhuij and Van Oost (2000) study was the combination of family environmental factors and personal factors in examining eating behavior in adolescents. The present study aims to investigate the relative contribution of family determinants over and above personal determinants in explaining the variance in dietary behavior.

Finally, the role of family general characteristics (e.g. cohesion, control, conflict, organization, independence) in dietary behavior of adolescents continues to be unclear. The present study introduces these general characteristics as an environmental factor that may influence the eating behavior of adolescents. The benefit of examining these characteristics is the fact that such an examination allows the description of parent-adolescent interaction across a wide range of family functions (cohesion, control and independence), whereas parenting practices are by definition domain specific (preparation of meals, availability of healthy food in the house etc). Also the present study examines parent-adolescent interaction on healthy eating behavior in both genders.

In conclusion, concerning the findings of the empirical studies on family influence, a few points can me made: (a) family environment and the existing relationships seem to be related to children's dietary behaviors; (b) positive characteristics such as cohesion, independence, support and acceptance seem to be positively related to

dietary behaviors (c) these characteristics have been linked mostly with female adolescents' dietary behavior rather than with male adolescents.

3.3. Peer Influence-Introductory remarks

Peer relationships are important for psychosocial development throughout childhood and adolescence (Hartup, 1999). During the adolescence period peer relationships and friendships in general have a unique significance. Similarly, a special type of group, termed "clique" emerges as an influential socialization factor in adolescence. The importance of the clique is that it provides the main social context in which adolescents interact with each other. Specifically, clique is the social setting within which adolescents hang out, talk to each other, experience emotional support, intimate self-disclosure and reflection (McNelles & Connolly, 1999).

Despite the fact that peer influence and peer relationships have an important contribution to healthy psychosocial development, peer relationships can also be a source of risk. Adolescents' friends may engage in problem behavior (e.g. risky eating, alcohol consumption) or when friends have beliefs that support risky behaviors (e.g. eating junk food makes you "cool") (Brendgen, Vitaro, & Bukowski, 2000). For instance, in Harris' (1998) review of behavior genetic studies, in which she analyzed parental and peer influence in adolescent behavior, it was displayed that about 50% of the variance in adolescent personality is genetic in origin and the remaining 50% primarily reflects the influence of peers.

Adolescents spend a great amount of time with friends, and eating is one of the important forms of socialization. Adolescents at this period of their lives seek peer approval and social identity. Hence, it can be assumed that peer influence and group conformity can be considered as important determinants in food acceptability and selection. However, resistance to these social pressures is assumed to be dependent upon key traits and skills such as a strong sense of autonomy and other self-regulatory skills which middle-adolescents have begun to develop.

Peer pressure has been identified as the critical mechanism for transmitting group norms. There is no clear processes and mechanisms through which peer influence is exerted, but it has been argued that peers can exert influence by offering desirable rewards to those conform to group norms or undesirable consequences to those resist them. This can be also called social reinforcement. These types of influence as it is emerged from ethnographic studies can be either direct and overt, or subtle and indirect. It is also suggested, that apart from social reinforcement, modeling and social comparison are also mechanisms through which peers' copy behaviors or norms (Brown, 1989; Kandel, 1980). Modeling occurs when individuals copy behaviors they see others perform. From an eating behavior perspective, peers could model excess consumption of junk food, coffees and other types of food that is considered as unhealthy. Social comparison, which Festinger (1954) proposed has an impact on self-perception and could provide information regarding group norms that motivate changes on adolescent's behavior.

It is essential to examine reinforcement, modeling and social comparison because these mechanisms can facilitate the better understanding of sociocultural aspects of eating behavior. As Urberg (1992) noted, differences in adolescents' willingness to engage in any behavior that is consistent with peer norms are associated with differences in the perceptions of the pressures to conform. It is also important to note that several researchers have demonstrated the important influence of friends, suggesting that weight-related attitudes and behaviors among friendship groups may predict body image, dieting onset, chronic dieting, eating disorder symptoms, and general eating behaviors (Huon, Lim, & Gunewardene, 2000; Huon & Walton, 2000; Paxton, Schutz, Wertheim, & Muir, 1999)

The following studies reviewed were selected from different Journal databases (PsychInfo, Science Direct, Gale Group-Expanded Academic Research-ASAP). The covered period is twenty years (1986-2006). Key words were "peer influence and eating behavior", "peer influence and nutrition". The studies found were reviewed in order to determine the extent to which peer influence components were identified and related to adolescents eating related behaviors.

3.3.1. Overview of peer influence on adolescents' eating behavior

A study by Baker, Little and Brownell (2003) examining eating behaviors in a sample of 279 adolescents indicated that social norms do play a role in adolescent decision making about eating through their influence on attitudes. More specifically, adolescents who thought that (a) their eating and activity behaviors were unimportant to peers and (b) their friends were not healthy about eating were less likely to have positive attitudes or intentions about healthy eating. Additionally, in a cross-sectional study in which the eating and body image concerns among average-weight and obese African American and Hispanic girls were examined, Vander Wal (2004) indicated that overweight girls had significantly lower body esteem and perceived greater amounts of peer influence compared to average-weight girls. Thus, peer acceptance appears to be very important.

Furthermore, a 3-year longitudinal study by Huon, Hayne, Gunewardene, Strong, Lunn, Piira, and Lim, (1999) examined dieting status and several factors such as social influence, vulnerability disposition, protective skills, and familial contexts in which 1,644 teenage girls. Their study demonstrated that the strongest predictor of dieting status was peer influence. Peers competitiveness was the most important predictor of dieting status. Other substantial effect was peer modeling. Also, influences from peers maintain a strong predictive capacity even when all the variables were taken into account.

Also, evidence from a study using a sample consisting of 1220 adolescents showed that peer influence was a significant determinant of eating behaviors in adolescents. Basically, this study indicated the impact of peers on behaviors associated with the intake of foods rich in saturated fats. Modeling of food intake is one of the mechanisms used by adolescents in order to be accepted by their peers. Therefore, peers can apply direct or indirect pressure for the adoption of unhealthy eating behaviors due to the need of adolescents to belong and to be accepted by the peer group (Monge-Rojas, Nunez, Garita, & Cehn-Mok, 2002).

Vereecken, Van Damme, and Maes (2005) in their study of social and environmental influences on fruit and vegetable consumption found that encouragement from peers

was strongly skewed toward disagreement, indicating that children were not encouraged to eat fruit or vegetables by their peers, nor did they expect that consuming these items daily would make them more physically attractive or popular.

Another study by Huon, Lim, and Gunewardene (2000) on the extent to which different levels of weight-loss dieting reflected differences in the sources (peers and parents) and forms of social influence (modeling, conformity and compliance) indicated that total peer influence was higher among the serious dieting group. Also, when they examined the age-related differences it was found that peer influence on dieting increased markedly for the middle age group (14-15) and then dropped off for the older girls. On the three forms of peer influence, it was found that modeling and conformity had markedly stronger effects than did compliance.

Further, evidence from a study on friendship, clique and peer influence on body image concerns, dietary restraint, extreme weight loss behaviors and binge eating among female adolescents showed that friendship groups displaying higher levels of body image concern and weight-loss behaviors have reported : (a) talking more about weight loss and dieting with their friends; (b) comparing their bodies more often with others; (c) receiving more teasing from friends about weight and shape; (d) friends as being more important in influencing their decisions to diet and (e) perceived their friends to be more preoccupied with dieting and weight loss (Paxton, Schutz, Wertheim, & Muir, 1999).

A more recent study by Dohnt and Tiggemann (2005) on peer influence and body dissatisfaction and dieting awareness in young girls indicated that there was significant relationship between girls' perception of their peers' body dissatisfaction and their own level of body dissatisfaction. Also, the girls displayed considerable understanding of the potential social consequences of weight, such as teasing about overweight and increased popularity and likeability for being thin.

In a similar study examining both male and female adolescents about body change strategies and eating problems it was found that sociocultural factors were also significantly linked to body change strategies and eating problems. For instance, it

was found that higher levels of peers' encouragement to lose weight or to increase muscles were accompanied by higher levels of corresponding body change strategies and eating problems. More specifically, for male adolescents body comparison and body importance were the unique predictors of body change strategies and eating problems, whereas in female adolescents body comparison and peer influence were significant predictors (Muris, Meesters, Van de Blom, & Mayer, 2005).

In line with the findings of the above study, another study on social influence and body image and eating disturbance (Van de Berg, Thompson, Obremski-Brandon & Coovert, 2002) found that social comparison was an important individual difference variable which served as a mechanism by means of which environmental influences affect eating and weight-related behaviors. Peer influence seems to be a direct predictor of restricting behaviors. Further, in a study about the role of social norms and friends' influences on unhealthy weight-control behaviors among adolescent girls it was demonstrated that social influences and more specifically, perceptions of friends' dieting and to a lesser extent the prevalence of trying to lose weight throughout school were associated with unhealthy weight control behaviors (Eisenberg, Neumark-Sztainer, Story and Perry, 2005).

Research on disordered eating showed that there is a significant effect of peer influence on binge eating. More specifically, Crandall's (1988) study found that women in two college sororities reported a positive relationship between binge eating and popularity, suggesting that binge eating is primarily acquired through peer modeling. Nevertheless, binge eating and popularity were related differently in the two sorority groups. For instance, in one group, the popularity of each member, measured through sociometric ratings, increased linearly with the amount of binge eating each member engaged in. In the other sorority, only binge eating at a level was associated with popularity. Similarly, a study by Young, McFatter and Clopton (2001) about family functioning, peer influence and media influence as predictors of bulimic behavior indicated that perceived peer pressure to maintain a thin body shape appears to have a direct relation to bulimic behavior. Nonetheless, it was also noted that this relationship is unclear.

Moreover, in a study on weight perception and psychological factors among Chinese adolescents it was found that perceived peer isolation was a significant predictor of perceived weight status. Specifically, boys who perceived themselves to be underweight were more likely to feel isolated by peers than boys who perceived their weight as normal. Also, girls who perceived themselves as overweight reported relatively but significantly higher perceived peer isolation than girls who perceived their bodies as underweight or normal. Further, it was revealed from the analysis that there was significant positive relationship between BMI and perceived peer isolation (Xie, Liu, Chou, Xia, Spruijt-Metz, Gong, Li, Wang, & Johnson, 2003).

Finally, a group of researchers (Lieberman, Gauvin, Bukowski & White, 2001) report that girls who had higher levels of dieting had also the following characteristics: they were more popular, they had positive opposite-sex relational esteem and finally they had higher attributions about the importance of weight and appearance for popularity and dating. Also, girls who were upset about weight-related teasing reported more dietary restraint than girls who were not upset by the teasing and those who were not teased at all. Further, peer pressure significantly predicted dieting and peer modeling contributed uniquely to dieting behavior. Additionally, the investigation of social influence on bulimic behavior indicated that negative peer behaviors were statistically significant with peer nominations of overweight teasing and social rejection showing unique prediction. Thus, girls who were nominated by their peers as teased about being overweight engaged in bulimic behaviors. Thus peer pressure was a significant predictor of bulimia, with unique variance for social reinforcement and peer modeling.

Table 3. *Overview of Empirical Studies on Peer Influence*

Empirical studies	Peer relationship related Variables	Comparable variables to the peer influence theories	Outcomes
1. Baker, Little & Brownell (2003)	Social norms	Modeling and reinforcement	Attitudes and intentions towards healthy eating
2. Vander Wal (2004)	Peer messages and peer likeability	Reinforcement	Overweight and low self-esteem
3. Huon, Hayne, Gunewardene, Strong, Lunn, Piira, & Lim, (1999)	Peers competitiveness and peer modeling	Social comparison and modeling	Dieting status
4. Monge-Rojas, Nunez, Garita, & Cehn-Mok(2002)	Peer eating practices, selection of food by peers, food beliefs transmitted by peers, type of food consumed by peers and places where peers consume food	Modeling and reinforcement	Unhealthy eating behaviors
5. Vereecken, Van Damme, & Maes (2005)	Encouragement	Reinforcement	Fruit and vegetable consumption
6. Huon, Lim, and Gunewardene (2000)	Modeling, conformity and compliance	Modeling and reinforcement	Diet
7. Paxton, Schutz, Wertheim, & Muir (1999)	Friend relations and perceived attitudes	Modeling, reinforcement and social comparison	Body image, dietary restraint, extreme weigh loss behaviors, binge eating

8. Dohnt & Tiggemann (2005)	Teasing, likeability, peer discussion and peer acceptance	Modeling and reinforcement	Body dissatisfaction and dieting awareness
9. Muris, Meesters, van de Blom, & Mayer (2005)	Body comparison, perceived encouragement	Reinforcement and social comparison	Body changes strategies and eating problems
10. Van de Berg, Thompson, Obremski-Brandon & Coovert (2002)	Teasing, feedback on physical appearance, sociocultural pressures	Modeling, reinforcement and social comparison	Body image and eating disturbance
11. Eisenberg, Neumark-Sztainer, Story & Perry (2005)	Perceptions of friends' dieting	Modeling	Unhealthy weight –control behaviors
12. Crandall (1988)	Peer modeling	Modeling	Binge eating
13. Young, McFatter and Clopton (2001)	Perceived peer pressure	Reinforcement	Bulimic behavior
14. Xie, Liu, Chou, Xia, Spruijt-Metz, Gong, Li, Wang, & Johnson (2003)	Perceived peer isolation	Reinforcement	Weight perception
15.Lieberman, Gauvin, Bukowski & White (2001)	Social reinforcement, peer modeling and peer teasing	Modeling and reinforcement	Disordered eating behaviors

3.3.2. Summary and direction for the present study

The reviewed studies on peer influence on adolescents' dieting related behaviors allow several conclusions. First, considerable empirical support has been found for the different peer influence mechanisms and their predictive power on eating behavior. Secondly, although existing evidence points to the notion that peers have a significant influence on eating behaviors; these studies have a limited theoretical framework, plus limited information on the different types of peer influences which are associated with eating behavior. One explanation of this is the fact that adolescents are in a phase seeking individuation, autonomy, and independence, and may not want to believe or admit that their behavior is influenced by others. Thus, this makes it difficult to assess social influence by simply asking youth about the influences of their friends and peers.

Thirdly, another issue that needs further research is the investigation of the different peer influence mechanisms on healthy eating or risky eating. The reviewed studies placed more emphasis on disorder eating and body image, ignoring the importance of everyday dietary behaviors. Further, gap in the reviewed studies is the examination of peer influence mechanisms for both genders. Thus, the present study aims to address the following issues by investigating these mechanisms on healthy and unhealthy dietary behavior for both genders. Finally, one important limitation of the reviewed studies is the fact that none of them examines interpersonal and self-regulation parameters of healthy and risky eating. The present study introduced the examination of the impact of self-regulation, peers and family influence in healthy and risky eating behavior.

In conclusion, concerning the findings of the empirical studies on peer influence, a few points can be made: (a) peer influence and especially mechanisms such as reinforcement and modeling seem to be related to dietary behaviors; (b) these mechanisms seem to be negatively related to adolescents dietary behaviors and (c) these mechanisms have been linked mostly with female adolescents' dietary behavior rather than with male adolescents.

3.4. Social influence and self-regulation in healthy eating behavior

Research suggests that intrapersonal competencies, such as self-regulation (Brody, Stoneman, Flor, MsCrary, Hastings, & Conyers, 1994), coping (Ohannessian, Lerner, Lerner, & von Eye, 1994) and emotional regulation (Barbarin, 1993; Katz & Gottman, 1991; Rutter, 1985) mediate the correlation between family environment and adolescent developmental outcomes. Although there are many studies that examined separately the influence of personal and interpersonal determinants on eating behavior, only a handful of studies exist that combine the family and peers variables together with personal determinants in predicting dietary behavior. For instance, the studies by Bourdeaudhuij and Van Oost (2000) examining the determinants of dietary behavior using the Theory of Planned Behavior showed that family determinants explain additional variance in dietary behavior over and above personal determinants. Additionally, these authors argue that health behaviors originate from a set of family characteristics indicating that family involvement is desirable in health promotion intervention (Bourdeaudhuij & Van Oost, 1998a).

Moreover, a study on the role of social norms and personal agency on adolescents' eating and activity behaviors showed that adolescents who perceive (a) that their eating and activity behaviors were unimportant to peers and parents, and (b) their friends and parents are not healthy regarding eating and activity were less likely to have positive attitudes or intentions about healthy eating and activity (Baker et al., 2003). Also, the results of another study indicated that family functioning predicts dietary restraint but that this effect is mediated by peer influence to diet (Lattimore & Butterworth, 1999). More specifically, the results showed that healthy family functioning was associated with greater individuation, which was associated with less perceived peer influence and which in turn was associated with low restraint.

In addition, Cognitive Evaluation Theory (CET) (Deci & Ryan, 1985) demonstrates that the social-context events can facilitate intrinsic motivation only when the individual has the opportunity to experience feelings of autonomy and self-determination. Studies examining health show that greater internalization is associated with greater adherence to medications among people with chronic illnesses (Williams, Rodin, Ryan, Grolnick, & Deci, 1998), improve glucose control among diabetics

(Williams, Freedman & Deci, 1998), are associated with better long-term maintenance of weight loss (Williams, Grow, Freedman, Ryan, & Deci, 1996).
Even though, the personal and interpersonal factors are of great importance in shaping healthy eating behavior; these factors have been mostly examined independently from each other. The present study aims to combine these factors and examine the impact of each of these parameters in healthy eating behavior.

Furthermore, another argument that emerged from the adolescents' literature is that adolescents at this period seek peer approval and social identity more than in earlier stages of their lives. Thus, they adopt behaviors that their peer group approves or perform. If this is true then one can argue that adolescents do not generate self-regulation skills towards health behavior goals. Further, on this statement researchers have argued that adolescents have limited abilities in areas of psychosocial functioning, such as self-reliance, which in turn is likely to interfere with the ability to act independently from the influence of others (Cauffman & Steinberg, 2000; Steinberg & Cauffman, 1996).

Therefore, the reason of choosing middle adolescents in the present study is because it would be interesting to examine whether self-regulation skills do play a role in adolescents' dietary behavior. Our assumption is that they do. Additionally, it also appears from the literature review that adolescents' resistance to social pressures is dependent upon key traits and skills such as a strong sense of autonomy and other self-regulatory skills which middle-adolescents begin to develop in this stage of their life.

On the other hand, the literature suggests that family relationships influence adolescents eating behavior to a great extent. If this is so, again one can argue that adolescents' self-regulation skills do not play a role on healthy eating. However, as it was stated above, our assumption is that self-regulation skills do play a role in healthy eating behavior of adolescents. We also argue that family relationships are important in the development of self-regulation skills. Findings suggest that the relationship between family functioning and autonomous functioning does exist (Lattimore & Butterworth, 1999). Thus, healthy relationship within the family means a clear sense

of self-independence from one's parents. A result of healthy family relationships is the promotion of the adolescents' self-regulation skills development.

As is evident from the overview of the studies presented above, there has been a proliferation of research on healthy eating related issues in adolescence. The present study is based on an explanatory model that tries to reflect the complexity and transactional nature of relations between healthy eating outcomes and the variables (personal and interpersonal) that are thought to predict these outcomes. The study focuses on self-regulation because of the existing misconception about the decision-making processes of adolescents. These misconceptions were created most probably by erroneous measurement of the relevant variables, something that is not rare at all in the health psychology literature. Additionally, more often than not, the conceptualization of the adolescents' cognitive skills is poor or incomplete. Consequently, as Beyth-Marom and Fischoff (1997) point out, our understanding of the adolescents' decision-making processes, particularly with respect to engaging in risk behavior, is quite vague, or even false. For all the above reasons, the present study articulates cognition and especially self-regulatory skills and behaviors as its basic theoretical framework.

4. METHOD

4.1. Aims of the study

The more specific aims of the study are the following:

- To investigate whether there is a difference between internal and socially imposed factors in healthy eating and risky eating behavior;
- To investigate whether there is a difference between internal (self-regulation) and socially imposed factors in successful accomplishment of healthy eating behavior;
- To investigate whether there is a difference in healthy eating behavior between those who had healthy eating as a goal and those who did not.

4.2. The importance of the study

Even though adolescents face very often difficulties with formulating their identity they become gradually more dependent on internal standards and beliefs (Harter, 1990). Therefore, it appears from the literature that adolescents' nutrition education efforts should encourage the development of healthful dietary skills which in turn involve self-regulation rather than building a nutrition knowledge base (Backman, Haddad, Lee, Johnston &Hodgkin, 2002).

So far in the literature, researchers used social-cognition models to identify the determinants of eating behavior in adolescence. Their weaknesses lie first on the fact that the target health behavior is considered in an external way and not as an existing personal goal. Secondly, they measure intention and not actual behavior. Finally, they are criticized because of their failure to describe the process in approaching the health behavior goals (Maes & Gebhardt, 2000).

Further, studies that examine interpersonal determinants in explaining the eating behavior of adolescents such as peer and family influence have managed to present in a great extent the social determinants of dietary behavior. But again on the other hand, findings suggest that resistance to social pressures depends upon skills such as strong influence of autonomy, self- efficacy and good interpersonal negation skills. Thus, a strong sense of autonomy is associated with less perceived parental influence to diet and with a parental style high in care and low in overprotection (Strong & Huon, 1998).

Therefore, in contrast to the social cognition models, the present study focuses on the role of motivated cognitions which involve personal goals in the adoption of health behaviors. It is essential to investigate self-regulation in adolescence using a functional definition of the term. In the literature, many researchers (e.g. Purdie & McCrindle, 2002; Luszczynska et al. 2004;Karwautz, Volkl-Kernstock, Nobis, Kalchmayr, Hafferl-Gattermayer, Wober-Bingol & Friedrich, 2001) refer to the term "self-regulation" without clarifying what self-regulation actually involves. Frequently, in the literature researchers place under the umbrella of self-regulation attitudes, intention, other variables from social – cognition models, and scales from Narcissism Inventories in order to identify determinants that predict dietary behavior. It's like applying stage theories without referring to any stages!

4.3. Basic concepts and terms

The present study uses various terms. The main concept in the study is **self-regulation** which refers to any effort made by an organism to alter its own responses. More specifically, self-regulation is defined as a goal-guidance process that contributes to the accomplishment and maintenance of personal goals (Maes & Karoly, 2005).

Also, another term used here is social influence which can be distinguished in (a) peer influence and (b) family influence. **Peer influence** refers to the attitudes and behaviors related to eating behavior among peers and friendship groups. **Family influence** refers to some general family characteristics. More specifically these are: (1) **Family cohesion** which refers to the degree of commitment, help, and support family members provide for one another. (2) **Control** which refers to how much set rules and procedures are used to run family life and (3) **Independence** which refers to the extent to which family members are assertive, are self-sufficient, and make their own decisions (Moos & Moos, 2002).

Healthy eating behavior which is the dependent variable in this study refers to a balanced diet low in fat, high in fiber (fruit and vegetables) and limited in salt and sugar-rich foods such as soft drinks, snacks and sweets.

The term **BMI** refers to the Body Mass Index which is basically the weight status expressed in weight percentile. Body mass index was computed for each subject using the following formula: BMI = weight (kg) / height (m^2).

Somatic symptoms refer to the body symptoms individual experiences (pain signals from specific parts of the body). Such as headache, pains in lower back etc.

Fatigue symptoms refer to the symptoms of tiredness that individuals have experienced the last two weeks and affect different areas of their everyday function such as lack of concentration, lack of motivation, physical exhaustion and lack of physical activity.

4.4. Participants

The participants of this study were adolescents (N= 799) attending the second grade of senior high school and had a mean age of16.6 (*SD* = 4.8) A cluster stratified sampling procedure was used as follows: the lists of all the existing senior high schools were obtained from the Cyprus Ministry of Education and Culture. Six of these (20% of the total number of schools) were randomly selected using as main criteria the type of community they serve (urban-rural). The 50% of these second grades of the schools was also selected at random. The students who attend these classes were the sample of the study. To ensure that this was a representative sample of the whole country, tests were applied using the following criteria: gender, place of residence (urban-rural) and family socio-economic status.

In order for a case to be included in the sample the following should hold true: (a) the participant should have completed all the scales; (b) the participant should have a clear goal that concerns his/her health. Fifty-three questionnaires had missing values and for this reason these cases were deleted from the data matrix. Overall, out of 928 completed questionnaires only 799 satisfied the above criteria.

The final sample of the study consisted of 307 males (38.4%) and 492 females (61.6%). In terms of the area of family residence, 454 participants (56,8%) live in urban areas and 345 (43.2%) live in rural areas (Table 4).

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* The sample of the second phase was 730 and not 799, because some adolescents were absent during the data collection day or the completed questionnaires had missing values.

Table 4. Number of adolescents participating in this study by gender and residence

		RESIDENCE			
		URBAN	**RURAL**	**N**	**%**
GENDER	Male	182	125	307	38.4
	Female	272	220	492	61.6
	TOTAL	454 (56.8%)	345(43.2%)	799	100

4.4.1. Mothers' demographics

Regarding their education, the majority of the mothers (61.6%) are high school graduates and only 10.6 % were elementary graduates. Further, 27.8% were college and University graduates (see Table 5). Regarding their profession most of them (40.8%) were white-collar employees (sales, secretarial, lower administrative staff) and 14.4% were blue-collar workers in industry, construction, manufacturing and other labor positions. Ten percent were University graduates working as independent professionals (engineers, lawyers, physicians and other executive positions in the service sector). Finally, the 34.8% were housewives (Table 6).

4.4.2. Fathers' demographics

As expected, the percentage of father who graduated from high school was higher than the corresponding percentage for mothers (63.8%). The elementary graduates were about the same as the one of the mother (9.5%). Furthermore, 26.7 were college and University graduates (Table 7). Regarding their profession, the majority were blue-collar workers 56.2% while 33.2% had administrative positions and other white-collar positions. A smaller percentage held executive and independent professional jobs (10.6%) (see Table 8).

Table 5. Mothers' educational level

EDUCATIONAL LEVEL	N	%
Elementary	85	10.6
High school	492	61.6
University	222	27.8
TOTAL	799	100

Table 6. Mothers' professional status

PROFESSIONAL STATUS	N	%
Manual	115	14.4
Clerical	326	40.8
Scientific	80	10.0
Housewife	278	34.8
TOTAL	799	100

Table 7. Fathers' educational level

EDUCATIONAL LEVEL	N	%
Elementary	76	9.5
High school	510	63.8
University	213	26.6
TOTAL	799	100

Table 8. Fathers' professional status

PROFESSIONAL STATUS	N	%
Manual	449	56.6
Clerical	265	33.2
Scientific	85	10.6
TOTAL	799	100

4.4.3. Family demographics

More than half of the participants (57.8%) stated that their family monthly income was average (between 1000 and 2000 Cyprus pounds). Almost about one third (24.7%) had lower than average income and smaller percentage (17.5%) had high income (see Table 9).

Table 9. Participants' Family monthly income

MONTHLY FAMILY INCOME (Cyprus pounds)	N	%
Low (500-1000)	197	24.7
Average (1001-2000)	462	57.8
High (2001-3000+)	140	17.5
TOTAL	799	100

The socio-economic status of the families was calculated based on the following variables: mother's education level, father's education level and family income. Families in which both parents had university education and their combined monthly income was high were classified in the high SES. Families in which both parents had high school education and average income were classified in the medium SES. Families in which both parents had elementary education and low income were classified in the low SES. All the other combinations of educational level and income were classified as medium SES.

Table 10. Participants' family Socio-economic status (SES)

SES	N	%
Low	205	25.7
Medium	466	58.3
High	128	16.0
TOTAL	799	100

4.5. Instruments

Since this is a longitudinal study the scales are divided into two categories: (a) scales for the first data collection wave and (b) scales for the second data collection wave. All the scales appear in the Appendix.

4.5.1. Instruments used for the first data collection wave

Healthy Eating Behavior

The dietary behavior, which is the dependent variable, was measured using a 60-item Food Frequency questionnaire adapted from the Preventive Medicine and Nutrition Clinic Survey (Kafatos, 2005).

The instrument consisted of 60 different types of food. The participants answered on five point Likert type scale, indicating the frequency of consuming each of these foods. These 60 types of food load on 9 factors. These factors are divided into two main categories "healthy food" and "unhealthy food". The first category ("healthy food") includes: (1) dairy products low in fat, (2) vegetables (3) fruits, (4) carbohydrates and (5) white meat. The second category ("unhealthy food") includes: (6) dairy products high in fat, (7) sweets, (8) red meat and (9) junk food.

Since this is a new instrument developed in 2005, research on the internal reliability of the factors is still in progress.

Examples for each type of food are as follows:

- Dairy products low in fat: semi-fat milk, skimmed milk, semi-fat yogurt, skimmed yogurt, low fat cheese (anari etc)
- Vegetables: pulse, salads, raw vegetables
- Fruits: fresh fruit juices, fruits, juices
- Carbohydrates: rice, potatoes, pasta, brown bread
- White meat: chicken, fish
- Dairy products high in fat: full fat milk, full fat yogurt, cheeses high in fat (kefalotyri etc)
- Sweets: chocolates, wafers, biscuits, creams, ice-cream, cakes
- Red meat: sausage, pork, beef, liver
- Junk food: cheese pies, sausage pies, kebab, pizza

Participants gave their answers on a five point Likert type of scale [1= never, 2= rare (once a month), 3=sometimes (once a week), 4= frequently (3-4 times per week), 5= very frequently (5-7 times per week), thus indicating how often they consumed each type of food.

Health Goal

The Health Goal was measured through the **Goal Elicitation Procedure** (Little, 1983). This instrument consists of 3 items. Participants selected first, a personal goal which they were currently pursuing regarding their health or they were planning on pursuing in the near future. Secondly they indicated how long they had been pursuing

this goal (less than a month or more than a month). Thirdly, a visual analogue scale was used to indicate the subjective saliency and proximity of the health goal.

e.g. Where would you put yourself in terms of progress towards this goal?

●----------●

I am just starting with this goal — I have achieved this goal

Self-regulation Cognitions

The **Self –Regulation Cognitions Scale** (Maes & De Gucht, 2005) is a self-report questionnaire consisting of 13 items and measures the following self-regulation cognition categories (factors):

1. *Commitment and persistence*. Five items load on this factor. The internal reliability for this subscale using the Cronbach alpha is .97. One example of the sentences included in the subscale is: "I plan my daily activities so that I have enough time and/or attention left to work on this goal".

2. *Goal efficacy*. Four items load on this factor and the internal reliability for this subscale using Cronbach alpha is .95. An example in this subscale is: "It is clear to me how I can achieve this goal"

3. *Self-determination*. Four items load on this factor. The internal reliability of the subscale using Cronbach alpha is .89. One example is: "I pursue this goal because it is important to me".

The participants answered on a five point Likert type scale (1= totally disagree, 2= disagree, 3= ambivalent, 4= agree, 5=totally agree).

Family Influence

The instrument used for family influence was the **Family Environment Scale (FES)** (Moos & Moos, 1981, 1986, 2002). The FES consists of 10 subscales and assesses three underlying sets of dimensions: (a) relationship dimensions, (b) personal growth (or goal orientation) dimensions, and (c) system maintenance dimensions. The relationship and system maintenance dimension reflect internal family functioning;

the personal growth dimensions reflect the linkages between the family and the larger social context.

The 10 subscales are:

Relationship Dimensions

(1). Cohesion: the degree of commitment, help and support family members provide to each other

(2). Expressiveness: the extent to which family members are encouraged to express their feelings directly

(3). Conflict: the amount of openly expressed anger and conflict among family members

Personal Growth Dimensions

(4). Independence: the extent to which family members are assertive, are self-sufficient, and make their own decisions

(5). Achievement Orientation: how much activities (such as school and work) are cast into an achievement-oriented or competitive framework

(6). Intellectual-Cultural Orientation: the level of interest in political, intellectual and cultural activities

(7). Active – Recreational Orientation: the amount of participation in social and recreational activities

(8). Moral – Religious Emphasis: the amount on ethical and religious issues and values

System Maintenance Dimensions

(9). Organization: the degree of importance of clear organization and structure planning family activities and responsibilities

(10). Control: how much set rules and procedures are used to run family life

The 2-month test-retest reliabilities, all in an acceptable range, vary from a low .68 for independence to a high .86 for cohesion. Test-retest reliabilities were also relatively high for the 4-month interval. Gehring and Feldman (1988) found good one week test-retest reliabilities for adolescents' ratings of cohesion and control.

For the purpose of the present study the researcher used the following subscales (factors):

1. *Cohesion*. An example of the sentences used in the subscale is “Family members really help and support one another”.

2. *Expressiveness*. One example of the sentences presented in the subscale is “Family members often keep their feelings to themselves”.

3. *Conflict*. An example of the subscale’s sentence is “Family members sometimes get so angry they throw things”.

4. *Independence*. One example of this subscale is “There is one family member who makes most of the decisions”.

5. *Achievement Orientation*. An example from the sentences used for this subscale is “We always strive to do things just a little better the next time”.

6. *Organization*. An example from the sentences presented in the subscale is “It’s often hard to find things when you need them in our household”.

7. *Control*. One example of the sentences used in the subscale is “Each person’s duties are clearly defined in our family”.

The participants were asked to give answers on statements about their families on a five-point Likert type of scale (1= not true at all, 2= not true, 3= ambivalent, 4= true, 5= absolutely true)

Peer Influence Questionnaire

The Food and Friends questionnaire (2F) (Georgiou & Kalavana, 2005) was used to measure peer eating practices. It is made up of 30 items. This scale includes three subscales (factors) which are: (1) food attitudes transmitted by peers, (2) approval by peers of new eating habits and (3) adaptation to the eating pattern of peers. This questionnaire is adapted from the research of Monge-Rojas, Nunez, Garita and Chen-Mok (2002).

The subscales:

1. *Peer’s attitudes about food*. The subscale consists of 10 items. An example is “My friends believe that chocolates give energy”. The participants gave answers on a five point Likert type of scale (1= totally disagree, 2= disagree, 3= ambivalent, 4= agree, 5= totally).

2. *Approval by peers of new eating habits*. The subscale consists of 10 items. One example of the sentences included in the subscale is "I should eat white meat" and the whole scale begins with the following sentence "My friends approve …". The participants answered on a five-point Likert type of scale (1= reject, 2=don't approve, 3= neither approve nor disapprove, 4= approve, 5= totally approve).

3. *Adaptation to the eating patterns of peers*. The subscale consisted of 10 items. A sentence's example is "I prefer to consume food that my friends like". Participants answered on a five-point Likert type of scale (1= totally disagree, 2= disagree, 3= ambivalent, 4= agree, 5= totally).

Body Mass Index (Garrow & Webster, 1985) is calculated as weight in kilograms by the squared height in meters, and was assessed by self-report. Although objective measures of weight and height would have been preferable, this was not done because of the large sample size. Measuring each student separately would have been too expensive and time-consuming.

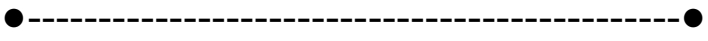
4.5.2. Instruments used for the second data collection wave

Six instruments were used for the second data collection wave. These are: Goal Elicitation Procedure (Little, 1983); the Self-regulation Skills Battery (Karoly, Ruhlman, Maes, De Gucht & Heiser, 2006), the Food Frequency Questionnaire (Kafatos, 2005), Somatic Symptoms (Derogatis, 1975), Checklist Individual Strength (CIS) questionnaire (Vercoulen, Alberts & Bleijenberg, 1999).

Health Goal

The Health Goal was measured through the **Goal Elicitation Procedure** (Little, 1983). The instrument consists of 4 items. Firstly, participants wrote down the health goal that they identified six months earlier. Secondly they indicated to what extent they were working on this goal during the past 2½ months. Thirdly, they indicated whether they were still working on the goal, they had attained this goal or given up. Fourth, a visual analogue scale was used to indicate the subjective saliency and proximity of the health goal.

e.g. Where would you put yourself in terms of progress towards this goal?



I am just starting with this goal — I have achieved this goal

Self-regulation Skills Battery (Karoly, Ruhlman, Maes, De Gucht & Heiser, 2006) is divided into two self- report questionnaires each of which consists of 58 items and measures the same self-regulation skills. The only difference is that the questions in each scale are phrased differently. For instance, when a participant on the Goal elicitation procedure indicated that he or she is still pursuing the goal then he/she had to give answers on the questions in the Self-regulation A scale. These questions were written in the present tense. If the participant achieved or gave up on the indicated health goal then he/she had to complete the Self-regulation B scale questions, which were written in the past tense. It is noted that research on the internal reliabilities of the subscales is still in progress)

The self-regulation skills that are measured in both scales are the following:

1. *Ownership.* Consists of 5 items and measures the degree to which a goal is internally or externally oriented. An example of the sentences included in the subscale is “I pursue this goal because other people think it is important for me”, “I have chosen this goal myself”

2. *Self-efficacy* (4 items).

“I possess the necessary skills to attain this goal”, “I have what it takes to reach this goal”

3. *Need for feedback* (4 items).

“I am keen to know whether I am doing well on this goal”, “I look for information on my progress toward this goal”

4. *Help seeking* (4 items).

“When attaining this goal becomes difficult, I will ask other people for help or advice”, “I will not turn to other people for help if attaining this goal gets really difficult”

5. *Social comparison* (5 items).

"I evaluate my progress toward this goal in comparison to how well other people are doing in pursuing it", "I evaluate my progress on this goal by comparing myself to other people who are also working on it, but are doing worse than I am"

6. *Planning* (4 items).

"I carefully schedule my activities so I have enough time to pursue this goal", "T try to plan out in advance the steps necessary to reach this goal"

7. *Self-monitoring* (5 items).

"I am on the lookout for potential obstacles that might interfere with my progress on this goal", "I keep track of my overall progress toward this goal"

8. *Self-criticism* (5 items).

"I tend to criticize myself when I am not making progress toward this goal", "I routinely criticize myself if I don't work hard enough on this goal"

9. *Self-reward* (5 items).

"I reward myself when I make progress toward this goal", "I congratulate myself when things are going well on this goal"

10. *Attention / Stimulus control* (4 items).

"I try not to let other goals interfere with this goal", "I try not to let other people interfere with my work on this goal"

11. *Coping with problems* (5 items).

"When problems arise that could hinder my progress toward this goal, I calmly wait and see", "I think about the consequences of any solution, before I deal with problems pertaining to this goal"

12. *Self-efficacy enhancement* (4 items).

"I regularly remind myself that I have what it takes to attain this goal", "I am confident to find a solution, should problems arise that hinder my progress toward this goal"

13. *Emotion control* (4 items)

"I manage to keep my emotions in control if I fail to make progress toward this goal", "If I fail to make progress toward this goal, I do not get stressed out"

The participants answered on a five point Likert scale (5=totally agree, 4=agree, 3=ambivalent, 2=disagree, 1=totally disagree)

Food Frequency Questionnaire (Kafatos, 2005)**.** This is the same instrument that was used for the collection of the first data collection wave.

Somatic Symptoms (Derogatis, 1977). This is the somatization dimension of the Symptom Checklist 90-R (Derogatis, 1977). The Symptom checklist 90-R consisted of 9 subscales-dimensions. These dimensions are labeled as: somatization (SOM); obsessive-compulsive (O-C); interpersonal sensitive (I-S); anxiety (ANX); hostility (HOS); phobic anxiety (PHOB); paranoid ideation (PAR); and psychoticism (PSY). There are also three global indices, labeled as: global severity index (GSI); positive symptom distress index (PSDI); and positive symptom total (PST). High test-retest and internal consistency have been demonstrated, and there do not appear to be any problems with the practice effect. However, for the purpose of the present study the use of only one of the dimensions is needed, that is the symptoms of the somatization dimension. This dimension was chosen because of the assumption that risky eating behavior may have a direct effect on the somatic functions.

The components of *somatization dimension* are: headaches, faintness or dizziness, pains in heart or chest, pains in lower back, nausea or upset stomach, soreness of muscles, trouble getting your breath, hot or cold spells, numbness or tingling in part of the body, lump in throat, feeling weak in parts of the body and heavy feeling in your arms or legs.

Checklist Individual Strength (CIS) questionnaire (Vercoulen, Alberts & Bleijenberg, 1999; Beurskens, Bultmann, Kant, Vercoulen, Bleijenberg, & Swean, 2000). This is a questionnaire that measures fatigue. It consists of 20 statements for which the person has to indicate on a 7-point scale to what extent the particular statement applies to him or her (Vercoulen, Swanink, & Fennis, 1994). The statements refer to aspects of fatigue experienced during the previous 2 weeks. The number of items per dimension varies.

Four subscales are included in this measurement. These are as follows:

(a). *Subjective feeling of fatigue* (8 items). Examples of the statements included in the subscale are “I feel tired”, “Physically I feel exhausted”.

(b). *Concetration* (5 item). Examples: “Thinking requires effort”, “When I am doing something I can concentrate quite well”.

(c). *Motivation* (4 item). Examples: “I feel very active”, “I am full of plans”.

(d). *Physical activity* (3 items). Examples: "I do quite a lot within a day", "I have a low output".

4.6. Procedures

A Longitudinal design was applied in this study. Therefore, the participants' responses were measured in two occasions. The main advantage of the longitudinal design in the present research is the fact that it permits the examination of the participants' goal intention for healthy eating and the actual accomplishment of the above goal. Thus, since this study was administered at specific points during the goal attainment process, this will provide prospective and retrospective information on the process of goal pursuit. Consequently, the data collection was conducted in two phases. The first phase started in September of 2005 and the second phase six months later (March 2006). The questionnaires for both phases were completed by the participants in the school rooms and were collected the same day by the researcher. Before that, the researcher gave explanations and answered questions about completing the questionnaires. She also explained the fundamental goals of the present research. The researcher emphasized that the questionnaires were anonymous, and that all the rules of research ethics would be fully applied. A code was placed on each questionnaire. The code was necessary in order to reach the same participants six months later. It was also mentioned to the adolescents that the participation in this research was voluntary. Those who did not want to participate had no consequences whatsoever. The time needed for the completion of the first phase questionnaires was approximately 40 minutes and all the participants submitted the completed questionnaires to the researchers. The time needed for the completion of the second phase questionnaires was approximately 30 minutes. During the data collection procedure the researcher clarified difficult points and defined unknown words.

Missing values

Overall, the participants responded to 209 items for the 1st data collection wave and 161 items for 2nd wave (including the demographic information).

For the collection of the first data wave, the cases with missing values were all excluded from the study (53 cases). In the second data wave collection the missing values were replaced by distribution mean values for each item (Robson, 1993). This

is a statistical technique in which means are calculated from available data and are used to replace missing values prior to analysis. Because the amount of missing data and actual values in the present study were confined (highest percentage of the missing value was 21.97%), the replacement of the missing value with the mean value had no important effect on the variance and the distribution of the values (Tabachnick & Fidell, 1996).

4.7. The Variables used in the present study

The dependent (measured) variable of this study is eating behavior. It is assumed that this variable is influenced by a number of independent variables as follows:

- The self-regulation cognitions variables used for this study are the following (Maes & De Gucht, 2005).

1. Goal commitment and persistence includes individuals' statements about arranging the context to make healthy eating goal possible;
2. Goal related self-efficacy includes statements showing the capability of the individual to follow a healthy diet;
3. Self-determination concerns statements for keeping track of healthy eating;

- The self-regulation skills variables

4. Self-efficacy includes statements showing the capability of the individual to follow a healthy diet;
5. Planning includes statements about arranging the environment to make healthy eating possible;
6. Self-criticism concerns individuals' statements regarding judgments on the accomplishment of healthy eating goal;
7. Self-reward includes statements that encourage individuals to continue striving towards healthy eating goal;
8. Attention/stimulus control includes statements regarding the individuals' commitment on the healthy eating goal;
9. Emotion-control includes individuals' statements of positive affect concerning the healthy eating goal.

- The family environment variables which resulted from the confirmatory factor analysis on the Family Environment scale are:

1. Cohesion: the degree of commitment, help and support family members provide to each other.
2. Independence: the extent to which family members are assertive, are self-sufficient, and make their own decisions
3. Control: how much set rules and procedures are used to run family life

- The peer influence variables are based on the youth culture of enabling the acceptance or non-acceptance of the individual within the peer group. These variables are:

1. Peers' attitudes about food
2. Approval by peers of new eating habits
3. Adaptation to the eating pattern of peers

- The eating behavior variables which resulted from the confirmatory factor analysis of the Food Frequency Questionnaire are:

1. Sweets: chocolate, wafers, croissant, cakes
2. Red meat: beef, pork, lamb, sausage
3. Carbohydrates: potatoes, rice, pasta
4. Fruits: fresh juices, fruits, juices
5. Vegetables and white meat: fresh fish, pulse and vegetables

- The variables emerged from the confirmatory factor analysis for somatic symptoms scale

1. Headache symptoms
2. Body Aches symptoms

- The variables emerged from the confirmatory factor analysis for Checklist of Individual Strength

1. Subjective feeling of fatigue
2. Motivation
3. Lack of energy

4.8. Research questions

The following research questions were stated based on prior research. Some of them refer to the factors that form the theoretical model and some refer to the subgroups of the study's sample.

Research question

1. Self-regulation cognitions will influence the eating behavior of those who set healthy eating as their goal. Most specifically, it is assumed that self-regulation will have a positive relation with both behaviors-healthy eating and risky eating, with stronger relation with healthy eating behavior.
2. Family environment will influence eating behavior not directly but through self-regulation and peer influence. The argument is that family practices (such as providing specific food in the household) do have a direct effect on eating behavior, but family characteristics have indirect effect through the development of cognitions and skills (for instance self-regulation cognitions).
3. Peer influence is expected to have a negative relation with self-regulation cognitions.
4. Peer influence is expected to have a positive relation with risky eating behavior and less strong relation with healthy eating behavior for those who set the goal of healthy eating.
5. Risky eating will have a positive relation with BMI.
6. Healthy eaters are expected to have higher scores on self-regulation cognitions compared to those who are considered as non-healthy eaters.
7. Adolescents who will accomplish their goal they will use more self-regulation skills compared to those who will fail to accomplish their goal.
8. Females are expected to be more influenced by peers compared to male adolescents. This hypothesis is based on the great amount of research based on the evidence that female adolescents present more eating disorder problems and peer influence compared to male adolescents.
9. Risky eating is expected to have relation with somatic symptoms.
10. Self-regulation skills factor will influence the accomplishment of the healthy eating goal.

11. The peer influence factor will have a negative relation with adolescents' self-regulation skills towards healthy eating goal accomplishment.
12. The family influence factor will have a positive relation with healthy eating goal accomplishment through self-regulation skills.
13. The family environment factor will have a positive relation with peer influence.
14. The successful accomplishment of healthy eating goal will be related to higher levels of self-regulation.
15. The successful accomplishment of healthy eating goal will be related to higher levels of autonomy-independence.
16. The successful accomplishment of healthy eating goal will be correlated to families high in quality on emotional involvement.
17. The degree of failure for accomplishing the healthy eating goal will be correlated to the peer influence.
18. Adolescents who successfully change in the direction of healthy eating will have higher levels of self-regulation. Therefore, the mean score of the "self regulation" indicator will be significantly higher for the group that has achieved healthy eating compared to the mean score of the group that has not.
19. Adolescents who failed to accomplish their goal on eating healthily will be influenced by environmental factors and especially by peer groups. It is assumed that peer influence and group conformity are important determinants in food acceptability and selection when adolescents have not internalized healthy eating goal. Therefore, the indicators of "healthy eating behavior" and "self regulation skills" will be significantly higher for the first group compared to the second.
20. Adolescents who perceive the emotional involvement between their family members as satisfactory will have better healthy diet compared to those who perceive the emotional involvement between family members as low quality. The mean score of the indicators of "healthy diet" and "self-regulation skills" will be significantly higher for the first group compared to the mean score of the second group.
21. Adolescents who set the goal for healthy eating and feel that they have autonomy will pursuit their goal for eating healthily compared to those who set the same goal but feel that they are controlled by their parents. The mean

score of the indicators “autonomy”, “healthy eating” will be statistically higher for the first group compared to the mean score of the second group.

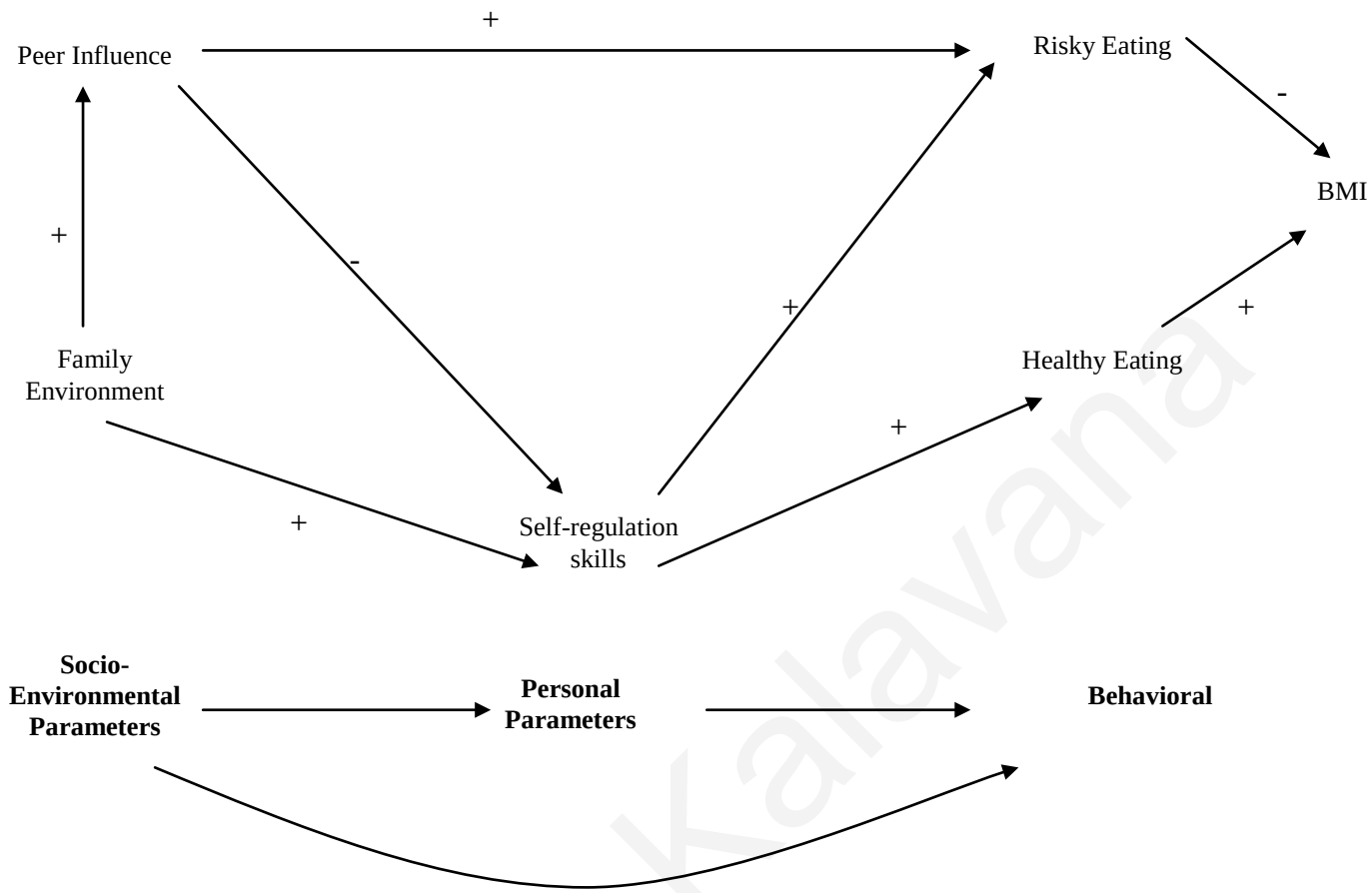
Research questions based on the factors structure among the groups for both phases

22. The self-regulation factor will be identical across the three groups (health eating goal group, physical exercise goal group and quit smoking goal group)
23. The family environment factor will be identical across the three groups.
24. The peer influence factor will be identical across the three groups.
25. The healthy eating factor will be identical across the three groups.
26. The risky eating factor will be identical across the three groups.
27. The self–regulation factor will have different effect for each group
28. The family environment factor will have different effect for each group.
29. The peer influence factor will have different effect for each group.
30. The healthy eating factor will have different effect for each group.
31. The risky eating will have different effect for each group.

4.9. The proposed model

The proposed model explaining healthy eating behavior among adolescents that was tested in this study is shown in Figure 8. Personal factors that are hypothesized to have a direct relation with healthy eating behavior include self-regulation cognitions and skills. The socio-environmental factors included in the model are: (a) family environment (family relationship such as cohesion, control and independence) and (b) peer influence (social reinforcement, comparison and modeling). As shown in the model, these variables were hypothesized to be associated with healthy eating behavior directly and indirectly through their influence on personal factors. Hypothesized pathways were based on previous research examining factors associated with dieting and other disordered eating behaviors (Strong & Huon, 1998; Thompson, Coovert, Richards, Johnson, & Cattarin, 1995; Thompson, Coovert, & Stormer, 1999).

Figure 8. *The proposed theoretical model*



5. RESULTS

5.1. Phase I

5.1.1. Data Analysis

The statistical analysis went through seven phases:

(I). Exploratory factor analysis conducted for each of the scales used in the present study. Within this analysis orthogonal rotation and the Varimax technique was used in order to force the factors to be uncorrelated with each other (Breakwell, Hammond & Fife-Schaw, 1997). The reason for selecting orthogonal rotation and not oblique rotation is because in varimax rotation the goal is to maximize the variance of factor loadings by making high loading higher and low ones lower for each factor. Therefore, emphasizing differences in loadings facilitate interpretation of the factors by making unambiguous the variables that correlate with it. The aim of the exploratory factor analysis is to extract those variables, which are expected to form the factors for each scale. The factors extracted from this analysis should have eigen values greater than one in order to be further statistically analyzed. It is important to note that the selection of factors was not only based on eigenvalue greater than one. The use of interpretability was the criterion for selecting the number of factors. Thus, the researcher identified the minimum and maximum number of factors and carried out an analysis for each potential solution. Thus, the solution which made the most theoretical sense was the most appropriate.

(II). On the second phase the reliability of both, the extracted factors and variables that make up the factors were examined.

(III) Because of the high factor loadings that were revealed by the factor analyses, the decision was made to use composite variables in subsequent analyses, rather than the original, individual variables. Thus, summing the scores on the variables that loaded highly on the factor created composite variables for each factor (Rosenthal & Rosnow, 1991)

(IV). A correlation matrix was also used to test the strength of association between the factors extracted. The Pearson product-moment correlation, r, was used for this association.

(V). The next step was to examine the structure of the extracted factors through confirmatory factor analysis. For the purpose of the factor structure identification of each instrument, SEM analyses were conducted using the EQS (Bentler, 1995). SEM offers advantages in that it provides information on (a) the overall fit of the proposed model to the data, (b) the strengths of association for specific pathways between latent variables included in the model and (c) shows the mediational role of specific variables included in the model.

In this study, each factor in the hypothesized structural model was modeled as a latent variable composed of at least two other composite variables. Thus, before relevant pathways between the factors were examined, confirmatory factor analysis was used to verify whether the proposed factors themselves were well defined (i.e., to test the fit of the measurement model).

Each model was estimated by using normal theory maximum likelihood methods (ML). For each model the following fit indices were used in order to evaluate the extent to which the data fit the models tested: the scaled χ^2, Comparative Fit Index (CFI) of Bentler (1990), the Root Mean-Square Error of Approximation (RMSEA) (Brown & Mels, 1990) and the indicator Root Mean-Square Residual (RMR). It is important to indicate that two mean scores were created for each participant in order to represent the means scores of two variables that load on each factor. Additionally, it is important to note that reducing a large number of raw scores to a limited number of representative scores is an approach suggested by proponents of structural equation modeling (Gustafsson, 1988). Moreover, this manipulation increases the reliability of the measures fed into the analysis and it therefore facilitates the identification of factors (Raykov & Marcoulides, 2000).

(VI). After testing the fit of the measurement models the data were further statistically processed again in structural equation modeling. A multiple group model was used, with the following three groups: adolescents who had healthy eating as a goal, adolescents who had physical exercise as a goal and adolescents who had quitting smoking as their goal. Factor loadings for the measurement model were fixed to be equal across the three groups, whereas the pathways between latent variables were left free to be estimated. This stage of model testing focused on estimating the magnitude and significance of the pathways between the latent variables, in addition to obtaining measures of overall model fit. Thus, the proposed model was tested, including all

hypothesized pathways. Measures were obtained to assess overall model fit and the statistical significance of specific parameters. Chi- square analysis was used to test the hypothesis that the relationship proposed in the model provide a plausible explanation of those that exist in the data. Also, additional measures have been examined to assess the fit of the model, such as: Comparative Fit Index (CFI) of Bentler (1990), the Root Mean-Square Error of Approximation (RMSEA) (Brown & Mels, 1990) and the indicator Root Mean-Square Residual (RMR).

Furthermore, to test the hypothesis that the factor structure is the same in the three groups, we constrained the factor loadings (regression coefficients) between the factors and their indices to equality across the three groups. We then calculated a test statistic for examining the equality of these parameters across the three groups by subtracting the chi-square statistic from the constrained and unconstrained models. This chi-square difference statistic was then compared to the chi-square distribution with the degrees of freedom.

(VII). At the final stage the mean value for each factor of the scales was examined. This transformation allowed further statistical analysis such as multivariate analysis of variance (MANOVA) in order to test the interpersonal hypotheses of the present research. Also, a t-test was used in order to compare the healthy eating group and non-healthy eating group with all the other independent variables.

5.1.2. Exploratory factor analysis

Self-regulation Cognitions Scale

The factor analysis extracted three factors that correspond to the following: “Goal commitment”, “Goal efficacy”, “Self-determination”.

The “Goal commitment” factor has an eigenvalue of 2.5. The variance explained was 19.5 %. Also, to examine the internal reliability of the factor coefficient α values were calculated. The value of Cronbach α was .73 and can be considered as satisfactory (Cronbach, 1990).

The ‘Goal efficacy” factor has an eigenvalue of 2.4 and explained variance was 19.1%. The Cronbach alpha of the factor was .79.

The “Self-determination” factor has eigenvalue 1.8 and 14.3% of explained variance and the Cronbach alpha is .67.

It was also found that dropping any item from the overall test was not followed by considerable increase in α value for each of the subdomains of the test. The Table that follows presents in detail the factors’ characteristics for self-regulation cognition scale.

Table 11. The self-regulation factors as resulted from the Exploratory Factor Analysis on Self-regulation Cognitions Scale

FACTORS (Cronbach's Alpha into parenthesis)	FACTOR EIGENVALUE	PERCENTAGE (%) OF EXPLAINED VARIANCE	FACTOR COMPONENTS (The loadings are into parenthesis)
Factor 1. Goal Commitment (.73)	**2.5**	**19.5**	V11: I plan my daily activities so that I have enough time and/ or attention left to work on this goal (.63) V12: I have detailed step-by-step plan to help me achieve this goal (.62) V13: I try to avoid being diverted from this goal by other important things or goals in my life (.70) V14: I don't allow myself to be distracted from this goal by other things (.73) V15: If other things temporarily demand my attention, I try to get back to working on this goal as soon as possible (.68)
Factor 2. Goal Efficacy (.79)	**2.4**	**19.1**	V3: It is clear to me how I can achieve this goal (.71) V4:I know for sure that I can reach this goal (.80) V5:I have the necessary skills to attain this goal (.74) V6:I feel very confident that I can achieve this goal (.78)
Factor 3. Self-determination (.67)	**1.8**	**14.3**	V7: I pursue this goal because other people think it is important (.82) V8:I pursue this goal to avoid conflict with other people (.80) V10: I think about how happy other people will be if I achieve this goal

The Food Frequency Scale

Five factors were extracted from this analysis. The first factor the "Sweets" (eigen value 2.6 and 15.4% of explained variance), the Cronbach alpha of the factor was .80.

The second factor is the "Red meat" (eigenvalue of 2.4 and 14.2% of explained variance), the Cronbach alpha of the factor was.75. These two factors can be considered as the "unhealthy food" factors.

The third factor is "Carbohydrates" (eigenvalue of 1.7, and 10.3% of explained variance), the Cronbach alpha was .60.

The fourth factor is "Fruits" (eigenvalue of 1.6 and 9.7% of explained variance), and the Cronbach alpha was .56.

The fifth factor is "Vegetables and white meat" (eigenvalue of 1.5 and 9.4% of explained variance). The Cronbach alpha for this factor was .52. These last three factors can be considered as the "healthy food" factors.

It was also found that dropping any item from the overall test was not followed by considerable increase in α value for each of the subdomains of the test. Table 12 presents in detail all the technical characteristics of the Food Frequency factors.

Table 12. Eating behavior factors as resulted from the Exploratory Factor Analysis for the Food Frequency Scale

FACTORS (Cronbach's Alpha into parenthesis)	FACTOR EIGENVALUE	PERCENTAGE (%) OF EXPLAINED VARIANCE	FACTOR COMPONENTS (The loadings are into parenthesis)
Factor 1. Unhealthy diet (Sweets) (.80)	**2.6**	**15.4**	V21: Chocolates (.79) V22: Wafers (.79) V23: Croissant (.82) V27: Cakes (.69)
Factor 2. Unhealthy diet (Red meat) (.75)	**2.4**	**14.2**	V34: meat or mince meat of beef (.76) V35: meat or mince meat of pork (.77) V36: meat or mince meat of lamb (.74) V38: kinds of sausage (.65)
Factor 3. Healthy diet (Carbohydrates) (.60)	**1.7**	**10.3**	V45: Potatoes (.59) V46: Rice (.73) V47: Pasta (.78)
Factor 3. Healthy diet (Fruits) (.56)	**1.6**	**9.7**	V32: Juices (.52) V50:Fruits (.76) V51: Fresh juices (.81)
Factor 4. Healthy diet (Vegetables and white meat) (.52)	**1.5**	**9.4**	V42: Fresh fish (.44) V44: Pulse (.76) V49: Vegetables (.76)

The Family Environment Scale

From the seven factors presented in the scale used for this research only 3 factors extracted. These factors are: (1). “Family cohesion”. The factor has an eigenvalue of 2.7 and the explained variance was 18.5%. The value of Cronbach α was .76.

(2) “Family control”. The eigenvalue of this factor is of 2.3 and the explained variance was 15.6%. The value of Cronbach α was .66.

(3). “Family Independence. The eigenvalue of this factor is of 1.9 and the explained variance was 13.1%. The value of Cronbach α was .61.

It is also noted that dropping any item from the overall test was not followed by considerable increase in α value for each of the subdomains of the test. Table 13 presents in detail the factors’ characteristics for the family environment scale.

Table 13. The Family Environment Factors as extracted from the Exploratory Factor Analysis

FACTORS (Cronbach's Alpha into parenthesis)	FACTOR EIGENVALUE	PERCENTAGE (%) OF EXPLAINED VARIANCE	FACTOR COMPONENTS (The loadings are into parenthesis)
Factor 1. Family cohesion (.76)	**2.7**	**18.5**	V1: Family members really help and support one another (.64) V22: There is a feeling of togetherness in our family (.69) V36: Family members really back each other (.73) V50: We really get along well with each other (.73)
Factor 2. Family control (.66)	**2.3**	**15.6**	V27: Being on time is very important in our family (.62) V28: There are set ways of doing things at home (.74) V35: There is a strong emphasis on following rules in our family (.68) V48: Each person's duties are clearly defined in our family (.54)
Factor 3. Family independence (.61)	**1.9**	**13.1**	V11: In our family, we are strongly encouraged to be independent (.60) V25: We come and go as we want to in our family (.73) V49: We can do whatever we want to in our family (.81)

The Peer Influence Scale

By means of an exploratory factor analysis, three factors were extracted. The first factor refers to "adaptation to the peer dietary behavior" and has an eigenvalue of 2.5 and 8.6% of explained variance. The value of Cronbach α was .78.

The second factor refers to "peer's approval of dietary behavior". The eigenvalue of this factor is of 2.2 and explained variance was 7.6%. Also, the value of Cronbach α was .78.

The third factor is "peer's attitudes about dietary behavior". The eigenvalue of this factor is of 2.2 and the explained variance was 7.3%. The value of Cronbach α was .66.

It was also found that dropping any item from the overall test was not followed by considerable increase in α value for each of the subdomains of the test. Table 14 presents in detail the characteristics for each peer influence factors.

Table 14. The Peers Influence factors which extracted from the Exploratory Factor Analysis

FACTORS (Cronbach's Alpha into parenthesis)	FACTOR EIGENVALUE	PERCENTAGE (%) OF EXPLAINED VARIANCE	FACTOR COMPONENTS (The loadings are into parenthesis)
Factor 1. Adaptation to the peer dietary behaviors (.78)	**2.5**	**8.5**	V41: It is important in my peer group to eat similar foods (.79) V42: We feel closer to each other when we share a pizza(.71) V43: I prefer to eat food that my friends like(.73) V47: My friends and I eat similar foods(.68)
Factor 2. Peer's approval of dietary behaviors (.78)	**2.2**	**7.6**	V37: My friends approve to eat Hamburger and French fries(.83) V38: approve to eat pizza (.84) V39: to eat pasta(.72)
Factor 3. Peer's attitudes about dietary behaviors (.66)	**2.2**	**7.3**	V22: Fruits are good for the health (.50) V28: Pulse have iron (.71) V29: Sweets spoil the teeth (.74) V30: We must eat healthy food(.71)

5.1.3. Descriptive statistics

Self-regulation Cognition Scale

The following table presents the means and the standard deviations for each factor of the self-regulation scale.

Table 15. Descriptive statistics, means and standard deviations of the Self-regulation Cognition factors

Self-regulation Cognition scale Sub-scales	Variables	Mean	Standard Deviation
Goal efficacy	V03	4.0	0.8
	V04	4.0	0.9
	V05	4.1	0.8
	V06	3.8	0.9
Self-determination	V07	2.2	1.2
	V08	1.9	1.1
	V10	3.1	1.3
Goal commitment	V11	3.3	1.1
	V12	3.2	1.1
	V13	3.3	1.1
	V14	3.4	1.1
	V15	3.7	1.0

Food Frequency Scale

Table 16 presents the means and the standard deviations for each factor of the Food Frequency Scale

Table 16. Descriptive statistics, means and standard deviations of the Food Frequency factors

Food Frequency Scale Sub-scales	**Variables**	**Mean**	**Standard Deviation**
Sweets	V21	3.2	1.1
	V22	2.6	1.2
	V23	2.8	1.2
	V27	2.8	1.0
Meat	V34	2.9	1.1
	V35	3.1	1.0
	V36	2.4	1.1
	V38	2.8	1.2
Carbohydrates	V45	3.5	0.9
	V46	3.1	1.0
	V47	3.7	0.9
Fruits	V32	4.0	0.9
	V50	4.0	1.0
	V51	3.5	1.2
Vegetables and white meat	V42	2.9	1.0
	V44	3.2	1.0
	V49	3.0	1.2

Family Environment Scale

The table that follows presents the means and the standard deviations for each factor of the Family Environment Scale

Table 17. Descriptive statistics, means and standard deviations of the Family Environment factors

Family Environment Scale Sub-scales	**Variables**	**Mean**	**Standard Deviation**
Cohesion	V01	4.3	0.8
	V22	4.1	0.9
	V36	4.0	1.0
	V50	4.1	0.9
Control	V27	3.7	1.1
	V28	3.1	1.0
	V35	3.2	1.1
	V48	3.1	1.1
Independence	V11	3.2	1.1
	V25	1.9	1.0
	V49	2.3	1.0

Peer Influence Scale

Table 18 presents the means and the standard deviations for each factor of the Peer Influence Scale

Table 18. Descriptive statistics, means and standard deviations of the Peer Influence factors

Peers Influence on Dietary Scale Sub-scales	**Variables**	**Mean**	**Standard Deviation**
Peers attitudes about dietary behaviors	V22	4.6	0.6
	V28	4.1	0.8
	V29	4.2	0.8
	V30	4.4	0.8
Peer's approval of dietary behavior	V37	3.0	1.0
	V38	3.2	1.0
	V39	3.5	0.8
Adaptation to the peers' dietary behaviors	V41	3.3	1.1
	V42	3.3	1.1
	V43	2.6	1.1
	V47	2.6	1.1

Table 19 presents the composite variables. The reduction of a large number of raw scores to a limited number of representative scores is an approach suggested by proponents of structural equation modeling (Gustafsson, 1988). Also, this manipulation increases the reliability of the measures fed into the analysis and thus facilitate the identification of the factors (Raykov & Marcoulides, 2000).

Table 19. Composite Variables used in Structural Equation Modeling

SCALES	FACTORS	INITIAL VARIABLES	COMPOSITE VARIABLES
Self-regulation Cognition Scale	Goal commitment	V11	COM1
		V12	
		V13	COM2
		V14	
		V15	
	Goal efficacy	V03	EFF1
		V05	
		V04	EFF2
		V06	
	Self-determination	V07	DET1
		V08	
		V10	DET2
Food Frequency Scale	Unhealthy dietary behavior (sweets)	V21	SWE1
		V22	
		V23	SWE2
		V27	
	Unhealthy dietary behavior (meat)	V34	MEA1
		V36	
		V35	MEA2
		V38	
	Carbohydrates	V45	CAR1
		V46	
		V47	CAR2
	Fruits	V50	FRU1
		V51	
		V32	FRU2
	Vegetables & white meat	V44	VEG1
		V49	
		V42	FIS2

SCALES	FACTORS	INITIAL VARIABLES	COMPOSITE VARIABLES
Peers' influence	Adaptation to peers' eating behavior	V41	ADT1
		V47	
		V42	ADT2
		V43	
	Peer's approval of eating behavior	V38	APP1
		V39	
		V37	APP2
	Peer's attitudes about dietary behaviors	V22	ATT1
		V28	
		V30	

		V29	ATT2
Family Environment Scale	Family cohesion	V1	COH1
		V36	
		V22	COH2
		V50	
	Family control	V27	CON1
		V35	
		V28	CON2
		V48	
	Family independence		
		V25	IND1
		V49	
		V11	IND2

5.1.4. Correlations between the factors

From the Bivariate statistic analysis the following correlations between the factors emerged (It is noted that interpretation of the following correlations are limited to those factors having a strong relation and are statistically significant p<.01).

Healthy eating is positively related in a statistically significant level (r = .36, p<.01) to risky eating. This was an unexpected result, explanations on this result is given in the discussion section. Also, healthy eating is positively related in a statistically significant level (r = .16, p<.01) with self-determination. Thus the more determined adolescents are to their goal the more they will consume healthy food. The same also emerged for commitment. Healthy eating is positively related in a statistically significant level (r = .15, p<.01) with commitment and persistence. Also, healthy eating is positively related in a significant level (r = .13, p<.01) to family cohesion. Further, there is also positive relation in a significant level (r =.12, p<.01) between healthy eating and family control.

Risky eating is positively related in a statistically significant level (r = .13, p<.01) to adaptation to peers' eating behavior. Risky eating is positively related in a statistically significant level (r = .31, p<.01) to approval by peers of eating behavior. Thus, the adolescent engages in risky eating the more approval he or she will receive from his/ her friends.

Self-determination is strongly and positively related in a statistically significant level (r =.41, p<01) to commitment. Thus, the more self-determined adolescents are the more commitment they will present toward their goal. Commitment is related in a statistically significant level (r = .17, p<.01) to family cohesion. Surprisingly, self-efficacy is related in a statistically significant level (r = .24, p<.01) to adaptation to peers eating behavior. Furthermore, self-efficacy is related in a statistically significant level (r = .16, p<.01) to family control.

Adaptation to peers' eating behavior is related in a statistically significant level (r = .12, p<.01) to peers approval on eating behavior. Also, adaptation to peers eating behavior is related in a statistically significant level (r = .28, p<.01) to family control.

Approval by peers is related in a statistically significant level ($r = .16$, $p<.01$) with independence within the family context. Peers attitudes toward eating behavior is related in a statistically significant level ($r = .19$, $p<.01$) with family cohesion.

Finally, control within the family is related in a statistically significant level ($r = .30$, $p<.01$) with family cohesion).

Table 20 displays the correlations between the factors.

Table 20. *Bivariate correlations of among the factors (Pearson r)*

	1	2	3	4	5	6	7	8	9	10	11
1.Healthy eating		.36**	.16**	.14**	-.01	.08*	.08*	.09*	.13**	.12**	.06
2. Risky eating			-.03	-.06	.07	.13**	.31**	.06	-.03	.04	.09*
3.Self determination				.41**	.08*	.10**	-.06	.07*	.14**	.20**	.10**
4 Commitment					-.09**	.03	-.03	.11**	.17**	.10**	.10**
5. Goal efficacy						.24**	-.02	.04	-.03	.16**	-.00
6. Adaptation							.12**	.03	.03	.28**	.08*
7. Approval								-.03	.00	.07*	.16**
8. Attitudes									.19**	.11**	-.02
9. Cohesion										.30**	-.03
10. Control											.04
11.Independence											
M	3.48	2.91	3.40	4.03	3.65	2.97	3.23	4.34	4.17	3.28	2.66
SD	.53	.73	.84	.66	1.47	.89	.84	.61	.72	.78	.83

*p<.05 **p<.01

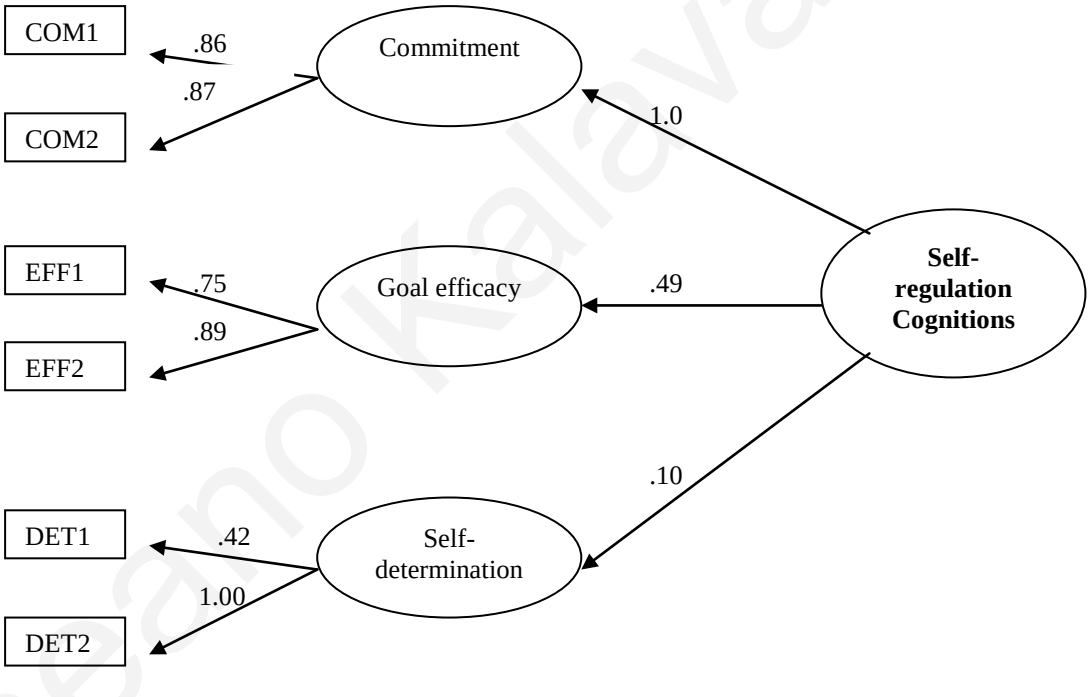
5.1.5. Confirmatory Factor Analysis

For the purpose of confirmatory factor analysis on the scales used for the present study, new variables (composite) were formed which consisted of the mean scores of the initial variables that loaded on the factors at the first place. For example, on the self-regulation scale variables V11 and V12 (see Table 19) which load on the factor "Goal commitment" were added and divided by the overall number of the initial variables (for this example the overall number of the initial variables is two). The new composite variables were used for confirmatory factor analysis. This manipulation is widely used in structural analysis (Demetriou, Kyriakides & Avraamidou, 2003) and was also applied for the purpose of the confirmatory analysis for the remaining factors of the present study. In Table 19 the initial and the composite variables that were used in the confirmatory factor analysis are presented.

Self-regulation Cognitions Scale

The confirmatory factor analysis of the scale was based on the exploratory factor analysis which showed the formation of the three self-regulation factors. The results of the present analysis confirm the construct validity of the three first order factors and one second order factor. The three first order factors refer to “Goal commitment”, “Goal efficacy” and “Self-determination”. The second order factor refers to ‘self-regulation”. The fit statistics (scaled $\chi^2 = 42.442$, $df = 6$, $p<.001$; RMSEA = .08 and CFI = .97) were acceptable. The standardized factor loadings were all positive and the great majority of them were higher than .65 (Figure 9).

Figure 9. *Confirmatory Factor Analysis of the Self-regulation Cognitions Scale*

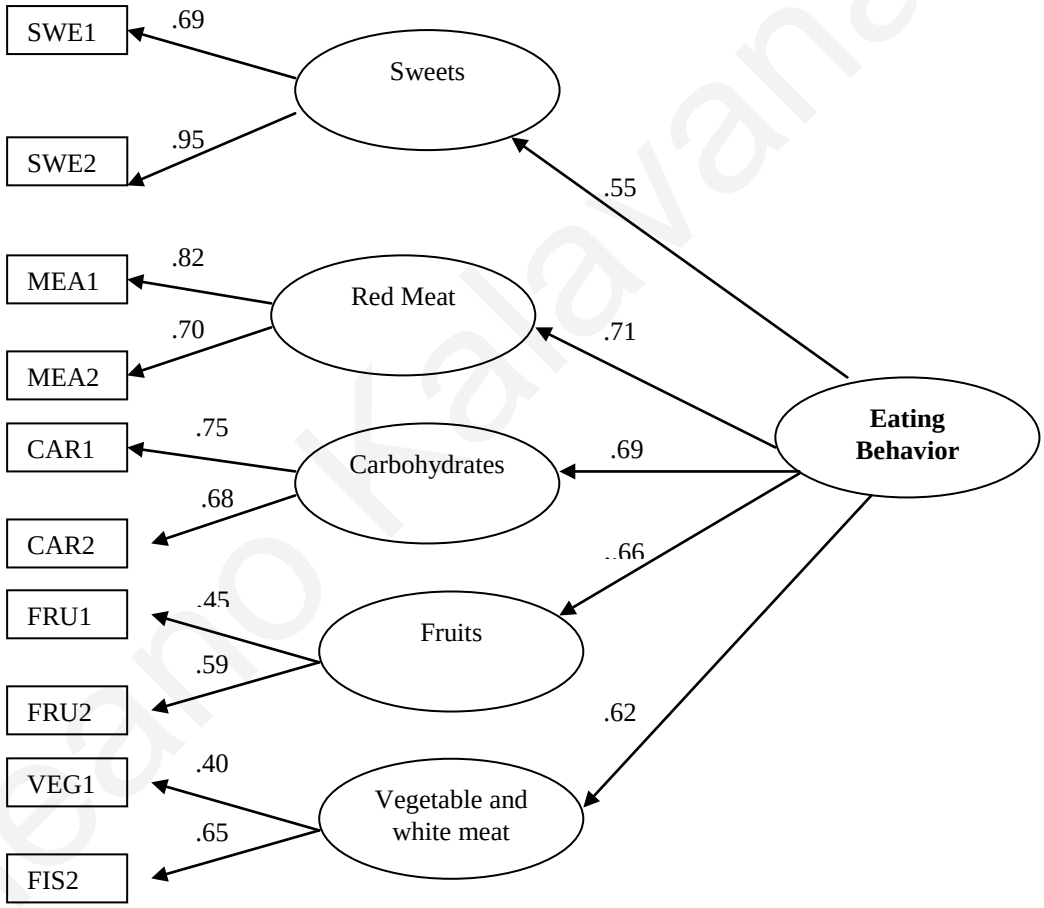


χ^2 / df = 42.442 / 6 = 7.0; p<.001, CFI = .97, RMSEA = .08, RMR = .04

The Food Frequency Scale

The scale examines the dietary behavior of the participants. The scale consisted of nine subscales but the exploratory factor analysis showed the existence of five factors. Based on the results of exploratory analysis, confirmatory factor analysis was conducted. The analysis showed that the construct validity of the scale is satisfactory. The analysis confirmed the existence of five first order factors and one second order factor. The first order factors are “Sweets”, “Red meat”, “Carbohydrates”, “Fruits” and “Vegetables and white meat”. The second order factor is the “eating behavior”. The fit statistics (scaled χ^2 = 133.486, *df* = 30, $p<.001$; RMSEA = .06 and CFI = .93) were acceptable. The standardized factor loadings were all positive and the great majority of them were higher than .60. The loadings on the second order factor are between .55 and .70. More information in detail presented in Figure 10.

Figure 10. *Confirmatory Factor Analysis of the Food Frequency Scale*

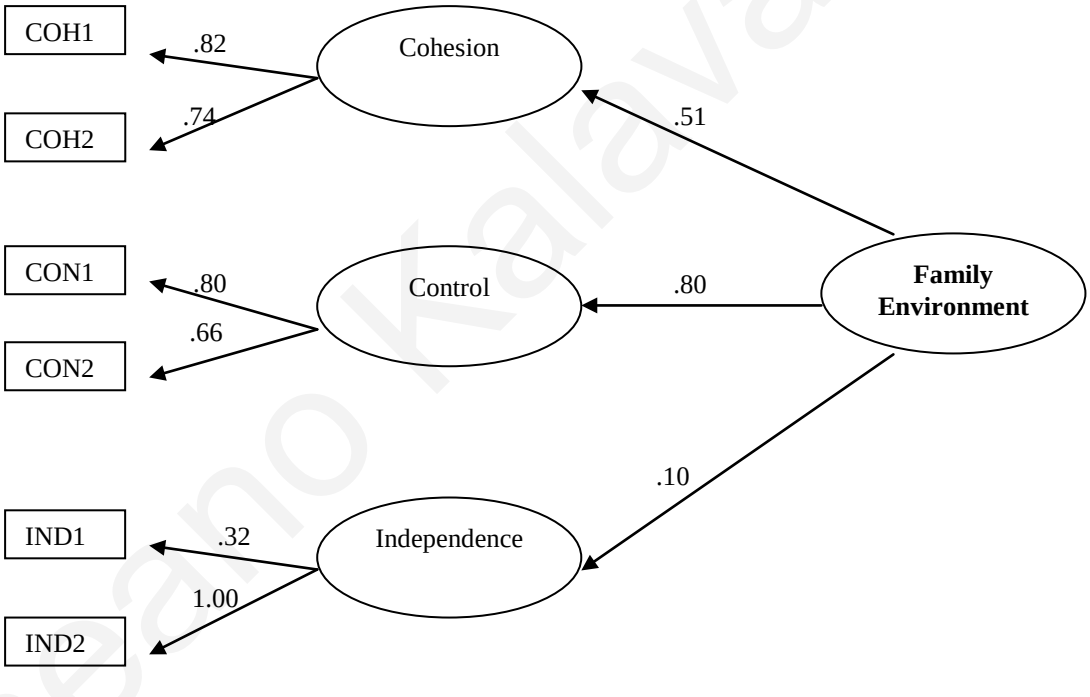


χ^2 / df = 133.486 /30 = 4.44; p<.001, CFI = .93, RMSEA = .06, RMR = .05

Family Environment Scale

The scale used in the present study consisted of seven subscales but the exploratory factor analysis showed the existence of three factors. Based on the results of exploratory analysis, confirmatory factor analysis was conducted. The analysis showed that the construct validity of the scale is satisfactory. The analysis confirmed the existence of three first order factors and one second order factor. The first order factors are "family cohesion", "family control", and "independence". The second order factor is the "family environment". The fit statistics (scaled $\chi^2 = 49.446$, $df = 6$, $p<.001$; RMSEA = .09 and CFI = .95) were acceptable. The standardized factor loadings were all positive and the great majority of them were higher than .65. More information in detail are presented in Figure 11.

Figure 11. *Confirmatory Factor Analysis of Family Environment Scale*

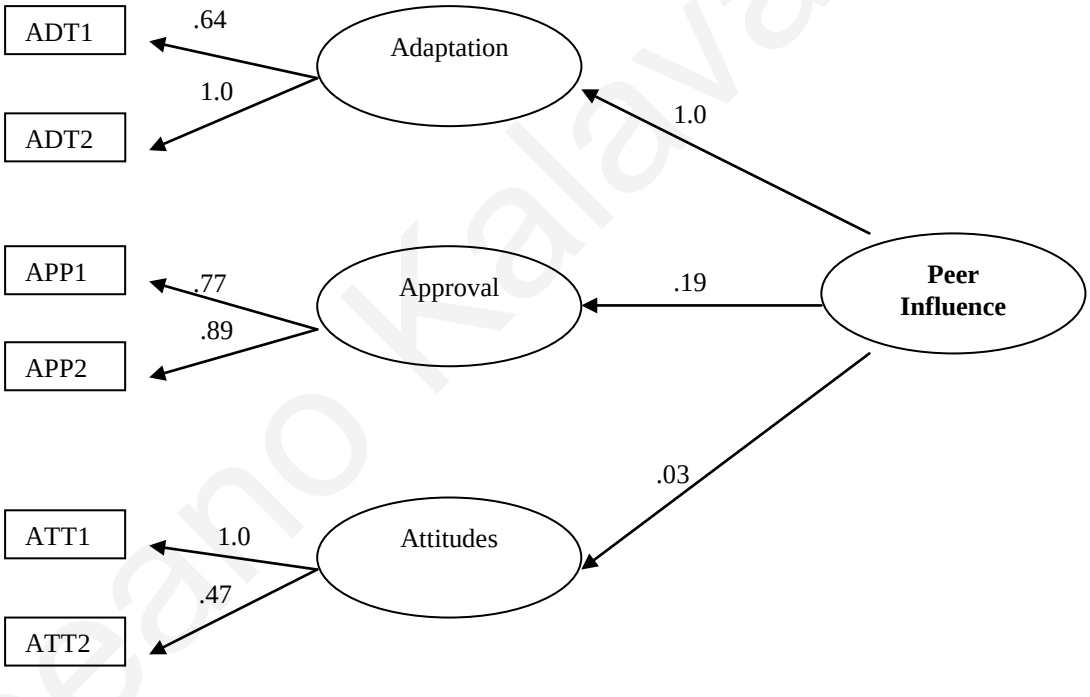


χ^2 / df = 49.446 / 6 = 8.24; p<.01, CFI = .95, RMSEA = .09, RMR = .03

Peer Influence Scale

The scale examines the peer's influence on dietary behavior. Based on the results of exploratory analysis, confirmatory factor analysis was conducted. The analysis showed that the construct validity of the scale is satisfactory. The analysis confirmed the existence of three first order factors and one second order factor. The first order factors are "adaptation to peer's eating patterns", "approval by peer of dietary behavior" and "peer's attitudes about dietary behavior". The second order factor is the "peer influence". The fit statistics (scaled $\chi^2 = 20.139$, $df = 6$, $p<.001$; RMSEA = .05 and CFI = .98) were satisfactory. The standardized factor loadings were all positive and the great majority of them were higher than .60 (Figure 12).

Figure 12. *Confirmatory Factor Analysis of the Peer Influence Scale*



χ^2 / df = 20.139 / 6 = 3.35; p<.001, CFI = .98, RMSEA = .05, RMR = .02

5.1.6. Structural Equation Modeling

The following models (Figure 13, 14 and 15) present the interconnection of the four basic factors that structure the model to be tested in the present study.

Before the results interpretation for each model, it is important to note the procedure followed for constructing and testing the models.

First, we decided to split the participants based on their health goal. Thus, we end up with three groups. The 1st group consisted of those who had healthy eating as their health goal (N=473), the 2nd group consisted of those who had physical exercise as their goal (N= 202) and the 3rd group consisted of those who had quitting smoking as their goal (N=124). The reason of this decision was to examine whether these three groups respond with the same on the measurements and thus the factors examined can be generalized to the three groups.

Secondly, structural equation modeling (SEM) was used to formulate and test the models explicitly in multi-group analyses. More specifically, the full measurement model (including all of the latent variables and the indicators) was fitted to the data of the three groups simultaneously in a multi-group model, to assess whether the indicators measure the same components across the three groups. In this model, the configuration of the factor loadings was identical for all the groups, but parameters were free to vary across groups. The goodness of fit statistic of this model can be considered as acceptable (χ^2/df = 1760.161 /1053 =1.67, p<001, CFI=.87, RMSEA = .03, RMR = .08).This model provided a baseline, by which we evaluated a more constrained model

Then, we established measurement invariance, that is, we constrained the regression coefficients (factor loadings) of the observed indicators of the common factors to be identical in all groups. We found no significant measurement invariance between the three groups constructs, suggesting that constraining the models to be equal for the three groups was appropriate. Thus, the proposed model can be generalized across the three groups. Also, a calculation of difference in χ^2 and degrees of freedom between conditions (restricted and non restricted indicated that differences (χ^2_{diff} =15.98/ *df*= 28) did not reach level of statistical significance. Furthermore, the goodness of fit

statistic was significantly better for the constrained model than the unconstrained one (χ^2/df = 1776.146 / 1081=1.67, p<001, CFI=.88, RMSEA =.03, RMR = .08)

Description of the constrained model

The model is generalized across the three groups. Thus, this result confirms the hypothesis that the constructing factors for examining healthy eating behavior are the same for middle age adolescents (hypotheses 22, 23, 24, 25 and 26). Furthermore, the relation of these factors on healthy eating and risky eating differs among the three groups. This also confirms the hypotheses that although the factor construct will be identical among the three groups, the groups will present differences based on the relations of the factors. These results confirm also the hypotheses of the present research (hypotheses 27, 28, 29, 30 and 31). The goodness of fit statistic for the model can be considered as satisfactory χ^2/df = 1776.146 /1081 =1.58, p<001, CFI=.88, RMSEA = .03, RMR = .08 (Figures 13, 14 and 15). Note that multiple sample analysis is done by fitting an ordinary model in each sample, but doing this in a single run simultaneously for the three groups. Of course, this is done by taking into account that some parameters are the same in each of the samples (using equality constraints across groups) while others are allowed to be different. Thus, in the present study there are three models (one for each group) but there is a single goodness-of-fit χ^2 test.

On the top of the figures is the family environment factor, on which three factors [family cohesion (Coh), family control (Con) and independence in the family (Indep)] load. On the left hand side the self-regulation cognitions factor consisting of three also [goal commitment (Com), goal efficacy (GEff), and self-determination (SDet)] and on the right hand side is peer influence factor. Three factors load on this factor these are adaptation to peer's eating patterns (Adap), peer's approval of dietary behavior (Appr) and peer's attitudes about eating behavior (Attit). Finally, on the bottom of the figure appear the dependent variables of this study, that is, on the left risky eating behavior and on the right healthy eating behavior. Two factors load on the risky eating behavior. There are: sweets (Swe), red meat (Rme). And three factors load on the healthy eating behavior. These are: carbohydrates (Carb), fruits (Fru) and vegetables (Veg). Also, BMI was introduced in the model in order to test the relation with both eating behaviors on BMI (it is noted that researcher test also the relation with the

other three second-order factors on BMI and found the loadings of these factors on BMI were very low across the three models).

Regarding the interdependence between the five second-order factors that structure the hypothetical model of the first phase of the present study, the following relations were established:

1. The family environment influences all the other factors of the model
2. The strongest predictor of risky eating behavior is peer influence
3. The family environment influences both eating behaviors indirectly. The direct influence is weak, in contrast to the indirect influence through self-regulation and peer influence which is stronger.

The great majority of the standardized path coefficients relating the first-order, and the second-order factors were higher than .50.

Description of the results for the group who set healthy eating as their goal (Figure 13).

Although, researchers in literature focus only at the structure of the model which is identical across the groups. In this study, the loading values of the factors are presented and described.

Based on the structural relations between the factors for the group who had healthy eating as their goal, the results show the following:

The family environment that involves family functioning characteristics such as cohesion, control and independence have very weak direct relation with the two eating behaviors, but have stronger indirect relations through self-regulation cognitions and peer influence. These results confirm the hypothesis that family environment will influence more indirectly the two eating behaviors than directly (hypothesis 2).

Self-regulation that includes cognitions about commitment and persistence toward the goal, self-efficacy and self-determination appears to have a relation with both eating behaviors, and slightly affecting more the healthy eating behavior. These results confirm the hypothesis that self-regulation cognitions will be related with both eating behaviors (hypothesis 1).

Peer influence that involves peer's approval of eating patters, adaptation to peer's eating patterns, and peer's attitudes toward eating behavior, appears to have a negative relation with self-regulation. This result confirms the hypothesis that peer influence will have a negative impact on self-regulation (hypothesis 3). Thus, the more the adolescents are influenced by their peers on eating behaviors the less self-regulation cognitions they will generate for controlling eating. Furthermore, peer influence appears to be related with both eating behaviors. More specifically, and as it was expected peer influence has a stronger relation with risky eating than with healthy eating behavior. These results are in line with the hypothesis of the present research (hypothesis 4).

Risky eating which involves the consumption of sweets and red meat are negatively related to Body Mass Index. This result was unexpected. The researcher expected that adolescents who consume more unhealthy food would have higher BMI. Thus, the hypothesis 5 is rejected. To further examine this result, a scatterplot was examined between risky eating responses and BMI. It was found that the majority of the respondents on the risky eating questions reported consuming these types of food once a week and 3 to 4 times per week. Thus, the frequency of this consumption can not be considered as worsening the BMI (Graph 1). In other words, the sample did not include obese individuals because examining this special population was not among the aims of this study.

The construction of the same factors among the three groups confirms the construct validity and thus, we can argue that the participants respond to the measures in the same way. Therefore, this construct validity allows the researcher to test and interpret the differences between the groups with more confidence. It should be noted that the size of the factor loadings for the two groups (adolescents who had physical exercise or quit smoking as their goal) are of secondary importance. These loadings are of crucial importance mainly for the group on which this study was focus (i.e. adolescents who had healthy eating as their goal).

Description of the results for the group who set physical exercise as their goal (Figure 14).

Based on the structural relations between the factors for the group who had physical exercise as their goal, the results show the following:

The family environment that involves family functioning characteristics such as cohesion, control and independence have a weak relation with the two eating behaviors, but have stronger indirect relation through self-regulation cognitions and peer influence. These results confirm again the hypothesis that family environment will influence more indirectly the two eating behaviors than directly.

Self-regulation which includes cognitions about commitment and persistence toward the goal, self-efficacy and self-determination appears to have a positive relation with both eating behaviors. Surprisingly, self regulation appears to have strong relation with risky eating than on healthy eating. One possible explanation about this relation is may be the fact the present study examines the relation between self-regulation and healthy eating behavior and not physical exercise behavior.

Peer influence that involves peer's approval of eating patters, adaptation to peer's eating patterns, and peer's attitudes toward eating behavior, appears to have a weak relation with both eating behaviors. However, peer influence appears to have an indirect relation with both eating behaviors through self-regulation cognitions.

Description of the results for the group who set quit smoking as their goal (Figure 15).

Based on the structural relations between the factors for the group who had quitting smoking as their goal, the results show the following:

The family environment that involves family functioning characteristics such as cohesion, control and independence appeared to have weak relation with risky eating behavior and stronger relation with healthy eating behavior. However, again family functioning characteristics have an indirect relation with eating behaviors through self-regulation and peer influence. Specifically, it seems from the results that family environment is negatively related with peers influence. Thus, adolescents who experience more cohesion, control and independence in their family, the less they are

influenced from their friends. These results confirm again the hypothesis that family environment will influence more indirectly the two eating behaviors than directly.

Self-regulation which includes cognitions about commitment and persistence toward the goal, self-efficacy and self-determination appears to be related with both eating behaviors. Surprisingly, self-regulation appears to be negatively related with both eating behaviors. More specifically, self-regulation cognitions have a stronger negative relation with risky eating. Thus, the more the adolescents present self-regulation cognitions the less he will consume unhealthy food. Further, this also exists for self-regulation and healthy eating. This was not expected for healthy eating behavior. One possible explanation about this relation is may be the fact that the present study examines the relation between self-regulation and healthy eating behavior and not quitting smoking behavior.

Peer influence that involves peer's approval of eating patters, adaptation to peer's eating patterns, and peer's attitudes toward eating behavior, appears also to be related to both eating behaviors. Also, this group's healthy eating behavior is influenced more by peer than by self-regulation.

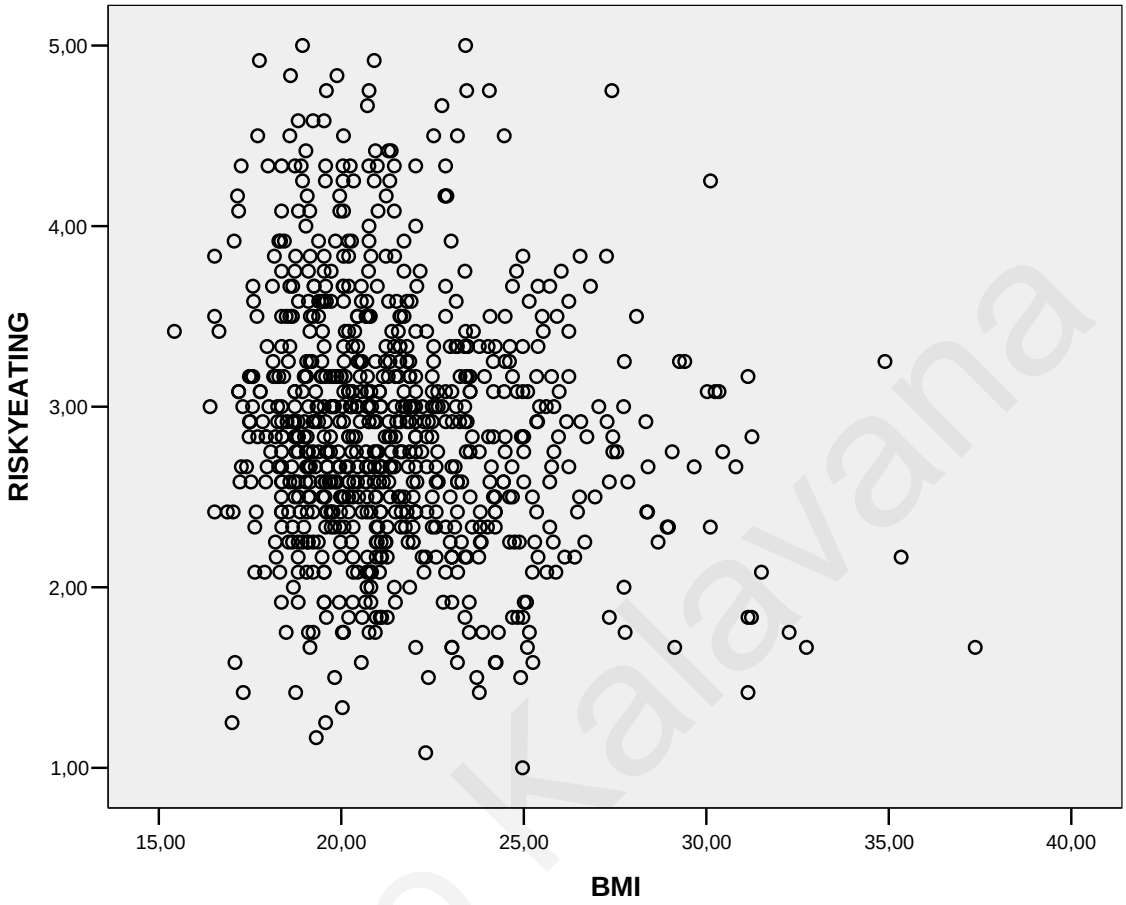
To summarize the above results, it appears that the theoretical model for explaining healthy eating behavior in adolescents is confirmed. Based on the models for the three groups, the model for those who set as their goal healthy eating (which is the main attention of the present study) explains well the parameters influencing risky and healthy eating. For instance, family appears to have a strong indirect relation with self-regulation and peer influence. Also, self-regulation appears to have a relation with both behaviors, but it seems that self-regulation have stronger relation with healthy eating behavior. Also, it appears that peer influence is related to eating behavior. More specifically, peer influence has a stronger relation with risky eating. Finally, it appears that for the first group peer influence had a negative relation with self-regulation.

Also, the model explaining the interrelation of the factors for the group who set as their goal physical exercise shows that peer influence have very weak relation with

both eating behaviors. Whereas self-regulation had a stronger relation with both behaviors, and especially on risky eating. Also, in this group family environment appears to have a direct relation with healthy eating.

Finally, the model explaining the interrelation of the factors for the group who set as their goal quitting smoking indicates that self-regulation is negatively related to both eating behaviors. One possible explanation about these relations is the fact that self-regulation in this study measures the cognitions that individuals have toward their goal, so in this group their goal is quitting smoking. Thus, it appears that their self-regulation cognitions toward smoking is negatively related to eating behavior. So, it is possible that this goal interferes with eating behavior. Also, it appears that peer influence had a relation on both eating behaviors. More explanations on the overall results are given in the discussion section.

Graph 1. Risky eating responses and BMI



Responses: 1=never, 2= once a month, 3=once a week, 4=often (3 to 4 times per week), 5= very often (5 to 7 times per week)

A BMI below 20 is consider to be underweight, a BMI of 20-25 to be healthy. BMIs of 25 to 30 are generally considered overweight while BMI over 30 is generally considered very overweight (obese) (Garrow &Webster, 1985).

Figure 13. *The model describing the interrelation of factors for the group consisting of those who had healthy eating as a goal.*

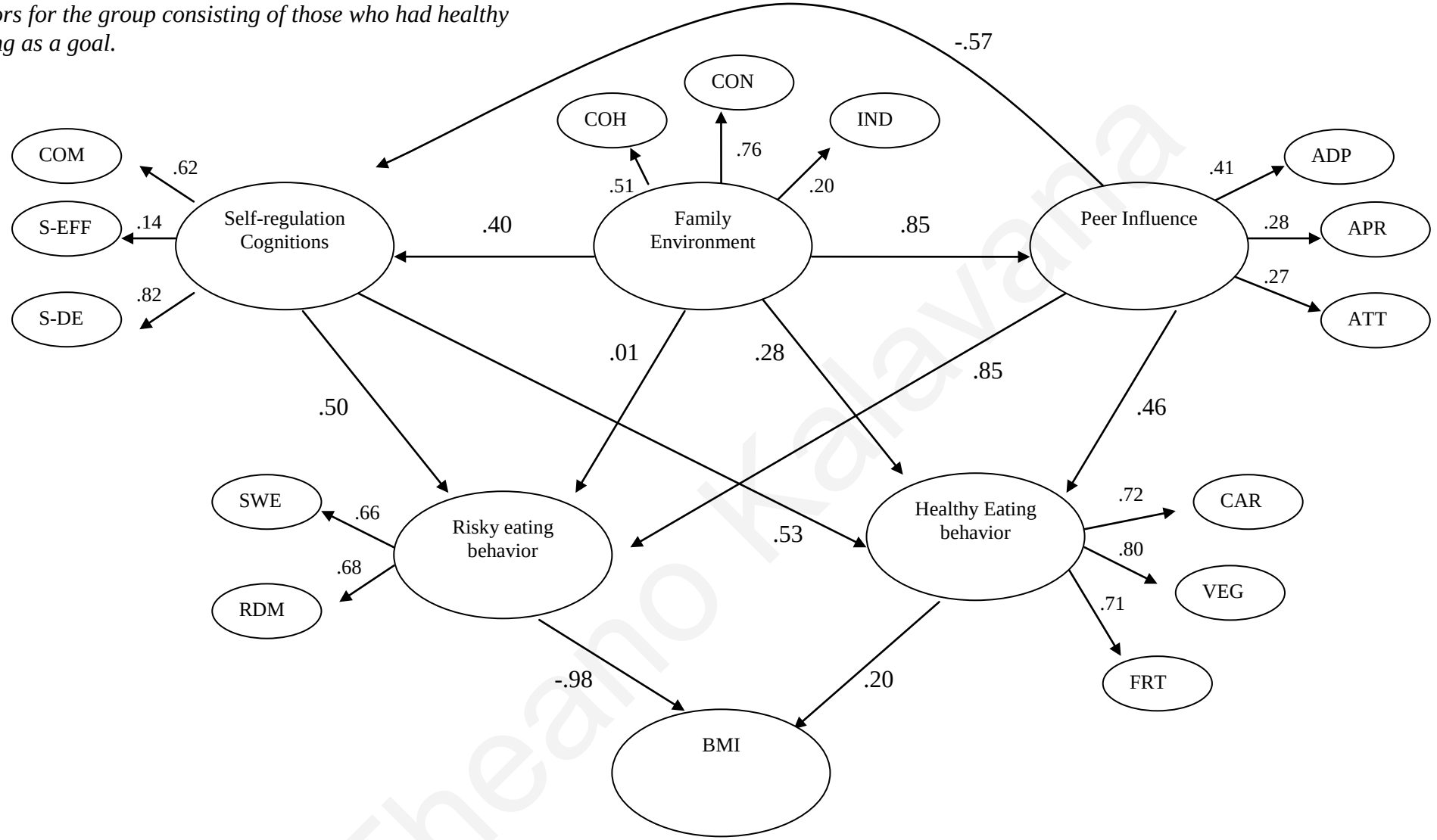


Figure 14. *The model describing the interrelation of factors for the group consisting of those who had physical exercise as a goal.*

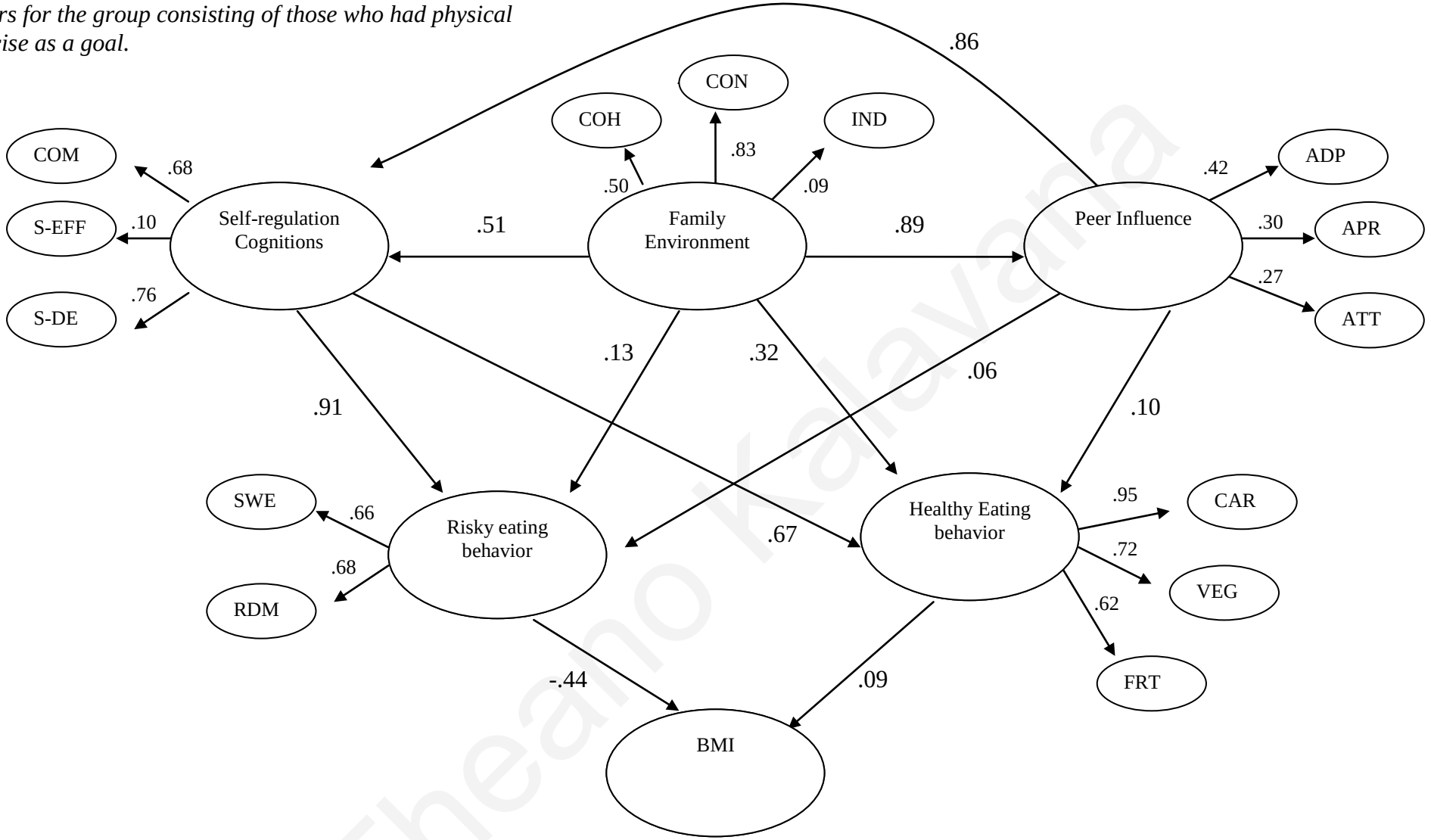
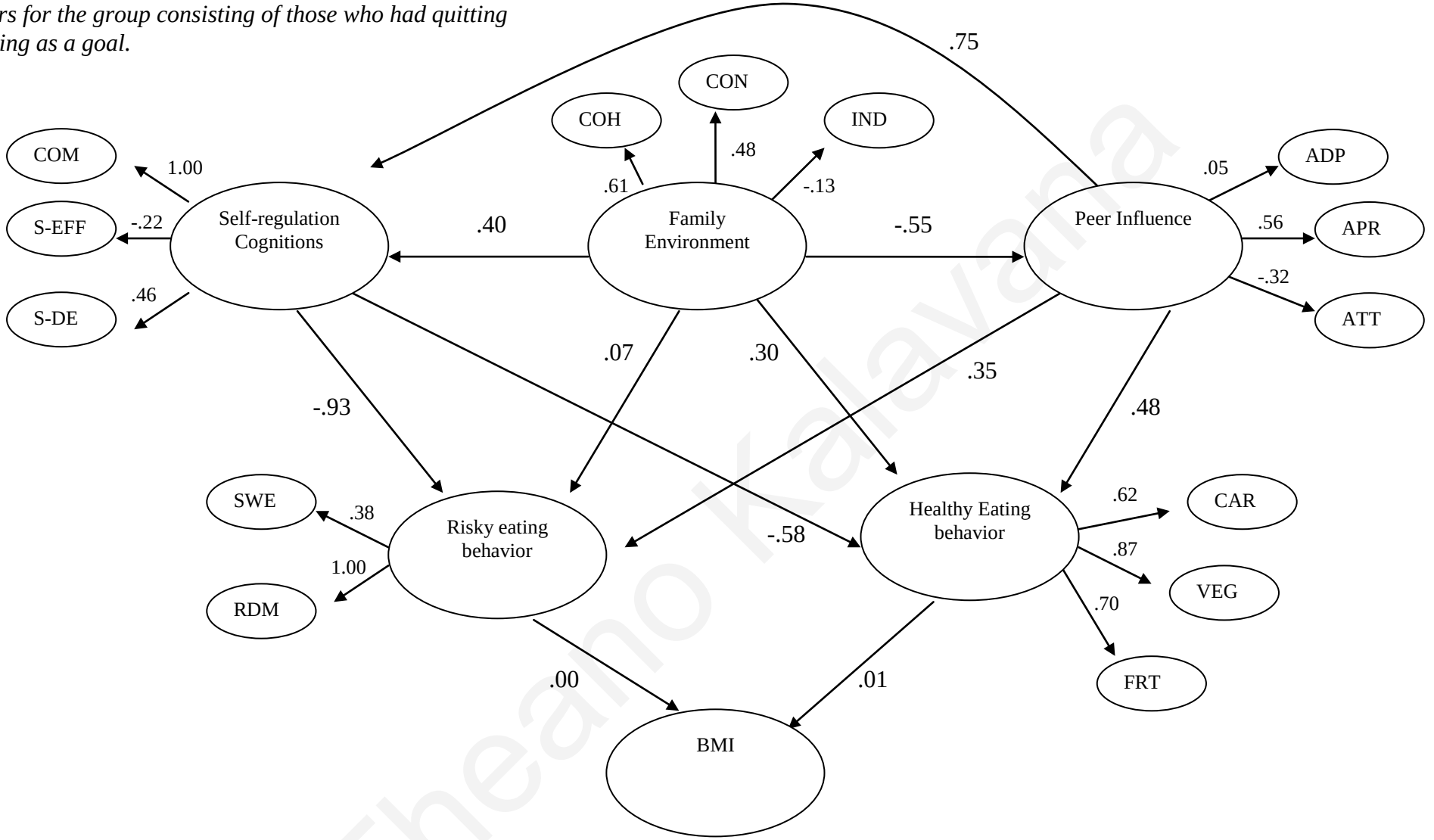


Figure 15. *The model describing the interrelation of factors for the group consisting of those who had quitting smoking as a goal.*



χ^2 = 1776.146 /1081 =1.58 ; p<001, CFI=.88, RMSEA = .03, RMR =.08

5.1.7. Differences between groups

Differences between gender and self-regulation cognitions

It seems that there is no significant difference between gender and self-regulation cognitions. That is, the mean scores of commitment, self-efficacy and self-determination for males and females do not differ significantly (Table 21).

Table 21. Multivariate Analysis of Variance (MANOVA) between gender and self-regulation cognitions

Source of Variance	DF	Type III Sum Squares	Mean Square	F	P
Commitment	1	.88	.88	2.07	.15
	798	333.02	.42		
	799	333.9			
Goal efficacy	1	5.88	5.88	2.86	.09
	798	1616.24	2.05		
	799	1622.12			
Self-determination	1	1.07	1.07	1.52	.21
	798	558.76	.71		
	799	559.83			

Differences between gender and eating behavior

In contrast to the above results, and as expected in the present study there are differences between gender and eating behavior. More specifically, male adolescences consume more sweets than female adolescences. Thus, in sweet factor there is statistically significant difference between male and female adolescents (X_1=3.16, X_2 = 2.90, (F(1,798)= 6.70, p<.01). Additionally, there is statistically significant difference between male and female adolescents in red meat factor (X_1=3.19, X_2 = 2.64, (F(1,798)= 60.34, p<.001). Surprisingly, there is also statistically significant difference between male and female adolescents on vegetable/white meat factor (X_1=3.07, X_2 = 2.90, (F(1,798)= 1.54, p<.01). One explanation of these differences may be that males need more calories to function and therefore they eat more quantities of food (Table 22) This also, is further supported based on the statistically significant difference between male and female adolescents on the BMI factor X_1=22.22, X_2 = 20.60, (F(1,798)= 40.76, p<.001 (Table 23).

Table 22. Multivariate Analysis of Variance (MANOVA) between gender and eating behavior

Source of Variance	DF	Type III Sum Squares	Mean Square	F	P
Sweet	1	5.50	5.50	6.70	.01
	798	647.20	.82		
	799	652.7			
Red meat	1	39.97	39.97	60.34	.00
	798	521.39	.66		
	799	561.36			
Carbohydrates	1	.09	.09	.17	.67
	798	339.08	.50		
	799	339.17			
Fruits	1	.93	.93	1.54	.21
	798	474.09	.60		
	799	475.02			
Vegetables/white meat	1	3.38	3.38	5.90	.01
	798	452.38	.57		
	799	455.76			

Table 23. Multivariate Analysis of Variance (MANOVA) between gender and BMI

Source of Variance	DF	Type III Sum Squares	Mean square	F	P
BMI	1	344.54	344.54	40.76	.00
	798	6651.33	8.45		
	799	6995.87			

Differences between gender and peer influence

Further, it seems from the analysis that there are also differences between gender and peer influence. There is statistically significant difference between male and female adolescents in adaptation to peer dietary behavior factor (X_1=3.09, X_2 = 2.91, (F(1,798)= 5.18, p<.05). Additionally, male adolescence seems to take into account more their peer's approval on their dietary behavior than female adolescents do. Thus, there is statistically significant difference between male and female adolescents on peers approval of dietary behavior factor (X_1=3.42, X_2 = 3.19, (F(1,798)= 10.49, p<.001). Thus, hypothesis (8) that female adolescents will be more influenced by peers compared to male adolescents is rejected (Table 24).

Table 24. Multivariate Analysis of Variance (MANOVA) between gender and peer influence

Source of Variance	DF	Type III Sum Squares	Mean square	F	P
Adaptation to peer dietary behavior	1	4.07	4.07	5.18	.02
	798	618.23	.78		
	799	622.30			
Approval by peers of the dietary behavior	1	7.25	7.25	10.49	.00
	798	543.91	.69		
	799	551.16			
Peers' attitudes on dietary behavior	1	.66	.66	1.74	.18
	798	300.23	.38		
	799	300.89			

Differences between gender and family environment

On the family environment factors, there is a statistically significant difference between male and female adolescents on independence factor (X_1=2.91, X_2 = 2.50, (F(1,798)= 20.41, p<.001).

Therefore, male adolescents experience more independence in their family environment than female adolescents. This can be explained based on the Cypriots sociocultural background, since in Cyprus society males always had more freedom within the family setting than females (Table 25).

Table 25. Multivariate Analysis of Variance (MANOVA) between gender and family environment

Source of Variance	DF	Type III Sum Squares	Mean Square	F	P
Cohesion	1				
	798	.04	.04	.08	.76
	799	408.26	.51		
		412.26			
Control	1	.00	.00	.00	.96
	798	492.26	.62		
	799	492.26			
Independence	1	13.48	13.48	20.41	.00
	798	519.85	.66		
	799	533.33			

Differences between health goal groups and self-regulation cognitions

The analysis showed that there are statistically significant differences between the three groups of goal setting. More specifically, adolescents who reported 'physical exercising' as their goal have higher mean score on commitment and persistence factor, from adolescents who reported as their goal healthy eating and those who reported quitting smoking (X_1= 4.23, X_2 = 3.93, X_3 = 4.18(F(1,798)= 14.59, p<.001). Also, there are statistically significant differences between the three groups on goal efficacy factor. Adolescents who have quitting smoking goals have higher mean scores from adolescents who reported as their goal healthy eating or physical exercise X_1= 4.19, X_2 = 3.67, X_3 = 3.26 (F (2,797)= 14.93, p<.001) (Table 26).

Table 26. Multivariate Analysis of Variance (MANOVA) between health goal and self-regulation cognitions

Source of Variance	DF	Type III Sum Squares	Mean Square	F	P
Commitment	2	12.35	6.17	14.59	.00
	797	333.02	.42		
	799	345.37			
Goal-efficacy	2	61.34	30.67	14.93	.00
	797	1616.24	2.05		
	799	1677.58			
Self-determination	2	.06	.03	.04	.95
	797	558.76	.71		
	799	558.82			

Differences between health goal groups and BMI

There are also statistically significant differences between the groups' health goals and BMI. Those adolescents who reported healthy eating as their goal have higher mean score on the BMI factor, than those who reported as their health goal physical exercise and quitting smoking X_1= 22.16, X_2 = 20.88, X_3 = 21.18 (F(2,797)= 12.73, p<.001) (Table 27).

Table 27. Multivariate Analysis of Variance (MANOVA) between health goal and BMI

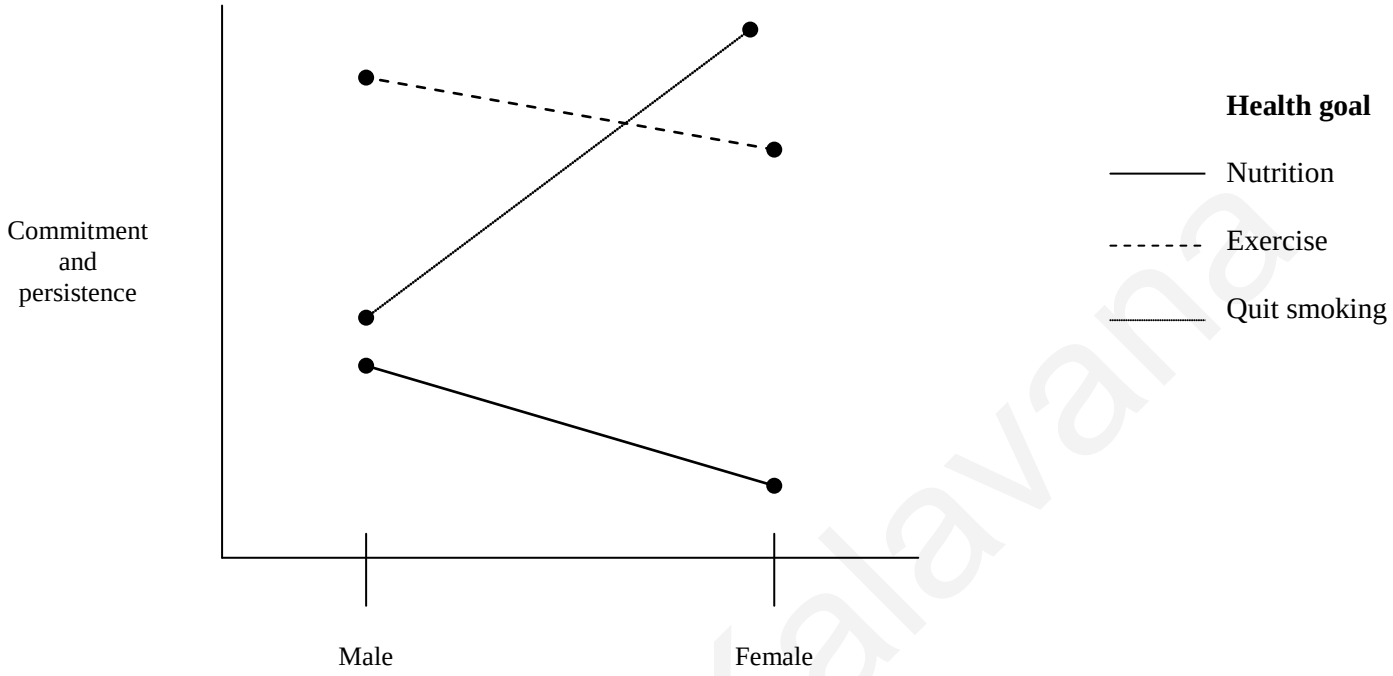
Source of Variance	DF	Type III Sum Squares	Mean square	F	P
BMI	2	215.20	107.60	12.73	.00
	797	6651.33	8.45		
	799	6866.53			

Interactions between gender and health goal on self-regulation cognitions

Interaction between gender, health goal on commitment and persistence

Further, the *post-hoc* analysis showed statistically significant interactions between gender, health goal in commitment and persistence ($F(2,797) = 4.41$, $p<.01$). More specifically, male adolescents who reported healthy eating as their health goal have are more committed and persistent compare to female adolescents who reported the same goal Additionally, male adolescents who reported physical exercise as their health goal are more committed and persistent compare to female adolescents who reported the same goal. In contrast female adolescents who reported as their health goal quitting smoking show more commitment and persistence than male adolescents who reported the same goal (Graph 2).

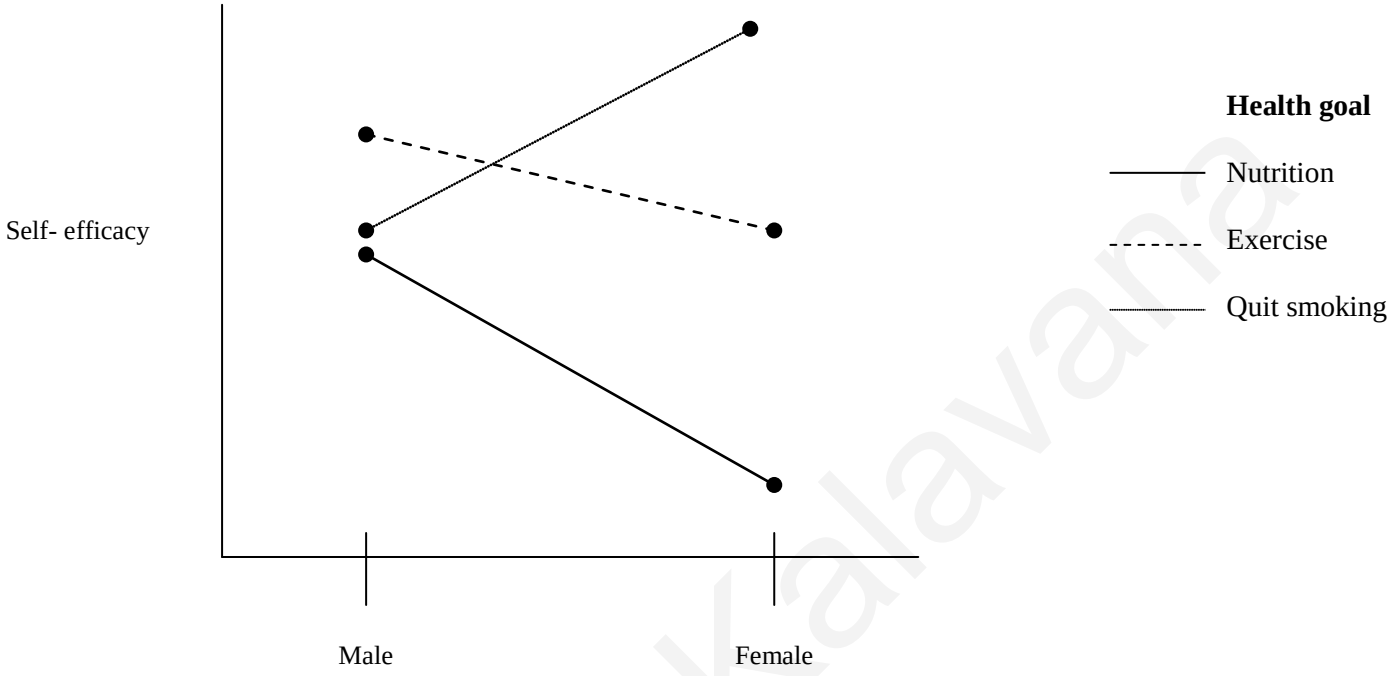
Graph 2. *Interactions between gender and health goal on commitment and persistence*



Interactions between gender and health goal on self-efficacy

Furthermore, it seems that there is statistically significant interaction between gender, health goal on self-efficacy ($F(2,797)= 5.78$, $p<.001$). More clearly, male adolescents who reported as their health goal healthy eating have higher self-efficacy than female adolescents who reported the same goal .The same emerged for the physical exercise goal, male adolescents have higher goal efficacy factor compare to female adolescents. In contrast again, female adolescents who reported as their health goal quitting smoking have higher self- efficacy compared to male adolescents who reported the same goal (Graph 3).

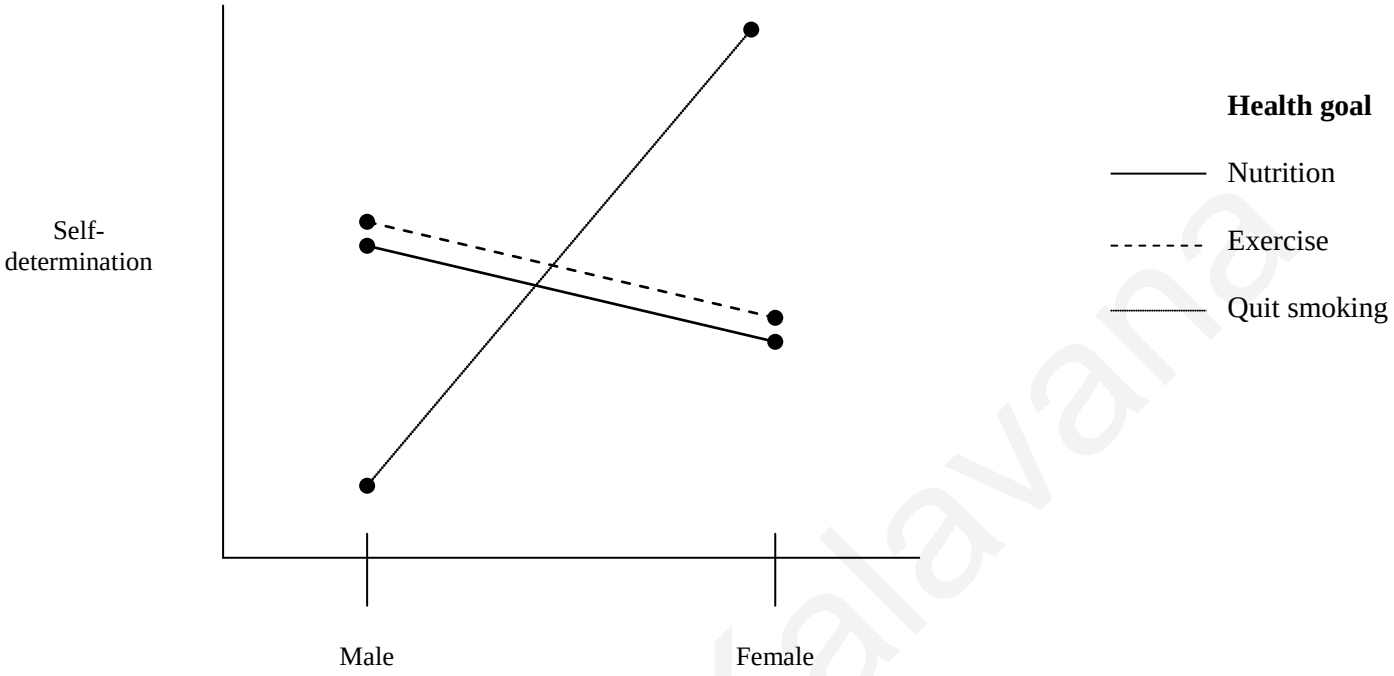
Graph 3. *Interactions between gender and health goal on self-efficacy*



Interactions between gender and health goal on self-determination

Moreover, on the self-regulation cognitions, there are statistically significant interactions between gender, health goal on the self-determination factor (F (2,797) = 4.13, p<.01). Specifically, male adolescents who reported as their health goal healthy eating are more self-determined compared to female adolescents who reported the same goal. Further, male adolescents who reported as their health goal physical exercise are more self-determined than females who reported the same goal (X_1= 3.46, X_2 = 3.34). In contrast again, female adolescents who reported as their health goal quitting smoking are more self-determined compared to male adolescents who reported the same goal (Graph 4).

Graph 4. *Interactions between gender and health goal on self-determination*



5.1.8. Comparisons between groups (healthy and non healthy eaters)

The healthy eating index variables were constructed as follows: the three eating factors (vegetables -white meat, fruits and carbohydrates) were combined into one variable ($\overline{X}$ = 3.56, *SD*=0.53). Those scores that lie above one standard deviation from the mean constituted the healthy eating group (N= 118). Those that lie one standard deviation below the mean constituted the non-healthy eaters group (N=121).

The two groups that emerged from this computation were compared in terms of all the independent variables (goal commitment, goal efficacy, self-determination, adaptation to peer's eating patterns, approval by peers of dietary behavior, peer's attitudes about dietary behavior, family cohesion, family control, independence in the family and BMI).

Self-regulation cognitions

The following table presents the differences between the two groups (healthy eaters and non-healthy eaters) on the self-regulation cognition variables. The analysis showed that there is a statistically significant difference between healthy eaters and non-healthy eaters on the following variables: goal commitment (X_1= 4.19, X_2 = 3.89, t = 3.78, p<001), self-determination (X_1=3.59, X_2 = 3.21, t = 3.78, p<001). Thus, healthy eaters seem to have better goal commitment and self-determination skills than non-healthy eaters. Therefore hypothesis 6 is confirmed.

Table 28. *Comparisons between the two groups regarding the self-regulation cognition factors*

Self-regulation factors	Group	$\overline{X}$	SD	t
Goal commitment	Healthy eaters	4.19	.59	3.78***
	Non-healthy eaters	3.89	.60	
Goal efficacy	Healthy eaters	3.56	1.38	.66
	Non-healthy eaters	3.69	1.55	
Self-determination	Healthy eaters	3.59	.84	3.21***
	Non-healthy eaters	3.23	.88	

* p<.05 **p<.01 ***p<.001

The Family Environment

Table 29 displays the differences between the two groups (healthy eaters and non-healthy eaters on the family environment variables. The analysis showed that there is a statistically significant difference between healthy eaters and non-healthy eaters on the following variables: family cohesion (X_1= 4.33, X_2 = 4.04, t= 3.18, p<01), family control (X_1= 3.49, X_2 = 3.12, t= 3.75, p<001). To summarize these comparisons showed that healthy eaters experienced more cohesion and control in their family than non-healthy eaters.

Table 29. *Comparisons between the two groups regarding family environment factors*

Family Environment factors	Group	$\overline{X}$	SD	t
Family cohesion	Healthy eaters	4.33	.65	3.18**
	Non-healthy eaters	4.04	.76	
Family control	Healthy eaters	3.49	.73	3.75***
	Non-healthy eaters	3.12	.81	
Independence in the family	Healthy eaters	2.77	1.00	1.41
	Non-healthy eaters	2.60	.87	

* p<.05 **p<.01 ***p<.001

The peer influence

Table 30 displays the differences between the two groups (healthy eaters and non-healthy eaters on the peer influence variables. The analysis showed that there is a statistically significant difference between healthy eaters and non-healthy eaters on the following variables: approval by peers of dietary behavior ($X1$= 3.35, X_2 = 3.04, t= 2.73, p<01), peer's attitudes about dietary behavior (X_1= 4.46, X_2 = 4.28, t= 2.30, p<05). Although, the present study assumes that healthy eaters will be less influenced by their peers, these comparisons showed that healthy eaters take more than the non-healthy eaters into account their peer' approval on what they eat and their peers' attitudes on dietary behavior.

Table 30. *Comparisons between the two groups regarding the peer influence factors*

Peer Influence factors	Group	$\overline{X}$	SD	t
Adaptation to peer's eating patterns	Healthy eaters	3.12	.97	1.65
	Non-healthy eaters	2.91	.94	
Approval by peer of dietary behavior	Healthy eaters	3.35	.90	2.73**
	Non-healthy eaters	3.04	.83	
Peer's attitudes of dietary behavior	Healthy eaters	4.46	.61	2.30*
	Non-healthy eaters	4.28	.59	

* p<.05 **p<.01 ***p<.001

BMI and Healthy Eating

Also, the analysis showed that there is a statistically significant difference between healthy eaters and non-healthy eaters on BMI (X_1= 20.7, X_2 = 21.6, t= 2.58, p<01). These comparisons showed that healthy eaters have lower body mass index than non-healthy eaters. This result was expected from the present study, since healthy eaters avoid food high in fat thus have slimmer bodies and lower body mass index than non-healthy eaters (Table 31).

Table 31. *Comparisons between the two groups regarding BMI*

	Group	$\overline{X}$	SD	t
BMI	Healthy eaters	20.74	2.28	2.56**
	Non-healthy eaters	21.69	3.32	

* p<.05 **p<.01 ***p<.001

5.2. Phase II

5.2.1. Data Analysis

The statistical analysis for the second data collection wave followed the same stages as in the first data collection wave analysis. These stages are the following:

(i). Exploratory factor analysis was conducted for each of the scales used in the present study;

(ii). Reliabilities for the extracted factors were examined;

(iii). Composite variables were created;

(iv). The strength of association between the factors extracted was tested via Correlation matrix was used in order to test;

(v). Confirmatory factor analysis was conducted in order to test the structure of the extracted factors. The following fit indices were used in order to evaluate the extent to which the data fit the models tested: the scaled χ^2, Comparative Fit Index (CFI) of Bentler (1990), the Root Mean-Square Error of Approximation (RMSEA) (Brown & Mels, 1990) and the indicator Root Mean-Square Residual (RMR).

(vi). After testing the fit of the measurement models the data were further statistically processed through structural equation modeling. A multiple group model was used, with the following three groups: adolescents who had healthy eating as a goal (N=434) , adolescents who had physical exercise (N=187) as a goal and adolescents who had quitting smoking as their goal (N=109). The procedure followed in the multiple group analysis was the same as in the first data collection wave. Chi- square analysis was used to test the hypothesis that the relationship proposed in the model provides a plausible explanation. Additional measures have been tested to assess the fit of the model, such as: Comparative Fit Index (CFI) of Bentler (1990), the Root Mean-Square Error of Approximation (RMSEA) (Brown & Mels, 1990) and the indicator Root Mean-Square Residual (RMR).

(vii). Finally, the mean value for each factor of the scales was examined. This transformation allowed further statistical analysis such as multivariate analysis of variance (MANOVA) in order to test the interpersonal hypotheses of the present research.

5.2.2. Exploratory factor analysis

Self-regulation Skills Battery

The factor analysis extracted six factors that correspond to the following: "Self-criticism"; "Planning"; "Self-efficacy"; "Self-reward"; "Emotional control" and "Attention/ stimulus control".

The "Self-criticism" factor has an eigenvalue of 3.1. The variance explained was 5.44%. Also, to examine the internal reliability of the factor coefficient α values were calculated. The value of Cronbach α was .77 and can be considered as satisfactory (Cronbach, 1990).

The "Planning" factor has an eigenvalue of 3.0 and the explained variance was 5.20%. The Cronbach alpha of the factor was .69.

The "Self-efficacy" factor has an eigenvalue of 2.8 and 4.92% of explained variance and the Cronbach alpha is .75.

The "Self-reward" factor has an eigenvalue of 2.6 and 4.59% of explained variance. The Cronbach alpha is .77.

"Emotional control" factor has an eigenvalue of 2.4 and the explained variance was 4.22%. The Cronbach alpha is .60.

Finally, the "Attention/stimulus control" factor has an eigenvalue of 2.2 and the explained variance was 3.80%. The Cronbach alpha is .65.

It was also found that dropping any item from the overall test was not followed by considerable increase in α value for each of the subdomains of the test. The Table that follows presents in detail the factors' characteristics for Self-regulation Skills Battery.

Table 32. The self-regulation factors as resulted from the Exploratory Factor Analysis on Self-regulation Skills Battery

FACTORS (Cronbach's Alpha into parenthesis)	FACTOR EIGENVALUE	PERCENTAGE (%) OF EXPLAINED VARIANCE	FACTOR COMPONENTS (The loadings are into parenthesis)
Factor 1. Self-criticism (.77)	**3.1**	**5.44**	V8: I tend to criticize myself when I am not making progress toward this goal (.73) V21: I routinely criticize myself if I don't work hard enough on this goal (.73) V34: When working on this goal, I criticize myself for not always having what it takes to succeed (.58) V47: I routinely criticize myself for unsatisfactory work on this goal (.66)
Factor 2. Planning (.69)	**3.0**	**5.20**	V6:I carefully schedule my activities so I have enough time to pursue this goal (.70) V19:I try to plan out in advance the steps necessary to reach this goal (.64) V45: I have a detailed step-by-step plan to help me to attain this goal (.63)
Factor 3. Self-efficacy (.75)	**2.8**	**4.92**	V2: I possess the necessary skills to attain this goal (.77) V15:I have what it takes to reach this goal (.77) V28: I have the necessary knowledge to reach this goal (53) V41: I have the ability to reach this goal (.69)

FACTORS (Cronbach's Alpha into parenthesis)	FACTOR EIGENVALUE	PERCENTAGE (%) OF EXPLAINED VARIANCE	FACTOR COMPONENTS (The loadings are into parenthesis)
Factor 4. Self-reward (.77)	**2.6**	**4.59**	V9: I reward myself when I make progress toward this goal (.63) V35: I treat myself to something special when I make progress toward this goal (.82) V48: I reward myself for working hard on this goal (.81)
Factor 5. Emotional control (.60)	**2.4**	**4.22**	V13: I manage to keep my emotions in control if I fail to make progress toward this goal (.67) V26:If I fail to make progress toward this goal, I do not get stressed out (.62) V39:If things go against me whilst pursuing this goal, I manage to keep my emotions in control (.63)
Factor 6. Attention/ Stimulus control (.65)	**2.2**	**3.80**	V10: I try not to let other goals interfere with this goal (.71) V23:I try not to let other people interfere with my work on this goal (.55) V36: I do not allow other things to distract me from this goal (.65)

The Food Frequency Scale

Four factors were extracted from this analysis. The first factor the "Sweets" (eigen value 6.9 and 11.5% of explained variance), the Cronbach alpha of the factor was .71.

The second factor is the "Red meat" (eigenvalue of 3.6 and 6.10% of explained variance), the Cronbach alpha of the factor was.76. These two factors can be considered as the "unhealthy food" factors.

The third factor is "Vegetables and white meat" (eigenvalue of 2.3 and 3.91% of the explained variance). The Cronbach alpha for this factor was .53.

The fourth factor is "Fruits" (eigenvalue of 1.8 and 3.14% of explained variance), and the Cronbach alpha was .59. The last two factors can be considered as the "healthy food" factors.

It was also found that dropping any item from the overall test was not followed by considerable increase in α value for each of the subdomains of the test. The Table 33 presents in details all the technical characteristics of the Food Frequency factors.

Table 33. Eating behavior factors as resulted from the Exploratory Factor Analysis for the Food Frequency Scale

FACTORS (Cronbach's Alpha into parenthesis)	FACTOR EIGENVALUE	PERCENTAGE (%) OF EXPLAINED VARIANCE	FACTOR COMPONENTS (The loadings are into parenthesis)
Factor 1. Unhealthy diet(Sweets) (.71)	**6.9**	**11.5**	V20: Nutella-Hazelnut (.70) V21: Chocolates (.70) V27: Cakes (.72)
Factor 2. Unhealthy diet (Red meat) (.76)	**3.6**	**6.10**	V34: meat or mince meat of beef (.65) V35: meat or mince meat of pork (.62) V36: meat or mince meat of lamb (.73) V37: rabit (.69) V41:liver (.57)
Factor 3. Healthy diet (Vegetables and white meat) (.53)	**2.3**	**3.91**	V42: Fresh fish (.47) V48: Salads (.63) V49:Vegetables (.63)
Factor 4. Healthy diet (Fruits) (.60)	**1.8**	**3.14**	V32:Juices (.73) V50:Fruits (.63) V51:Fresh juices (.62)

The Somatic Symptoms Scale

Two factors were extracted from this analysis. The first is “Headache type symptoms” (eigen value 2.8 and 25.4% of explained variance), the Cronbach alpha of the factor is .74.

The second factor is the “body-aches” (eigenvalue of 2.6 and explains 23.7% of the variance), the Cronbach alpha of the factor was.72. These two factors can be considered as the somatization symptoms. Table 34 presents all the technical characteristics of these factors.

Table 34. The Somatic Symptom Factors as extracted from the Exploratory Factor Analysis for the Somatic Symptoms Scale

FACTORS (Cronbach's Alpha into parenthesis)	FACTOR EIGENVALUE	PERCENTAGE (%) OF EXPLAINED VARIANCE	FACTOR COMPONENTS (The loadings are into parenthesis)
Factor 1. Headaches (.74)	**2.8**	**25.4**	V1: Headaches (.81) V2: Faintness or dizziness (.58) V5:Nausea (.54) V11:Feeling weak in parts of your body (.71)
Factor 2. Body-aches (.72)	**2.6**	**23.7**	V6: Soreness of muscles (.84) V7: Trouble getting your breath (.72) V8: Hot or cold spells (.57) V9: Numbness or tingling in part of the body (.71)

The Checklist Individual Strength Scale (CIS)

By means of an exploratory factor analysis, four factors were extracted. The first factor refers to "Subjective feeling of fatigue" and has an eigenvalue of 2.5 and explains 12.9% of the variance. The value of Cronbach α was .76.

The second factor refers to "Motivation". The eigenvalue of this factor is 2.3 and the explained variance was 11.9%. Also, the value of Cronbach α was .58.

The third factor is "Lack of energy". The eigenvalue of this factor is 2.2 and the explained variance was 11.2%. The value of Cronbach α was .66.

Table 35 presents in detail the characteristics of the factors extracted.

Table 35. The strength-fatigue factors which were extracted from the Exploratory Factor Analysis of the Checklist Individual Strength Scale

FACTORS (Cronbach's Alpha into parenthesis)	FACTOR EIGENVALUE	PERCENTAGE (%) OF EXPLAINED VARIANCE	FACTOR COMPONENTS (The loadings are into parenthesis)
Factor 1. Subjective feeling of fatigue (.76)	**2.5**	**12.9**	V1: I feel tired (.77) V4: Physically I feel exhausted (.54) V9: I feel weak (.67) V12: I feel rested (.66) V16: I get tired very quickly (.60)
Factor 2. Motivation (.58)	**2.3**	**11.9**	V2:I feel very active (.44) V5: I feel like doing all kind of nice things (.53) V7: I do quite a lot within a day (.52) V15: I am full of plans (.49)
Factor 3. Lack of energy (.66)	**2.2**	**11.2**	V10: I don't do much during the day (.83) V17: I have a low output (.51) V18: I feel no desire to do anything (.62)

5.2.3. Descriptive statistics

Self-regulation Skills Battery (SRSB)

The following table presents the means and the standard deviations for each factor of the Self-regulation Skills Battery.

Table 36. Descriptive statistics, means and standard deviations of the self-regulation skills factors

Self-regulation Skills Battery Sub-scales	Variables	Mean	Standard Deviation
Self -criticism	V08	3.7	1.1
	V21	3.6	1.0
	V34	3.2	1.0
	V47	3.4	1.1
Planning	V06	3.3	1.2
	V19	3.5	1.0
	V45	3.0	1.1
Self-efficacy	V02	3.9	0.8
	V15	3.9	0.9
	V28	3.8	0.9
	V41	4.0	0.9
Self-reward	V09	3.3	1.2
	V35	3.0	1.2
	V48	3.2	1.1
Emotional control	V13	3.6	1.0
	V26	3.2	1.2
	V39	3.6	0.9
Attention/Stimulus control	V10	3.4	1.2
	V23	3.9	1.0
	V36	3.5	1.1

Food Frequency Scale

Table 37 presents the means and the standard deviations for each factor of the Food Frequency Scale

Table 37. Descriptive statistics, means and standard deviations of the Food Frequency factors

Food Frequency Scale Sub-scales	**Variables**	**Mean**	**Standard Deviation**
Sweets	V20	2.4	1.1
	V21	3.4	1.1
	V27	2.5	1.0
Meat	V34	2.7	1.0
	V35	2.9	1.0
	V36	2.2	1.0
	V37	2.3	1.0
	V41	1.7	0.9
Vegetables and white meat	V42	2.7	0.9
	V48	3.8	1.1
	V49	2.8	1.1
Fruits	V32	3.8	1.0
	V50	3.9	1.0
	V51	3.4	1.2

The Somatic Symptoms Scale

The table that follows presents the means and the standard deviations for each factor of the Somatic Symptoms Scale

Table 38. Descriptive statistics, means and standard deviations of the Somatic Symptoms factors

Somatic Symptoms Scale Sub-scales	**Variables**	**Mean**	**Standard Deviation**
Headaches	V01	2.2	1.0
	V02	1.4	0.8
	V05	1.5	0.9
	V11	1.8	1.0
Body aches	V06	2.1	1.0
	V07	1.9	1.0
	V08	1.7	1.0
	V09	1.9	1.0

Checklist Individual Strength (CIS)

Table 39 presents the means and the standard deviations for each factor of the Checklist Individual Strength scale.

Table 39. Descriptive statistics, means and standard deviations of the Checklist Individual Strength factors.

Checklist Individual Strength Scale Sub-scales	**Variables**	**Mean**	**Standard Deviation**
Subjective feeling of fatigue	V01	4.0	1.9
	V04	3.0	1.8
	V09	3.1	1.9
	V12	3.6	1.8
	V16	3.4	1.8
Motivation	V02	2.9	1.6
	V05	2.4	1.6
	V07	3.0	1.8
	V15	2.1	1.6
Lack of energy	V10	3.1	1.2
	V17	2.7	1.7
	V18	2.5	1.8

Table 40. Composite variables used for the purpose of Structural Equation Modeling

SCALES	FACTORS	INITIAL VARIABLES	COMPOSITE VARIABLES
Self-regulation Skills Battery	Self-criticism	V08 V21	CRT1
		V34 V47	CRT2
	Planning	V06 V19	PLA1
		V45	PLA2
	Self-efficacy	V02 V41	SEF1
		V15 V28	SEF2
	Self-reward	V09 V48	SRW1
		V35	SRW2
	Emotional Control	V26 V39	EMC1
		V13	EMC2
	Attention/Stimulus control	V10 V36	ATN1
		V23	ATN2
Food Frequency Scale	Unhealthy diet (sweets)	V20 V21	SWT1
		V27	SWT2
	Unhealthy diet (Red meat)	V34 V36	RED1
		V35 V41	RED2
		V37	RED3
	Healthy diet (Vegetables & white meat)	V48 V49	VGT1
		V42	FISH2

SCALES	FACTORS	INITIAL VARIABLES	COMPOSITE VARIABLES
	Healthy diet (Fruits)	V50 V51	FRT1
		V32	FRT2

Somatic Symptoms Scale	Headaches	V01 V02	HEAD1
		V05 V11	HEAD2
	Body aches	V06 V09	BACH1
		V07 V08	BACH2
Checklist Individual Strength	Subjective feeling of fatigue	V01 V04	FTG1
		V09 V16	FTG2
		V12	FTG3
	Motivation	V02 V07	MOT1
		V05 V15	MOT2
	Lack of energy	V10 V17	ENG1
		V18	ENG2

5.2.4. Correlations between the factors

From the Bivariate statistical analysis the following correlations between the factors emerged.

The analysis showed that almost all the self-regulation skills were related to each other in a statistically significant level. For instance, the "self-criticism" factor is positively related in a statistically significant level ($r = .36$, $p < .01$) to "planning", to "self efficacy" ($r = .15$, $p < .01$), to "self-reward" ($r = .27$, $p < .01$), and to "attention / stimulus control"($r = .34$, $p < .01$). Further, "self- criticism" factor is negatively related to "risky eating" ($r = -.09$, $p < .05$). Thus, individuals who criticize themselves more they consume less unhealthy food. In addition to this, the "self-criticism" factor is related in a statistically significant level to healthy eating ($r = .08$, $p < .05$). Therefore, individuals who criticize themselves more consume more healthy food. In contrast, it appears that the "self-criticism" factor is related to "somatic symptoms" factor ($r = .09$, $p < .01$). Thus, it appears that the more individuals criticize themselves the more they will present somatic symptoms such as headaches. Also, the "self-criticism" factor is negatively related to " peers approval" ($r = -.07$, $p < .05$). This means that the more individuals criticize themselves the less they seek for peers' approval about eating behavior. In contrast, the "self-criticism" factor is positively related in a statistically significant level to "peers attitudes" ($r = .11$, $p < .01$). Individuals who criticize themselves more take more into account their peers attitudes towards eating. Also, the "self-criticism" factor is positively related to "family cohesion" ($r = .10$, $p < .01$) and to "family control" ($r = .08$, $p < .05$).

The "planning" factor is positively related in a statistically significant level to "self-efficacy" ($r = .27$, $p < .01$), to "self-reward" ($r = .27$, $p < .01$), to "emotional control" ($r = .22$, $p < .01$), to "attention / stimulus control" ($r = .40$, $p < .01$). It is also positively related to "healthy eating" ($r = .17$, $p < .01$). The "planning" factor is negatively related in a statistically significant level to "somatic symptoms" factor ($r = -.08$, $p < .05$) and to the "fatigue-individual strength" factor ($r = -.18$, $p < .01$). Further, "planning" factor is negatively related in a statistically significant level to "peers approval of eating behavior" ($r = -.09$, $p < .05$) and in contrast, is positively related to "peers attitudes on eating behavior" factor ($r = .09$, $p < .05$). Also, "planning" factor is positively related to "family cohesion" factor ($r = .18$, $p < .01$) and to "family control" factor ($r = .14$, $p < .01$).

The “self-efficacy” factor is positively related in a statistically significant level to “self-reward” (r =. 15, p<.01), to “emotional control” (r =.37, p<.01) and to “attention/ stimulus control” (r =.35, p<.01). Also, “self-efficacy” factor is positively and significantly related to “healthy eating” factor (r =.12, p<.01). Furthermore, “self-efficacy” factor is negatively related to “somatic symptoms” factor (r = -.19, p<.01) and to “fatigue-individual strength” factor (r = -.27, p<.01). “Self-efficacy” factor is also, positively and significantly related to “peer attitudes towards eating behavior” (r =.08, p<.05). In addition, “self-efficacy” factor is related in a statistically significant level to “family cohesion” (r =.18, p<.01) and to “family control” (r =.08, p<.05). “Self-reward” factor appears from the analysis to be positively and significantly related to “ emotional control” (r =.16, p<.01) and to “attention / stimulus control” (r =.24, p<.01). Surprisingly, it appears that “self-reward” factor is positively related in a statistically significant level to “risky eating behavior” factor (r =.09, p<.05). One possible explanation about this outcome may be the fact that individuals who set the goal of healthy eating and they do well towards pursuing this goal tend to reward themselves by letting themselves consume unhealthy food such as cakes, chocolate etc. On the other hand, “self-reward” appears to be positively related to “healthy eating behavior” (r =.11, p<.01), and negatively related in a statistically significant level to “fatigue, individual strength” factor (r = -.11, p<.01). Furthermore, “self-reward” is positively related in a statistically significant level to “adaptation to peers’ eating behaviors” (r = .11, p<.01). The possible interpretation for this outcome is similar to the explanation given above for the relation between “self-reward” factor and “ risky eating behavior” factor. Additionally, “self-reward” factor is positively and significantly related to “ peers attitudes towards eating” (r =.08, p<.05). “Self-efficacy” is also positively related to “family cohesion” (r =.12, p<.01) and to “family control” (r =.13, p<.01).

The “emotional control” factor is positively related in a statistically significant level to “attention / stimulus control” factor (r =.28, p<.01). Also, “emotional control” factor is positively related to “healthy eating behavior” factor (r =.13, p<.01). Further, “emotional control” factor is negatively related to both “somatic symptoms” (r = -.20, p<.001) and to “fatigue-individual strength” (r = -.23, p<.01). “Emotional control” factor is also negatively related to “peers approval on eating behavior”

(r = -.09, p<.05). Thus, the more adolescents control their emotions towards pursuing their goal the less they are influenced and need their peers' approval. Moreover, "emotional control" is positively related in a statistically significant level to "family cohesion" (r =.11, p<.01).

"Attention/ stimulus control" factor appears to be negatively related in a statistically significant level to "risky eating behavior" factor (r = -.10, p<.01) and to "fatigue-individual strength" (r = -.17, p<.01). In contrast, "attention /stimulus control" factor is positively related to "healthy eating behavior" factor (r =.10, p<.01). Moreover, "attention/ stimulus control" factor is positively related to "peers attitudes towards eating" factor (r =.12, p<.01). Also, "attention/ stimulus control" factor is positively related to "family cohesion" (r =.19, p<.01) and to "family control" (r =.07, p<.05).

The "risky eating behavior" factor appears to be positively related in a statistically significant level to "healthy eating behavior (r =.28, p<.01). One possible explanation about this may be the fact that adolescents who consume unhealthy food they do also consume healthy food. It would not be realistic to argue that risky eaters do not consume healthy types of food at all. Also, another explanation is the fact that examining this kind of special population (risky eaters) was not among the aims of this study. As it was also expected in this study, "risky eating behavior" factor is positively and significantly related to both "adaptation to peers' eating behavior" (r =.10, p<.01) and to "peers approval of eating behavior"(r =.19, p<.01). Additionally, "risky eating behavior" factor is positively related in a statistically significant level to "family control" factor (r =.07, p<.05).

As expected "healthy eating behavior" is negatively related in a statistically significant level to "fatigue-individual strength" factor (r = -.14, p<.01). Thus, adolescents who consume healthy food feel less tired and have more energy to do things. Moreover, "healthy eating factor" is positively related to both "family cohesion" factor (r =.10, p<.01) and to "family control" factor (r =.12, p<.01).

The "somatic symptoms" factor is positively and strongly related to "fatigue-individual strength" (r = .42, p<.01). Therefore, adolescents who experience somatic

problems such as headaches, body aches feel more tired, less energetic and motivated to do things. Also, “somatic symptoms” factor is negatively related to “family cohesion” factor (r = -.09, p<.05). Thus, adolescents who have more somatic problems experience less cohesion in their families. The same appears for “fatigue-individual strength” factor and “family cohesion” factor (r =-.22, p<.01).

The “adaptation to peers eating behavior” factor is positively related to “approval by peers of eating behavior” (r =.13, p<.01). Additionally, “adaptation to peers eating behavior” factor is positively related in a statistically significant level to both “family control” (r =.26, p<.01) and “family independence” (r =.10, p<.01). Therefore, the more adolescents adapt their peers eating behavior the more control and independence experience within their families.

“Peers attitudes towards eating behavior” factor is positively related in a statistically significant level to both “family cohesion” (r =.18, p<.01) and “family control (r =.07, p<.05).

Finally, “family cohesion” factor is positively related in a statistically significant level to “family control” factor (r =.29, p<.01). Table 41 displays the correlations between the factors.

Table 41. *Bivariate correlations of among the factors (Pearson r)*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.Self-criticism		.36**	.15**	.27**	.02	.34**	-.09*	.08*	.09**	.04	.03	-.07*	.11**	.10**	.09*	-.01
2. Planning			.27**	.27**	.22**	.40**	-.03	.17**	-.08*	-.18**	.11**	-.09*	.09*	.18**	.14**	.04
3.Self-efficacy				.15**	.37**	.35**	-.05	.12**	-.19**	-.27**	.00	-.02	.08*	.18**	.08*	.02
4 Self-reward					.16**	.24**	.09*	.11**	-.02	-.11**	.11**	.02	.08*	.12**	.14**	.05
5.Emotional Control						.28**	.04	.13**	-.20**	-.23**	.02	-.09*	.04	.11**	.04	.00
6. Attention							-.10**	.10**	-.04	-.17**	.00	-.05	.12**	.19**	.07*	-.01
7. Risky eating								.28**	-.01	-.02	.10**	.19**	.05	.03	.07*	.01
8. Healthy eating									-.00	-.14**	.01	-.00	.05	.10**	.12**	-.01
9.Somatic Symptoms										.42**	-.00	.01	.02	-.09*	-.00	-.02
10. Fatigue											.03	.01	-.02	-.22**	-.05	-.03
11.Adaptation												.13**	.00	.02	.26**	.10**
12. Approval													-.04	.02	.07	.16**
13. Attitudes														.18**	.07*	-.02
14. Cohesion															.29**	-.03
15. Control																.03
16. Independence																
M	3.52	3.23	3.94	3.14	3.50	3.66	2.50	3.40	1.84	3.13	2.30	3.22	4.34	4.20	3.30	2.65
SD	0.8	0.9	0.7	1.02	0.8	0.8	0.6	0.6	0.6	1.12	0.9	0.8	0.6	0.7	0.8	0.8

*p<.05 **p<.01

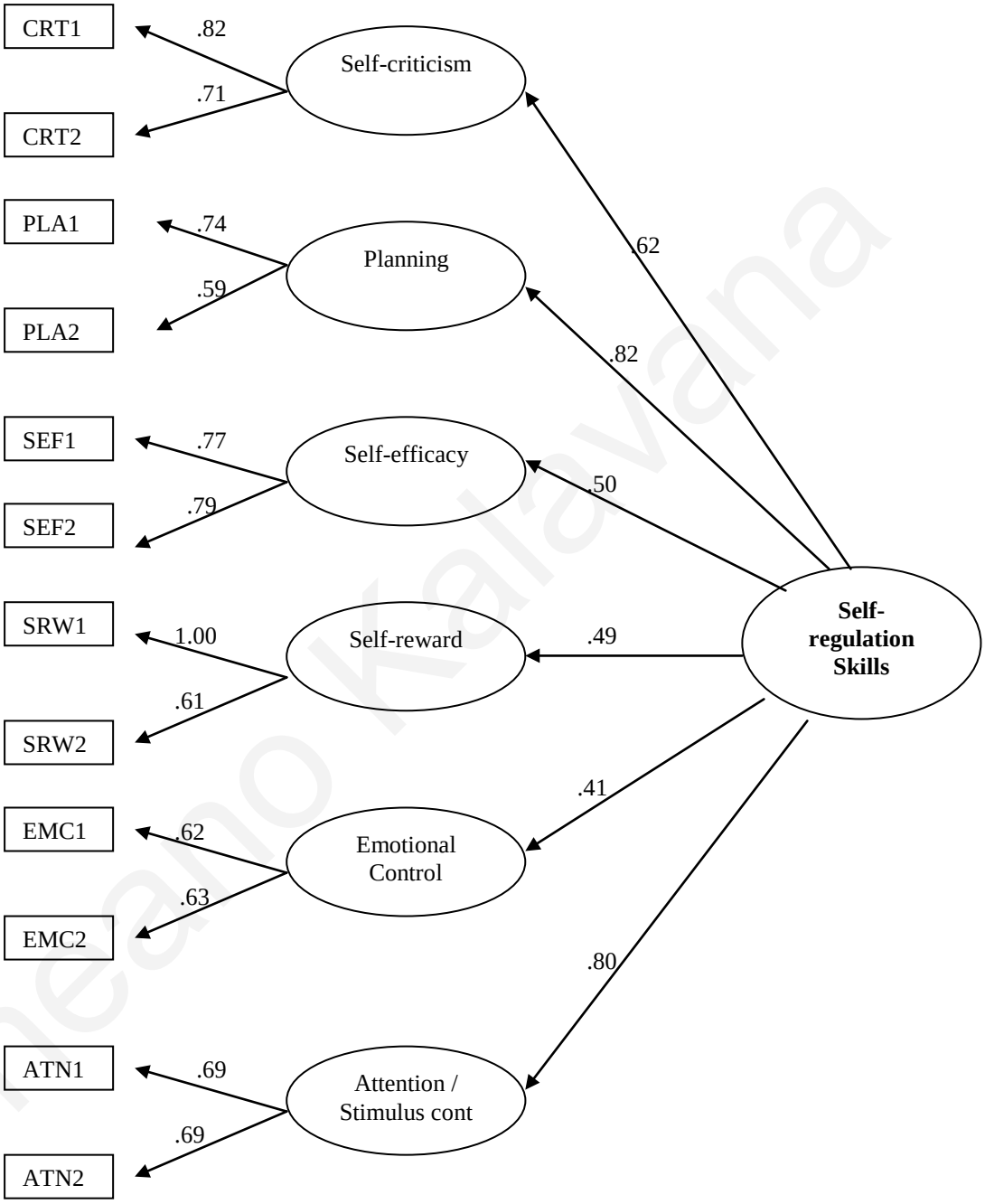
5.2.5. Confirmatory Factor Analysis

As in the analysis of the first data collection wave, for the purpose of confirmatory factor analysis of the scales used for the present study, new variables (composite) were formed which consisted of the mean scores of the initial variables that loaded on the factors at the first place. The new composite variables were used for confirmatory factor analysis. This manipulation is widely used in structural analysis (Demetriou, Kyriakides & Avraamidou, 2003) and was also applied for the purpose of the confirmatory analysis for the remaining factors of the present study. In Table 40 the initial and the composite variables that were used in the confirmatory factor analysis are presented.

Self-regulation Skills Battery

The confirmatory factor analysis of the scale was based on the exploratory factor analysis which showed the formation of six self-regulation skills factors. The results of the present analysis confirm the construct validity of the six first order factors and one-second order factor. The six first order factors refer to “Self-criticism”; “Planning”; “Self-efficacy”; “Self-reward”; “Emotional control” and “Attention / Stimulus control”. The second order factor refers to ‘self-regulation”. The fit statistics (scaled χ^2 = 134.512, *df* = 47, *p*<.001; RMSEA =.05 and CFI =.96) were satisfactory. The standardized factor loadings were all positive and the great majority of them were higher than .65. (Figure 16).

Figure 16. *Confirmatory Factor Analysis of the Self-regulation Skills Battery*

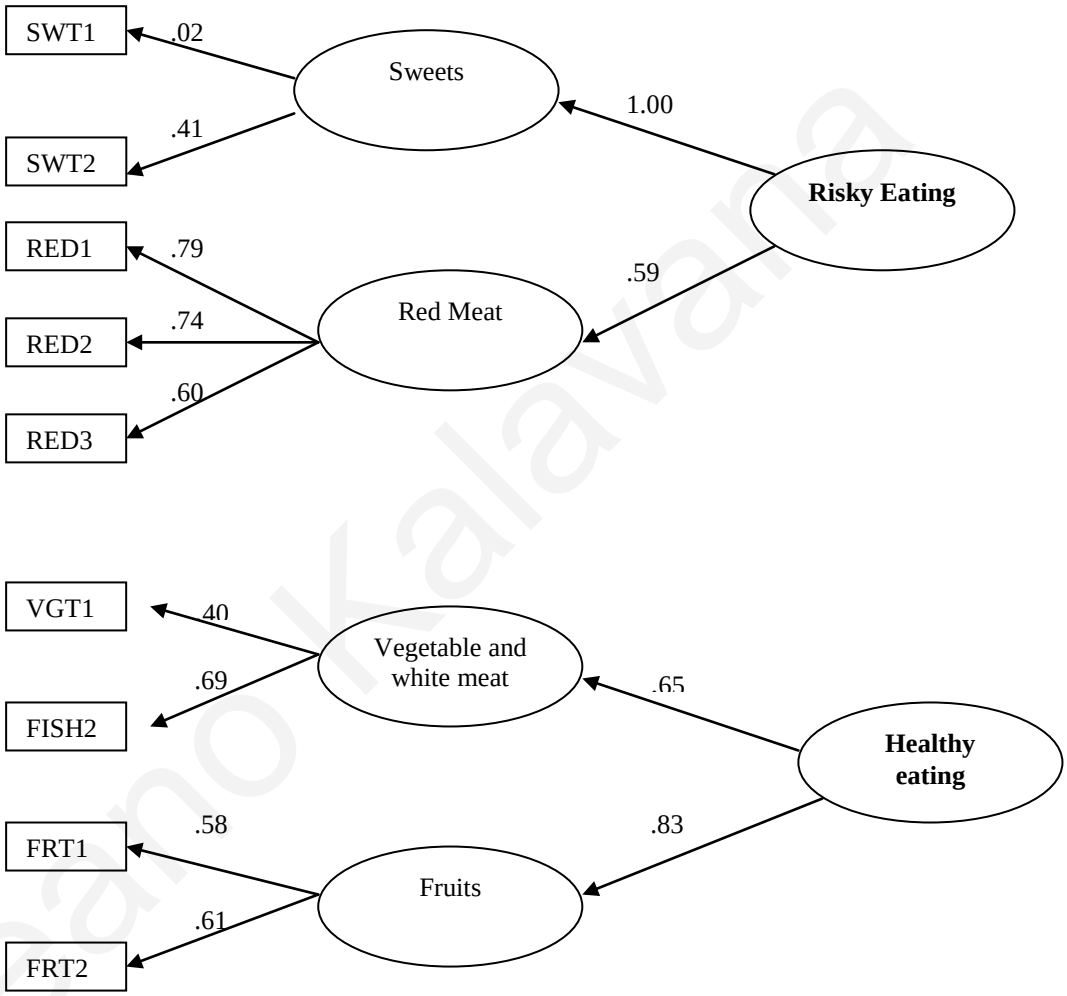


χ^2 / df = 134.512 / 47 = 2.86; p<.001, CFI = .96, RMSEA = .05, RMR = .04

The Food Frequency Scale

The scale examines the dietary behavior of the participants. The scale consisted of nine subscales but the exploratory factor analysis showed the existence of only four factors. Based on the results of exploratory analysis, confirmatory factor analysis was conducted. The analysis showed that the construct validity of the scale is satisfactory. The analysis confirmed the existence of four first order factors and one second order factor. The first order factors are “Sweets”, “Red meat”, “Vegetables and white meat” and “fruits”. The second order factor is the “eating behavior”. The fit statistics (scaled χ^2 = 114.951, *df* = 19, *p*<.001; RMSEA = .08 and CFI = .90) were acceptable. The standardized factor loadings were all positive and the great majority of them were higher than .60. The loadings on the second order factor are between .55 and 80 (Figure 17).

Figure 17. *Confirmatory Factor Analysis of the Food Frequency Scale*

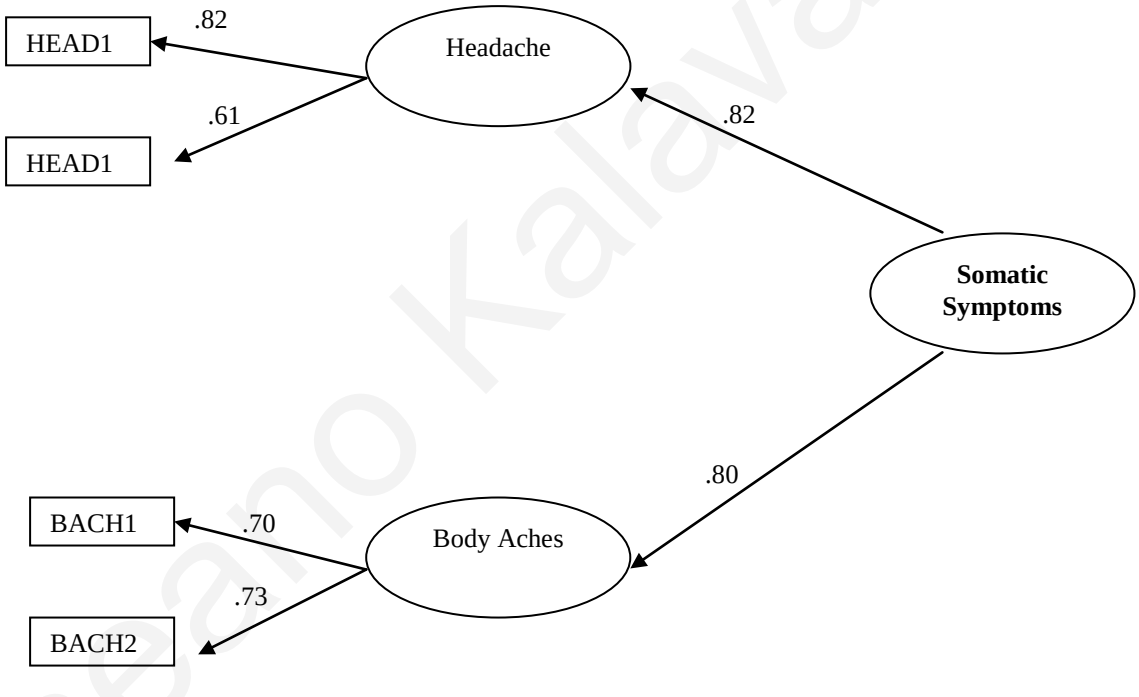


χ^2 / df = 114.951 /19 = 4,44; p<.001, CFI = .90, RMSEA = .08, RMR = .04

Somatic Symptoms Scale

Based on the results of exploratory analysis, confirmatory factor analysis was conducted. The analysis showed that the construct validity of the scale is satisfactory. The analysis confirmed the existence of two first order factors and one second order factor. The first order factors are: “Headaches”, and “Body Aches”. The second order factor is the “Somatic Symptoms”. The fit statistics (scaled $\chi^2 = 15.635$, $df = 3$, $p<.001$; RMSEA = .07 and CFI = .98) were acceptable. The standardized factor loadings were all positive and the great majority of them were higher than .70. More information in detail is presented in Figure 18.

Figure 18. *Confirmatory Factor Analysis of the Somatic Symptoms Scale*

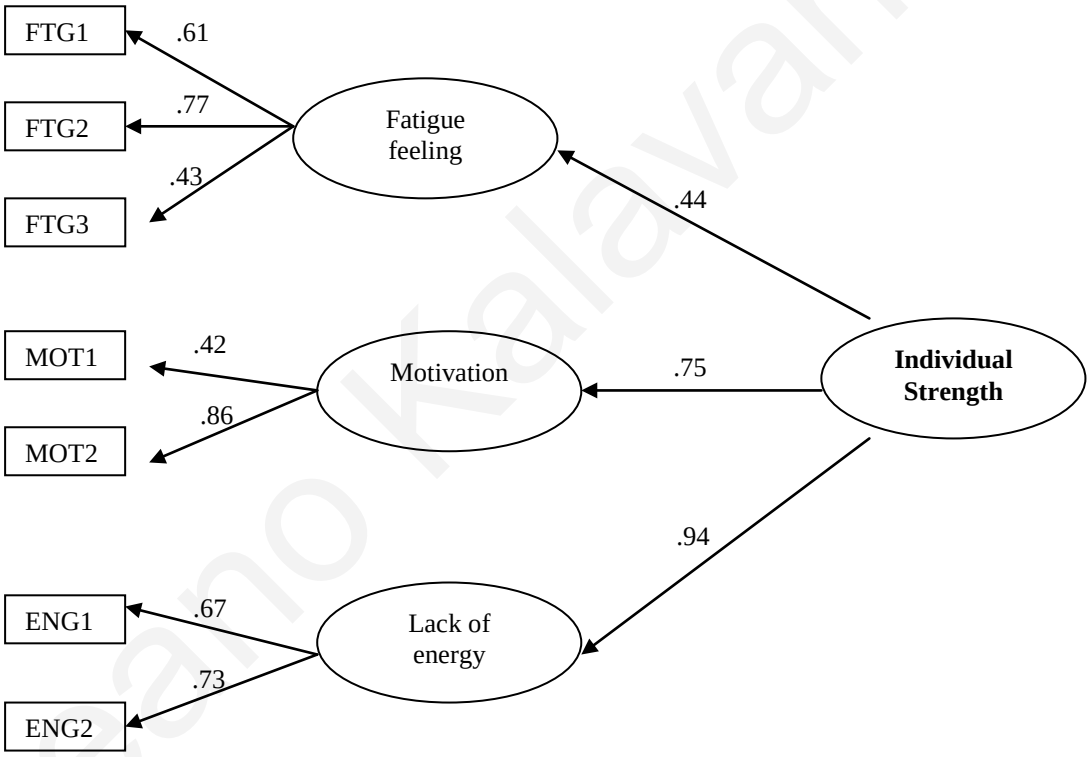


χ^2 / df = 15.635 / 3 = 5.21; p<.001, CFI = .98, RMSEA = .07, RMR = .04

Checklist Individual Strength

The scale examines the individuals' strength (e.g. fatigue, physical activity, motivation and concentration). Based on the results of exploratory analysis, confirmatory factor analysis was conducted. The analysis showed that the construct validity of the scale is satisfactory. The analysis confirmed the existence of three first order factors (instead of four) and one second order factor. The first order factors are "Fatigue feeling", "Motivation" and "Lack of energy". The second order factor is the "Individual strength". The fit statistics (scaled $\chi^2 = 40.792$, $df = 8$, $p<.001$; RMSEA = .07 and CFI = .97) were acceptable. The standardized factor loadings were all positive and the great majority of them were higher than .60 (Figure 19).

Figure 19. *Confirmatory Factor Analysis of the Checklist Individual Strength*



χ^2 / df = 40.792 / 8 = 5.09; p<.001, CFI = .97, RMSEA = .07, RMR = .08

5.2.6. Structural Equation Modeling for the 2nd data collection wave

The following models (Figure 20, 21 and 22) present the interrelations of all the basic factors that structure the model to be tested in the present study.

The procedure followed was the same as in the first data collection wave analysis. Structural equation modeling (SEM) and specifically multi-group analysis was used in order to formulate and test the proposed model. The three groups were the same as in the first data collection wave analysis. Those who had healthy eating as their goal (N=434), those who had physical exercise as their goal (N=187) and those who had quit smoking as their goal (N=109).

As in the first data collection wave, the full measurement model was fitted to the data of the three groups simultaneously in a multi-group model. This was done in order to assess whether the indicators measure the same components across the three groups. The analysis showed that configuration of the factor loadings was identical for all the groups. Note that parameters in this model were free to vary across the three groups. The goodness of fit statistic of this model can be considered as excellent (χ^2/df = 2046.130/ 1020 =2.00, p<001, CFI=.99, RMSEA = .06). This model provided a baseline, by means of which we evaluated a more constrained model.

The next step was to constrain the regression coefficients (factor loadings) of the observed indicators of the common factors to be identical in all groups. The analysis showed no significant measurement invariance between the three groups constructs. Thus, constraining the models to be equal for the three groups was appropriate. The analysis showed that the proposed model could be generalized across the three groups. Also, a calculation of difference in χ^2 and degrees of freedom between conditions (restricted and non restricted) indicated that the differences (χ^2_{diff} 19.839/ *df* 22) did not reach level of statistical significance. Furthermore, the goodness of fit statistic of the constrained model was almost the same as the unconstrained one (χ^2/df = 2065.969/ 1042=1.98, p<001, CFI=.99, RMSEA =.06)

Description of the constrained model

The model is generalized across the three groups. This result confirms the hypotheses that the constructing factors for examining healthy eating behavior are the same for middle age adolescents (hypotheses 22, 23, 24, 25 and 26). Furthermore, the relation of these factors with healthy eating and risky eating differs among the three groups. This also confirms the hypotheses that although the factor construct will be identical among the three groups, the groups will present differences based on the relations of the factors. These results confirm also the hypotheses of the present research (hypotheses 22 to 31). The goodness of fit statistic for the model can be considered as excellent (χ^2/df = 2065.969/ 1042=1.98, p<001, CFI=.99, RMSEA =.06). (see Figures 20, 21 and 22).

On the top of the figures is the family environment factor, on which three factors [family cohesion (COH), family control (CON) and independence in the family (IND)] load. On the left hand side the self-regulation cognitions factor also consisting of three factors [goal commitment (COM), goal efficacy (EFF), and self-determination (DET)]. Under the self-regulation cognitions factor is the self-regulation skills factor on which six factors load. These are: self-criticism (CRT), planning (PLA), self-efficacy, (SEF), self-reward (SRW), emotional control (ECN) and attention / stimulus control (ATN). Also, goal approximation loads on self-regulation skills factor, as it appears in the figure below self-regulation skills factor. On the top and on the right hand side is the peer influence factor. Three factors load on this factor. These are adaptation to peer's eating patterns (ADP), peer's approval of dietary behavior (APR) and peer's attitudes about eating behavior (ATT). Finally, on the bottom of the figure appear the dependent variables of this study. That is, on the left healthy eating behavior –time 1 and below this factor is healthy eating behavior – time 2. On the right hand side is the risky eating behavior – time 1 and below this factor risky eating behavior – time 2. Three factors load on the healthy eating behavior – time 1. These are: carbohydrates (CAR), fruits (FRT) and vegetables (VEG). Further, two factors load on healthy eating behavior – time 2: vegetables (VEG) and fruits (FRT). On risky eating behavior factor load two factors: sweets (SWE) and red meat (RDM). The same factors load on risky eating time – 2. In order to test the relation of both eating behaviors on the body weight, BMI was introduced in the model. Thus, in the model appears BMI time –1 and BMI time – 2. Also, in order to examine the impact of risky eating on body / health problems, we

introduced in the model the somatic symptoms factor in which one first order factor – body aches (BAC) loads. It is noted, that the researcher examined also the influence of healthy eating behavior on somatic symptoms and found no relation between these two factors.

Regarding the interdependence between the nine second-order factors that structure the hypothetical model of the first phase of the present study, the following relations were established:

1. The family environment influences all the other factors of the model
2. The strongest predictor of risky eating behavior is peer influence
3. The strongest predictor of healthy eating behavior is self-regulations skills through the goal approximation factor (first-order factor).
4. Time – 1 factors have strong relation with Time – 2 factors, showing a linear relation (It is noted, that the researcher examined reverse relations between the time –1 and time –2 factors, but the analysis showed, firstly, that the reciprocal model does not fit the data and secondly, that the relations between the factors were either negative or non-existent).

The great majority of the standardized path coefficients relating the first-order, and the second-order factors were higher than .50.

Description of the results for the group who set healthy eating as their goal (Figure 20).

Based on the structural relations between the factors for the group who had healthy eating as their goal, the results show the following:

The family environment has strong indirect relation with both eating behaviors through self-regulation cognitions and peer influence. Also, family environment appears to have a strong positive relation with self-regulation skills. Thus, the more the individuals are influenced by their family the more they exercise self-regulation skills towards healthy eating behavior. Based on these results hypotheses 12,16 and 20 were confirmed. Although, earlier studies argue that individuals who exercise self-regulation (internal parameter) show more autonomy and they are less influenced from external factors such as family and friends. As it was also presented in Deci and Ryan's (1985) Cognitive Evaluation Theory (CET), social-context events can facilitate intrinsic motivation only when the individual has the opportunity to

experience feelings of autonomy and self-determination. Therefore, it is possible that the population of the present study does experience the family environment as a facilitator towards self-regulation skills.

Self-regulation cognitions factor appears to be related with both eating behaviors (time –1), and slightly affecting more the healthy eating behavior (time –1). Additionally, self-regulation cognitions factor is positively related to self-regulation skills factor. Thus, thinking is a prerequisite of action but when action is established cognition is no longer need as much as before. Additionally, it appears that the self-regulation skills factor is the strongest predictor of healthy eating behavior (time –2) through goal approximation. Hence, our hypotheses that healthy eating accomplishment is related to self-regulation skills are supported (10, 14, 15 and 21). Specifically, self-regulation skills have a strong relation with goal approximation, which in turn is strongly related to healthy eating behavior (time – 2). Further, self-regulation skills and goal approximation appear to have a very weak relation with risky eating (time –2).

Peer influence appears to be negatively related to self-regulation cognitions factor and on the self-regulation skills factor. Based on these findings our hypothesis that peers will affect negatively self-regulation skills was rejected (hypothesis 11). Furthermore, peer influence appears to have a direct relation with both eating behaviors for both times. More specifically, and as it was expected, peer influence factor has a greater relation with risky eating than healthy eating behavior. Therefore, our hypotheses that peers will influence the eating behavior of adolescents are supported by the results (hypotheses17 and 19).

Risky eating behavior factor (time –1) is negatively related with BMI (time –1).Thus, our hypothesis that risky eating will have a positive relation with BMI was rejected (hypothesis 5). This result was further explained in the first data wave results and discussion. The same appears for BMI (time –2). Thus, these results did not support the hypothesis that risky eating will have a positive relation with BMI (hypothesis 5). On the other hand, it was found that risky eating (time –2) was strongly related to somatic symptoms factor, and hence hypothesis that risky eating will have an impact on somatic problems was supported (hypothesis 9). Thus, adolescents who consume unhealthy food present more body aches. Finally, healthy eating behavior (time –2) factor loads strongly to healthy eating behavior (time –1) and the same appears for risky eating behavior (time –2) factor on risky eating behavior factor (time –1).

As in the first phase, the make-up of the same factors among the three groups confirms the construct validity and thus, we can argue that the participants respond to the measures in the same way. Therefore, this construct validity allows the researcher to test and interpret the differences between the groups with more confidence. It should be noted that the size of the factor loadings for the two groups (adolescents who had physical exercise or quit smoking as their goal) are of secondary importance. These loadings are of crucial importance mainly for the group on which this study was focused (i.e. adolescents who had healthy eating as their goal).

Description of the results for the group who set physical exercise as their goal (Figure 21).

Based on the structural relations between the factors for the group who had physical exercise as their goal, the results show the following:

Again, the family environment has strong indirect relation with both eating behaviors (time –1) through self-regulation cognitions, self-regulation skills and peer influence. The self-regulation cognitions factor appears to have a relation with both eating behaviors (time –1). Surprisingly it was strongly related to risky eating behavior (time –1) as well. One possible explanation is the fact that this group's self-regulation cognitions involve their physical exercise goal and not the healthy eating goal. Further, self-regulation cognitions factor appears to have positive relation with self-regulation skills, which in turn is strongly related with goal approximation.

Despite the above argument, it appears that the self-regulation skills factor is not the strongest predictor of healthy eating behavior (time –2) but peer influence is. In contrast to healthy eating group, self-regulation skills and goal approximation appear to have a strong relation with risky eating (time –2).

Peer influence in contrast to the healthy eating group, appears to have positive relation with both, self-regulation cognitions and self-regulation skills factor. Thus, it appears that the more the adolescents are influenced by the peers the more they present self-regulation skills. Furthermore, peer influence appears to have a weak relation with risky eating (time –2) and almost no relation with risky eating factor (time –1). Also, it appears in this group that peer influence has weak relation with healthy eating behavior (time –1) and a very strong relation with healthy eating (time –2).

The risky eating behavior factor (time –1) has a negative relation with BMI (time –1 and time-2). It is noted that both factors' relation with BMI are considered to be very weak. Again, risky eating (time –2) is strongly related with somatic symptoms.

Description of the results for the group who set quit smoking as their goal (Figure 22).

Based on the structural relations between the factors for the group who had quit smoking as their goal, the results show the following:

Again, the family environment is strongly related with both eating behaviors (time –1) through self-regulation cognitions and peer influence. Also, for this group family environment appears to have a strong direct relation with self-regulation skills. Further, family environment has a negative relation with peer influence factor. This was further explained in the analysis of the first data collection wave.

The self-regulation cognitions factor, surprisingly, appears to have a negative relation with healthy eating behavior factor (time –1), and in contrast, is strongly and positively related to risky eating behavior (time –1). A possible explanation of these outcomes was given in the analysis of the first data collection wave. Additionally, self-regulation cognitions factor appear to have an effect on the self-regulation skills factor, which in turn has a strong effect on goal approximation. Thus, self-regulation cognition and skills through goal approximation have a strong negative impact on risky eating behavior for the quit smoking group, and a positive low effect on healthy eating behavior. One possible explanation may be the fact that the present study investigates these parameters in relation to healthy eating goal accomplishment and not in relation to quitting smoking goal accomplishment.

Peer influence appears to have a strong effect on self-regulation cognitions factor and a lower effect on self-regulation skills factor. Further, peer influence appears to have a very low effect on both risky eating behaviors (time –1 and time-2). In contrast to risky eating, peer influence has a stronger positive effect on healthy eating behavior (time-1 and time-2).

To summarize, it appears that the theoretical model for explaining healthy eating behavior in adolescents is confirmed. Based on the models for the three groups, the model for those who set as their goal healthy eating (which is the main emphasis of the present study) explains well the parameters influencing healthy eating goal

accomplishment. For instance, the self-regulation skills factor appears to have a strong effect on goal approximation, which in turn has a strong effect on healthy eating. Furthermore, another important outcome was the fact that risky eating has a strong effect on body symptoms. Thus, this outcome indicates how urgently necessary interventions are on healthy eating behavior among adolescents.

Moreover, family environment appears to be an important parameter in the development of self-regulation cognitions and skills. Thus, family environment plays a crucial role in healthy eating through self-regulation. Furthermore, these results showed the importance of peer influence on eating behavior. More specifically, the peer influence factor has a higher effect on risky eating and negative effect on self-regulation cognitions towards healthy eating goal accomplishment.

Finally, it is important to note that some of the effects on the first and second order factors for the groups that had physical exercise and quit smoking as their goals were not as good as for the healthy eating goal group. One possible explanation is the fact that the study did not examine physical exercise behavior and quit smoking behavior. On the other hand, the fact that all the factors emerged in all the groups is important. This shows that the parameters influencing eating behavior that were examined in the present research can be generalized on the adolescents' population. The examination of these parameters among the three groups strengthens our proposed theoretical model about self-regulation, family environment and peer influence on healthy eating accomplishment.

Figure 20. *The model describing the interrelation of factors for the group consisting of those who had healthy eating as a goal.*

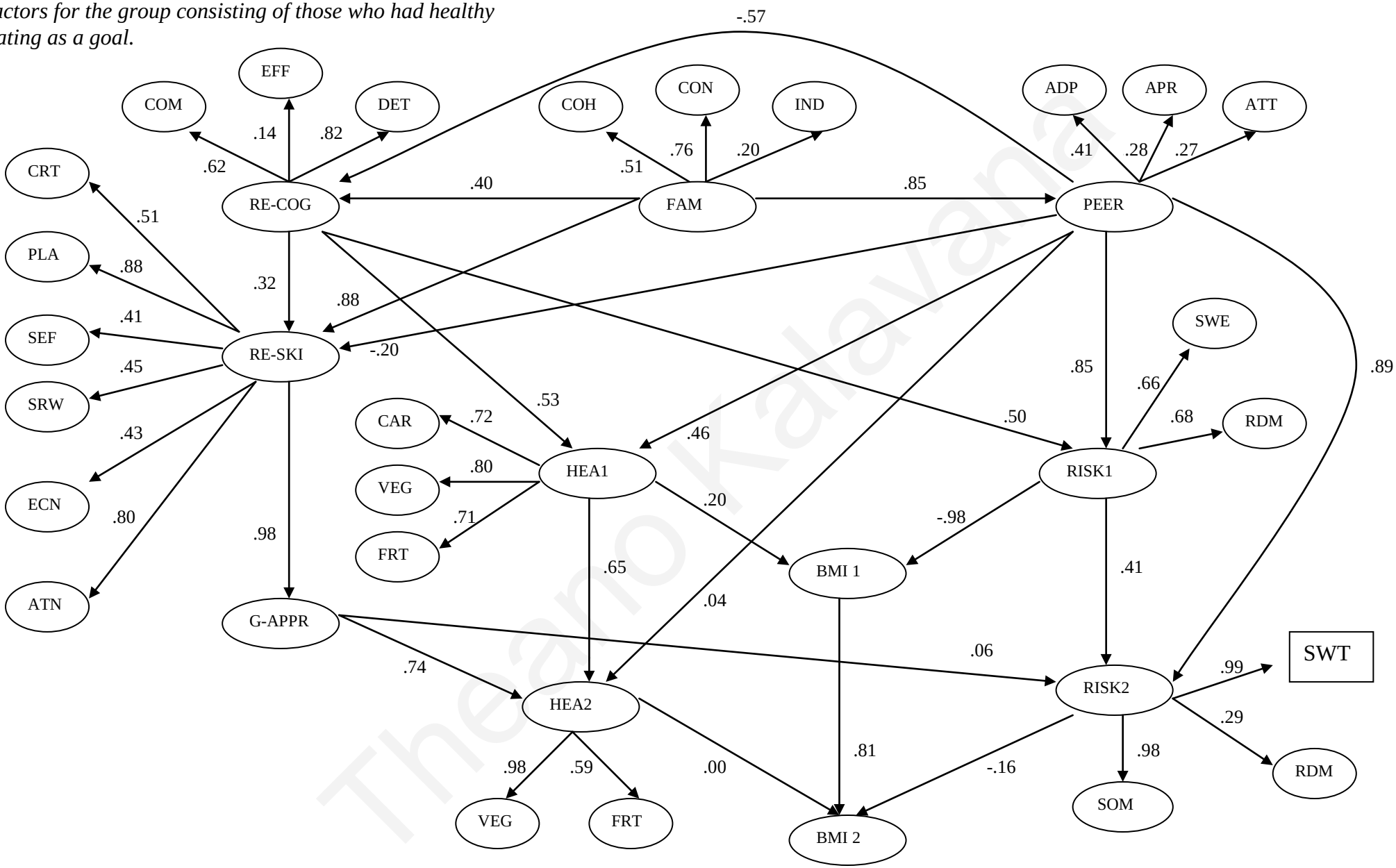


Figure 21. *The model describing the interrelation of factors for the group consisting of those who had physical exercise as a goal.*

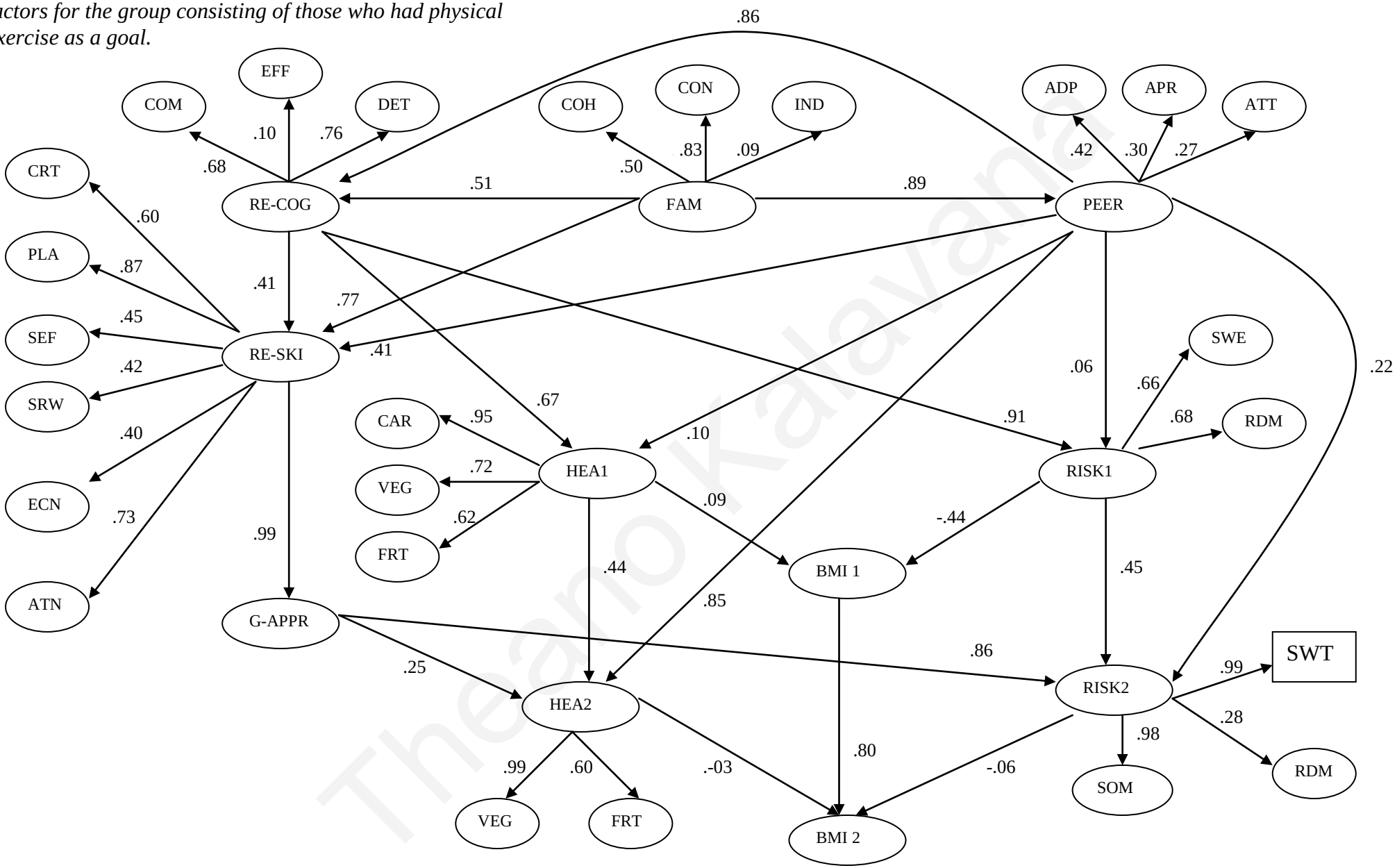
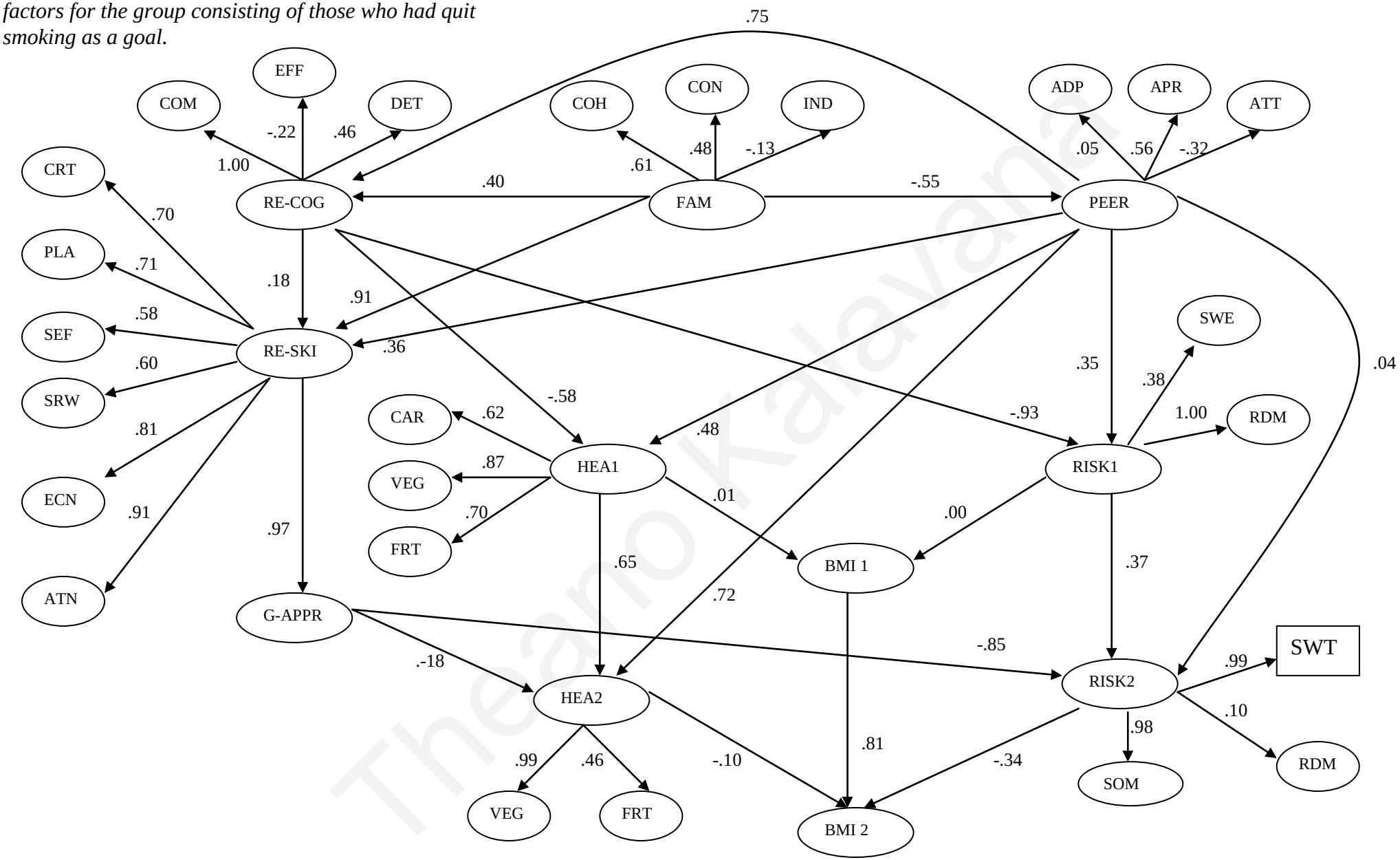


Figure 22. *The model describing the interrelation of factors for the group consisting of those who had quit smoking as a goal.*



$\chi^2/df = 2065.969/ 1042=1.98$, $p<001$, CFI=.99, RMSEA =.06

5.2.7. Structural Equation Modeling for 1st and 2nd data collection wave with separation of the depended variables (healthy and risky eating behavior)

The following models (Figure 23, 24, 25, 26) present the interrelations of all the basic factors with healthy eating and risky eating factor.

Structural equation modeling (SEM) was used in order to formulate and test the proposed model. The models that follow concerns only the group who set as their health goal "healthy eating behavior"

Description of the results with the Healthy eating as the depended variable-Phase I (Figure 23)

Based on the structural relations between the factors for the group who had healthy eating as their goal, the results show the following:

The family environment that involves family functioning characteristics such as cohesion, control and independence has a direct relation with healthy eating behavior, but has a stronger indirect relation to healthy eating behavior through self-regulation cognitions and peer influence. These results confirm again the hypothesis that family environment will influence more indirectly the two eating behaviors than directly (hypothesis 2).

Self-regulation that includes cognitions about commitment and persistence toward the goal, self-efficacy and self-determination appears to have a strong relation with healthy eating behavior.

Peer influence that involves peer's approval of eating patterns, adaptation to peer's eating patterns, and peer's attitudes toward eating behavior, appears to have a negative relation with self-regulation cognitions. This result confirms the hypothesis that peer influence will have a negative impact on self-regulation (hypothesis 3). Thus, the more the adolescents are influenced by their peers on eating behaviors the less self-regulation cognitions they will generate for controlling eating. On the other hand, peer influence appears to be strongly related with healthy eating behavior.

Furthermore, healthy eating appears to have a positive relation with BMI.

Description of the results with the Risky eating as the depended variable-Phase I (Figure 24)

Based on the structural relations between the factors for the group who had healthy eating as their goal, the results show the following:

The family environment that involves family functioning characteristics such as cohesion, control and independence has a negative and low direct relation with the risky eating behavior, but has stronger indirect relation to eating behavior through self-regulation cognitions and peer influence. These results also confirm the hypothesis that family environment will influence more indirectly the two eating behaviors than directly (hypothesis 2).

Self-regulation that includes cognitions about commitment and persistence toward the goal, self-efficacy and self-determination appears to have a low relation with risky eating behavior.

Peer influence that involves peer's approval of eating patterns, adaptation to peer's eating patterns, and peer's attitudes toward eating behavior, appears to have a strong negative relation with self-regulation cognitions. This result confirms the hypothesis that peer influence will have a negative impact on self-regulation (hypothesis 3). Thus, the more the adolescents are influenced by their peers on eating behaviors the less self-regulation cognitions they will generate for controlling eating. Furthermore, peer influence appears to be very strongly related to risky eating behavior. More specifically, and as it was expected peer influence has stronger relation with risky eating than healthy eating behavior. These results are in line with the hypothesis of the present research (hypothesis 4).

Risky eating which involves the consumption of sweets and red meat has a positive but low relation with Body Mass Index.

Description of the results with the Healthy eating as the depended variable-Phase II (Figure 25)

Based on the structural relations between the factors for the group who had healthy eating as their goal, the results show the following:

The family environment has strong indirect relation with healthy eating behavior through self-regulation cognitions and peer influence. Also, family environment appears to have a very strong positive relation with self-regulation skills. Thus, the more the individuals are influenced by their family the more they exercise self-regulation skills towards healthy eating behavior. Based on these results hypotheses 12, 16 and 20 were confirmed.

Self-regulation cognitions factor appears to be strongly and positively related with healthy eating behaviors (time –1). Additionally, self-regulation cognitions factor is positively related to self-regulation skills factor. Thus, thinking is a prerequisite of action but when action is established cognition is no longer need as much as before. Additionally, it appears that the self-regulation skills factor is the strongest predictor of healthy eating behavior (time –2) through goal approximation. Hence, our hypotheses that healthy eating accomplishment is related to self-regulation skills are supported (10, 14, 15 and 21). Specifically, self-regulation skills have a very strong relation with goal approximation, which in turn is strongly related to healthy eating behavior (time – 2).

Peer influence appears to be negatively related to self-regulation cognitions factor. Also, peer influence appears to have no relation with self-regulation skills factor. Furthermore, peer influence has a weak negative relation with healthy eating behavior.

Healthy eating behavior factor (time –1) appears to have a positive but not strong relation with BMI (time –1). On the other hand, healthy eating behavior (time – 2) has a negative relation with BMI (time –2). Additionally, healthy eating (time – 1) is strongly and positively related to healthy eating (time – 2). Also, healthy eating behavior (time – 2) has weak and negative relation with somatic symptoms.

Finally, there is a strong relation between BMI (time – 1) and BMI (time –2).

Description of the results with the Risky eating as the depended variable-Phase II (Figure 26)

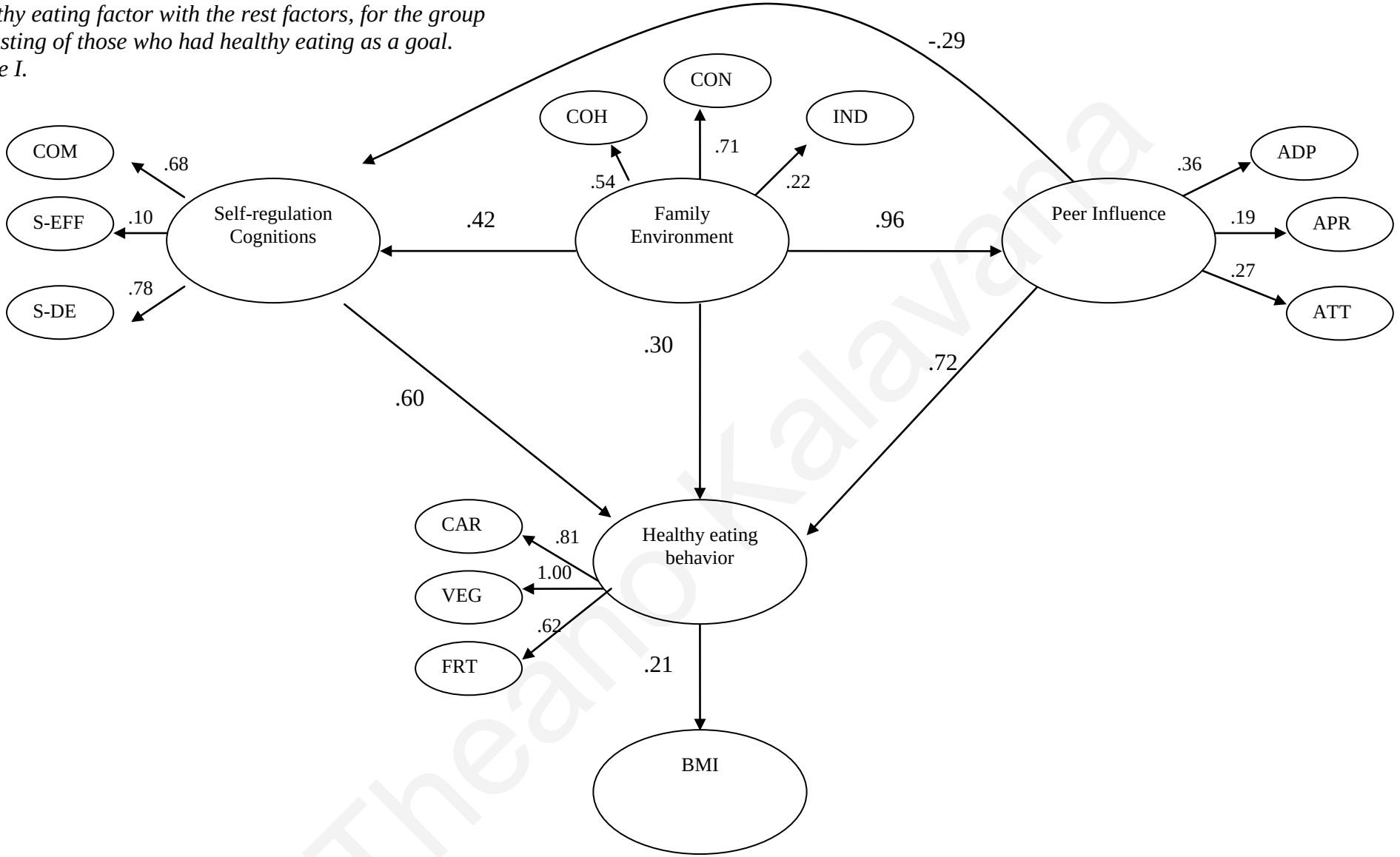
Based on the structural relations between the factors for the group who had healthy eating as their goal, the results show the following:

Family environment appears to have a strong positive relation with self-regulation skills and also positive relation with self-regulation cognitions. Thus, the more the individuals are influenced by their family the more they exercise self-regulation skills towards healthy eating behavior. Self-regulation cognitions factor appears to have very weak relation with risky eating (time –1). Additionally, self-regulation cognitions factor is positively related to self-regulation skills factor. Furthermore, self-regulation skills have a positive relation with goal approximation, which in turn has a weak relation to risky eating behavior (time – 2).

On the other hand, peer influence appears to have negative relation to self-regulation cognitions factor and a very weak relation with the self-regulation skills factor. Furthermore, peer influence appears to have a direct relation with risky eating behaviors for both times. More specifically, and as it was expected, peer influence factor is positively and strongly related with risky eating behavior (time –1) and risky eating behavior (time –2). Therefore, our hypotheses that peers will influence the eating behavior of adolescents are supported by the results (hypotheses17 and 19).

Risky eating behavior factors (time –1, and time -2) is positively related to BMI (time –1) and BMI (time – 2).Thus, our hypothesis that risky eating will have a positive relation with BMI is confirmed (hypothesis 5). In addition to this, it was found that risky eating (time –2) is positively related to somatic symptoms factor, and hence hypothesis that risky eating will have an impact on somatic problems was supported (hypothesis 9). Thus, adolescents who consume unhealthy food present more body aches. Finally, risky eating behavior factor (time –1) is strongly related to risky eating behavior factor (time –2).

Figure 23.The model describing the interrelation of Healthy eating factor with the rest factors, for the group consisting of those who had healthy eating as a goal. Phase I.

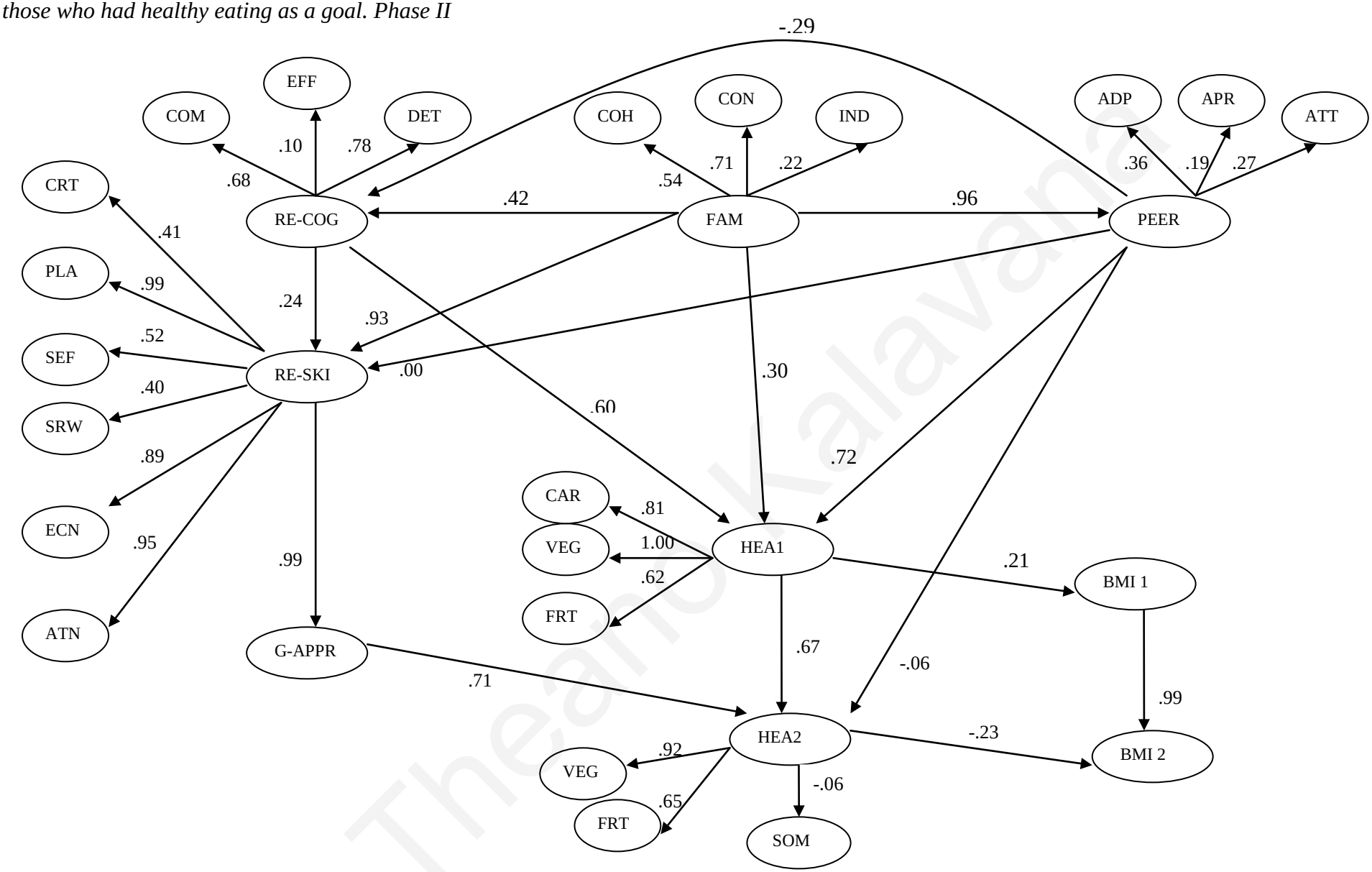


χ^2 = 462.164/257 =1.80; p<001, CFI=.91, RMSEA = .04, RMR =.07

Figure 24.The model describing the interrelation of Risky eating factor with the rest factors, for the group consisting of those who had healthy eating as a goal. Phase I

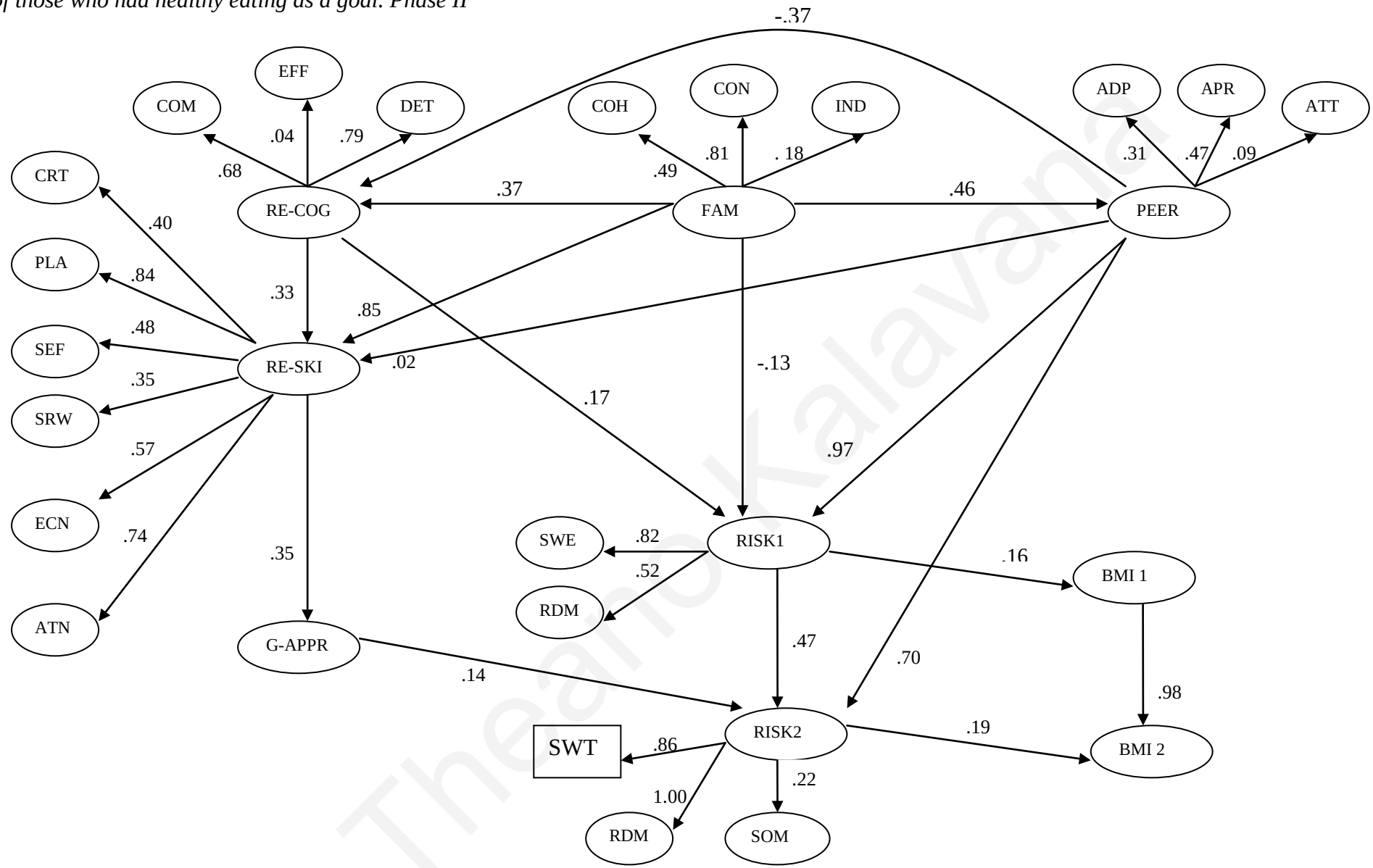
χ^2 = 363.890 /211 =1.72; p<001, CFI=.94, RMSEA = .04, RMR =.08

Figure 25. The model describing the interrelation of Healthy eating factor with the rest factors, for the group consisting of those who had healthy eating as a goal. Phase II



χ^2 = 375.184/206 =1.73; p<001, CFI=.90, RMSEA = .04, RMR =.06

Figure 26. The model describing the interrelation of Risky eating factor with the rest factors, for the group consisting of those who had healthy eating as a goal. Phase II



χ^2 = 350.869/195 =1.79; p<001, CFI=.92, RMSEA = .04, RMR =.07

5.2.8. Differences between genders

Differences between gender and self-regulation skills

It seems that there is a significant difference between gender and one of the self-regulation skills. The analysis showed that there is statistically significant difference between male and female adolescents on "self-criticism" skill (X_1=3.38, X_2 = 3.61, (F(1,729)= 5.84, p<.01). That is female adolescents criticize more themselves while trying to accomplish their goal compared to male adolescents (Table 42).

Table 42. Multivariate Analysis of Variance (MANOVA) between gender and self-regulation skills

Source of Variance	DF	Type III Sum Squares	Mean Square	F	P
Self-criticism	1	8.873	8.783	5.84	.01
	729	480.011	.66		
	730	488.884			

Differences between gender and eating behavior

In contrast to the above results, and as expected in the present study there are differences between gender and eating behavior. More specifically, male adolescences are more risky eaters than female adolescences. Thus, in risky eating factor there is statistically significant difference between male and female adolescents (X_1=2.69, X_2 = 2.38, (F(1,729)= 18.40, p<.001) (Table 43). Male adolescents consume more unhealthy food compared to female adolescents.

Differences between gender and BMI

Additionally, there are statistically significant differences between male and female adolescents on BMI (X_1=22.65, X_2 = 21.37, (F(1,729)= 15.25, p<.001) (Table 44). It is noted that the BMI's mean scores cannot be considered as scores for overweight or obese individuals (BMI>25.00). Also, males' BMI due to biological reason is always higher than the females' BMI. On the other hand, we cannot ignore the fact that the consumption of more unhealthy food contributes to the increase of BMI.

Table 43. Multivariate Analysis of Variance (MANOVA) between gender and risky eating

Source of Variance	DF	Type III Sum Squares	Mean square	F	P
Risky eating	1	4.483	4.483	15.75	.00
	729	206.073	.28		
	730	210.556			

Table 44. Multivariate Analysis of Variance (MANOVA) between gender and BMI

Source of Variance	DF	Type III Sum Squares	Mean square	F	P
BMI	1	146.404	146.404	15.25	.00
	729	6947.245	9.596		
	730	7093.649			

Differences between gender and somatic symptoms

Furthermore, there is statistically significant difference between male and female adolescents in "somatic symptoms" factor (X_1=1.64, X_2 = 1.96, (F(1,729)= 17.58, p<.001). Thus, it appears that female adolescents present more somatic symptoms than male adolescents (Table 45).

Table 45. Multivariate Analysis of Variance (MANOVA) between gender and somatic symptoms

Source of Variance	DF	Type III Sum Squares	Mean square	F	P
Somatic symptoms	1	7.138	7.138	17.58	.00
	729	293.856	.40		
	730	300.994			

Differences between Goal status groups

Differences between goal status groups and self-regulation skill factors

There are statistically significant differences on all the self-regulation skills factors and goal status. More specifically, there is statistically significant difference on the "self-criticism" factor between those who are still pursuing the goal, those who have accomplished their goal and those who failed to accomplish and they stopped trying (X_1= 3.60, X_2 = 3.16, X_3 = 2.99 (F(2,728)= 19.90, p<.001). Therefore, those who are still trying to accomplish their goal criticize more themselves compared to those who have accomplished their goal or have stopped trying. Also, it appears that those who have accomplished their goal criticized themselves more compared to those who failed to accomplish their goal.

Furthermore, there is statistically significant difference between the three groups on "planning" (X_1= 3.30, X_2 = 3.08, X_3 = 2.61 (F(2,728)= 17.21, p<.001). Specifically, those who are still trying to accomplish or have accomplished their goal generated more planning skills than those who failed to accomplish their goal and they gave up trying.

Also, it appears that there is a statistically significant difference on "goal efficacy" factor between those who continue working on their goal, those who succeed and those who quit their goal (X_1= 3.98, X_2 = 3.97, X_3 = 3.47 (F(2,728)= 14.89, p<.001). Thus, those who continue working on their goal have higher self-efficacy compared to those who have either accomplished the goal or gave up. Also, it appears that those who have accomplished the goal had higher self-efficacy than both the other two groups.

Additionally, there is statistically significant difference between the three groups on "self-reward" factor (X_1= 3.21, X_2 = 3.10, X_3 = 2.39 (F(2,728)= 16.66, p<.001). For instance, it appears that those who are still trying to accomplish their goal and those who successfully accomplished their goal reward themselves more compared to those who failed to accomplish their goal and they quit from trying.

Further on self-regulation skills, there is statistically significant difference between the three groups on "emotional control" (X_1= 3.54, X_2 = 3.28, X_3 = 3.07 (F(2,728)= 10.01, p<.001). More specifically, those who are still trying to accomplish their goal and those who successfully accomplished their controlled more their emotions while trying to accomplish the goal compared to those who failed to accomplish their goal and quit from trying. Finally, there is statistically significant difference between the three groups on "attention / stimulus control"(X_1= 3.73, X_2 = 3.43, X_3 = 3.14 (F(2,728)= 15.64, p<.001). Thus, once more it appears that those who are still trying to accomplish their goal and those who had accomplished their goal focus more on their goal and controlled more the conditions towards the accomplishment of their goal compared to those who failed to accomplish and thus they quit from trying thus, our hypotheses (7, 18) is confirmed (Table 46).

Table 46. Multivariate Analysis of Variance (MANOVA) between goal status groups and self-regulation skills

Source of Variance	DF	Type III Sum Squares	Mean Square	F	P
Self-criticism	2	26.390	13.19	19.90	.00
	728	480.011	.66		
	730	506.401			
Planning	2	27.103	13.55	17.21	.00
	728	570.025	.78		
	730	597.128			
Self-efficacy	2	13.780	6.89	14.89	.00
	728	335.006	.46		
	730	348.786			
Self-reward	2	33.400	16.70	16.66	.00
	728	725.613	1.00		
	730	759.013			
Emotional control	2	11.830	5.91	10.01	.00
	728	427.609	.59		
	730	439.439			
Attention / stimulus control	2	21.091	10.54	15.64	.00
	728	487.910	.67		
	730	509.001			

Differences between goal status groups and goal approximation

There is statistically significant difference between the pre-mentioned three goal status groups and goal approximation (X_1= 2.96, X_2 = 3.95, X_3 = 1.94 (F(2,728)= 54.62, p<.001). Those who are still trying to accomplish their goal were more close to pursuing their goal compared to those who failed to accomplish and they quit from trying. Thus, it appears that the group who quit from trying was the one who was far from approaching their goal (Table 47).

Table 47. Multivariate Analysis of Variance (MANOVA) between goal status group and goal approximation

Source of Variance	DF	Type III Sum Squares	Mean square	F	P
Goal Approximation	2	109.367	54.684	54.62	.00
	728	724.795	1.001		
	730	834.162			

Differences between goal status groups and BMI

Further, it seems from the analysis that there are also differences between the three goal status groups and BMI (X_1= 21.86, X_2 = 20.94, X_3 = 22.59 (F(2,728)= 5.85, p<.01). More specifically it appears from the analysis that those who had accomplished their goal of healthy eating had the lower BMI compared to those who are still trying to accomplish their goal and those who failed to accomplish and quit from trying. Also, the analysis showed that those who are still pursuing their goal had lower BMI than those who quit from trying (Table 48).

Table 48. Multivariate Analysis of Variance (MANOVA) between goal status group and BMI

Source of Variance	DF	Type III Sum Squares	Mean square	F	P
BMI	2	112.318	56.159	5.85	.01
	728	6947.245	9.596		
	730	7059.563			

Differences between goal status groups and individual strength

Further, it seems from the analysis that there are also differences between the three goal status groups and "fatigue-individual strength" factor (X_1= 3.10, X_2 = 2.94, X_3 = 3.63 (F(2,728)= 5.48, p<.01). Specifically, the analysis showed that adolescents, who had accomplished their goal felt less tired, were more motivated and energetic compared to those who are still trying to accomplish their goal and compared to those who failed to accomplish their goal and they quit from trying. Also, those who are still working on pursuing their goal feel less tired, are more motivated and energetic compared to those who failed to accomplish their goal and quit from trying (Table 49).

Table 49. Multivariate Analysis of Variance (MANOVA) between goal status group and individual strength

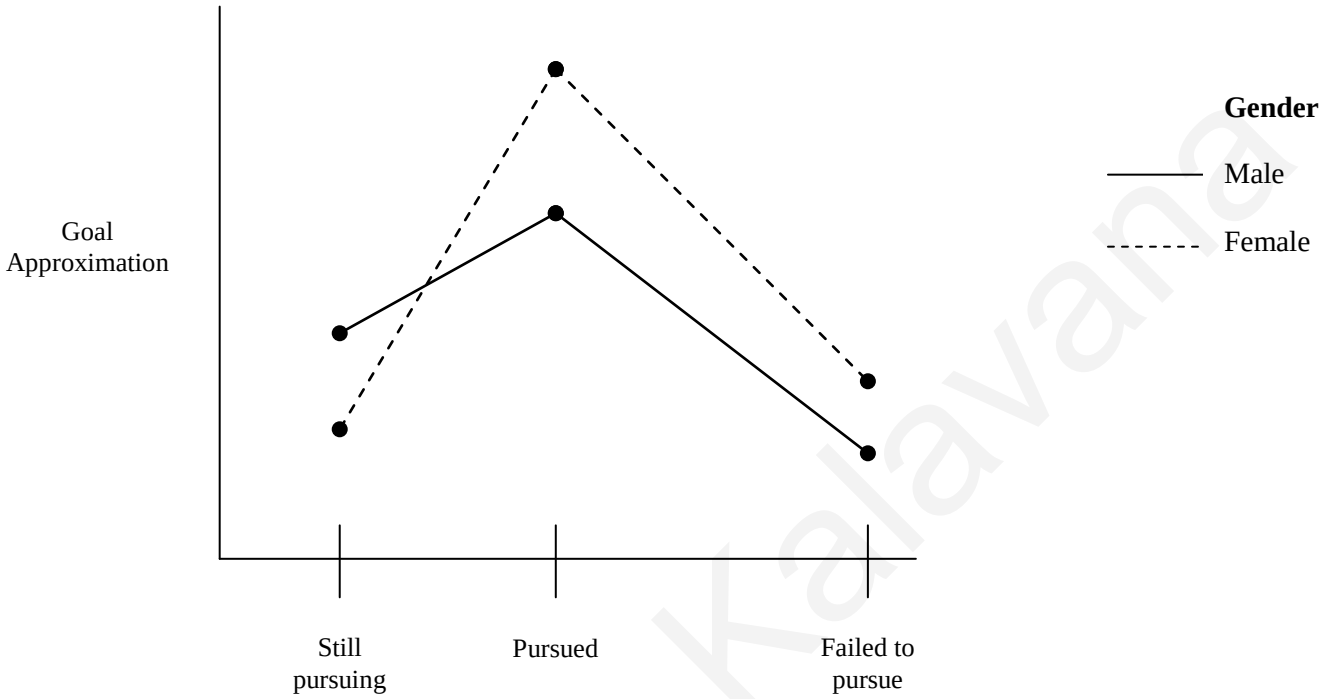
Source of Variance	DF	Type III Sum Squares	Mean square	F	P
Individual strength	2	13.480	6.740	5.48	.01
	728	890.493	1.230		
	730	903.973			

Interactions between gender and goal status on goal approximation

Interaction between gender and goal status on goal approximation

The *post-hoc* analysis showed statistically significant interactions between gender, goal status on goal approximation (F (2,728) = 4.53, p<.01). More specifically, male adolescents who reported that they are still pursuing their goal made more progress and were closer in approaching their goal compared to female adolescents who reported the same status. In contrast, female adolescents who reported that they had accomplished their goal made more progress and were closer on approaching their goal compared to male adolescents who reported that they had accomplished their goal. Finally, female adolescents who reported that they had failed to accomplish their goal and they quitted from trying made more progress in approaching their goal compared to male adolescents who reported that they failed to accomplish their goal (Graph 5).

Graph 5. *Interactions between gender and goal status on goal approximation*

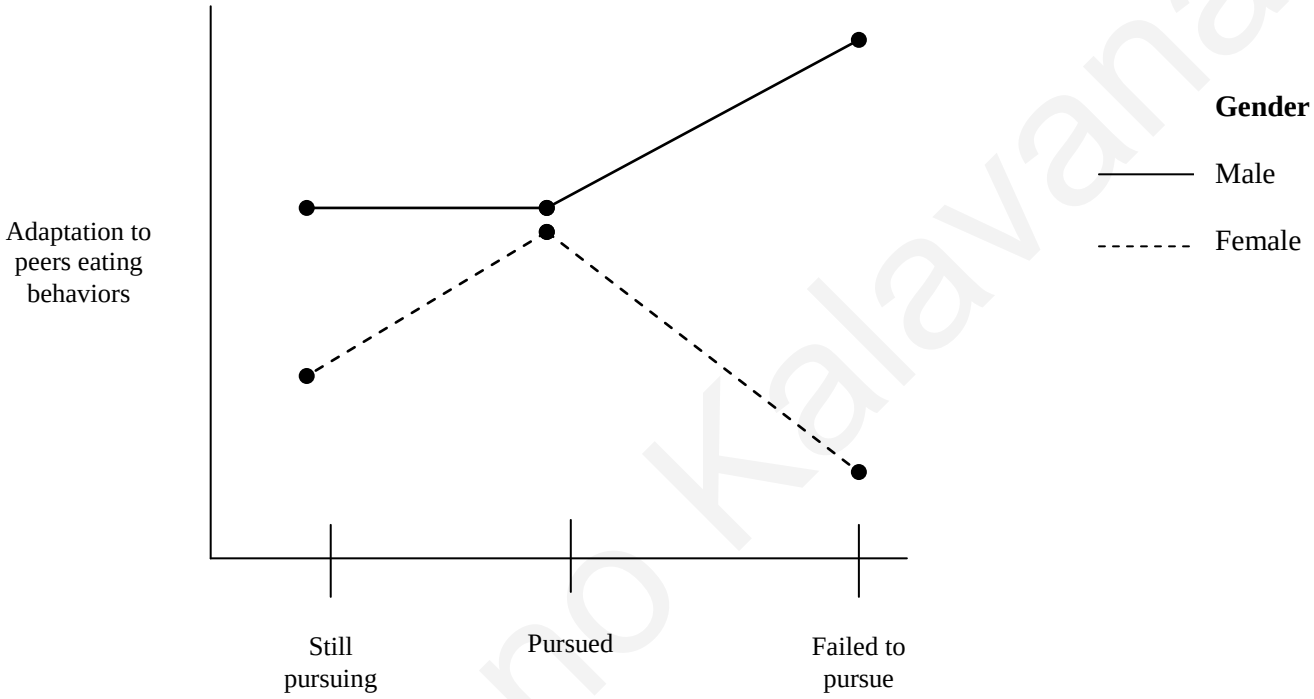


Interaction between gender and goal status on adaptation to peers eating behaviors

The analysis showed statistically significant interactions between gender, goal status on adaptation to peers eating behaviors ($F(2,728) = 5.44$, $p<.01$). Specifically, male adolescents who reported that they are still pursuing their goal adapt more to their peers eating behaviors compared to female adolescents who reported the same status. Also, male adolescents who reported that they quit from trying and failed to accomplish their goal adapt more to their peers eating behaviors compared to female adolescents who reported the same goal status. Further on this, male adolescents who failed on pursuing their goal adapt more to their peers eating behaviors compared to male adolescents who pursued successfully their goal and those who continue to pursue their goal. Thus, one conclusion from this outcome is the fact that male adolescents who failed to accomplish their goal are more influenced from their peers on their eating behavior than those who have successfully accomplished their goal

(see Graph 6). Therefore, our hypothesis (8) that female adolescents will be more influenced by peers compared to male adolescents is rejected.

Graph 6. *Interactions between gender and goal status on adaptation to peers eating behavior*

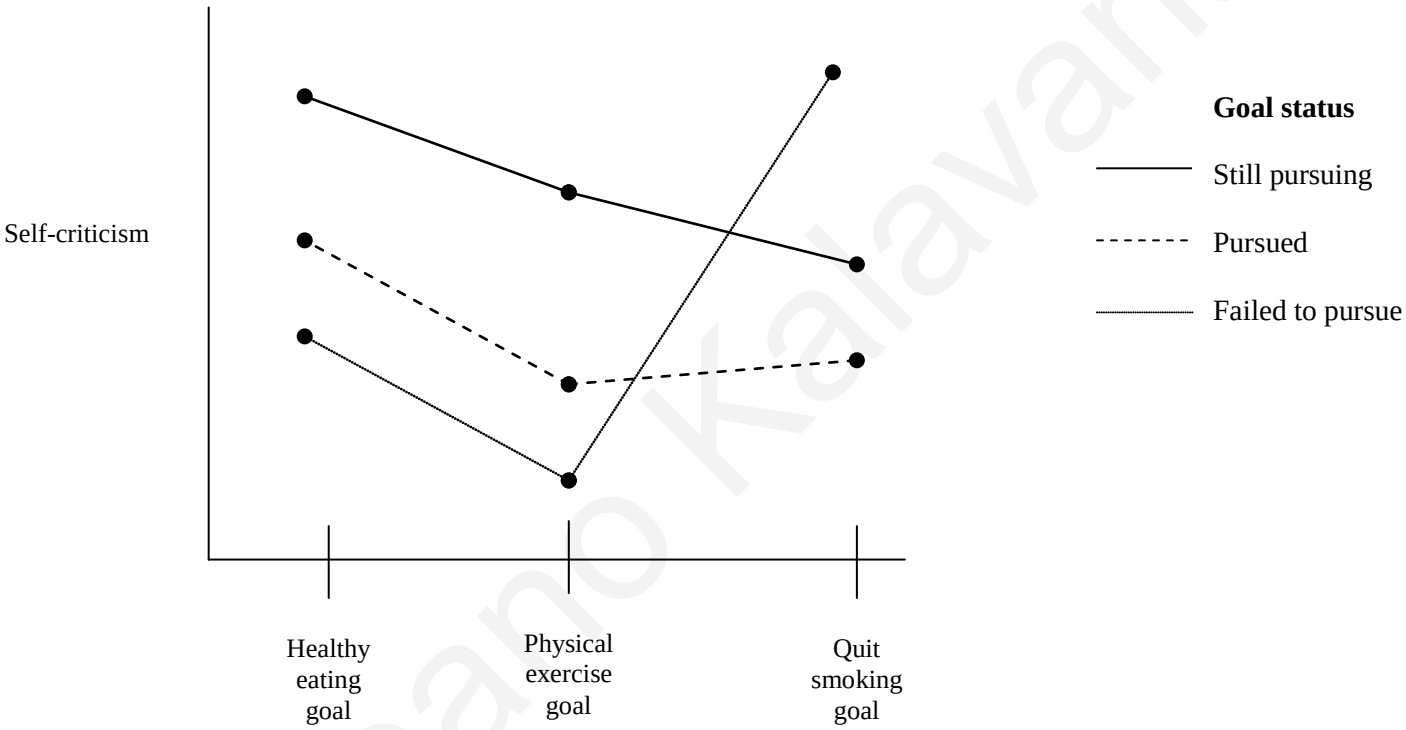


Interaction between health goals, goal status on self-criticism factor

Post-hoc analysis showed statistically significant interactions between health goals, goal status on self-criticism skill factor ($F(4,726) = 3.06$, $p<.01$). More specifically, adolescents who reported having healthy eating as their goal and they are still pursuing their goal, criticize themselves more compared to those who reported the same goal but have accomplished their goal or have stopped pursuing it. Furthermore, adolescents who reported physical exercise as their health goal and they also reported that they are still pursuing their goal criticize themselves more compared to adolescents who set the same health goal and they have accomplished it or have stopped trying. In contrast, those adolescents who set quitting smoking as their health goal and reported that they failed to accomplish it criticize themselves more than

those who set the same goal and they pursuit it successfully or are still trying to accomplish it (see Graph 7).

Graph 7. *Interactions between health goals and goal status on self-criticism factor*



6. DISCUSSION

6.1. The general framework of the discussion

The aim of the study was to answer the following questions:

1. Which factors influence the eating behavior of adolescents?
2. Is self-regulation the most important determinant in healthy eating goal accomplishment?

For many years, the research in the area of healthy eating behavior was based more on social-cognition models. Thus, in the literature appears often the fact that the persons attitudes, subjective norms and perceived behavioral control were the main determinants of intention towards healthy eating (Paisley, Lloyd, Sparks & Mela, 1995; Paisley & Sparks, 1998; Raats, Shepherd & Sparks, 1995; Sparks & Shepherd, 1992;Towler & Shepherd, 1991/2; Sparks, Hedderley & Shepherd, 1992; Ajzen & Timko, 1986; Povey, Conner, Sparks, James & Shepherd, 2000). Also, it appears that the methodological approach used in these studies did not allow the extraction of conclusions beyond correlations. Additionally, many researchers (e.g. Purdie & McCrindle, 2002; Luszczynska et al. 2004; Karwautz, Volkl-Kernstock, Nobis, Kalchmayr, Hafferl-Gattermayer, Wober-Bingol & Friedrich, 2001) refer to the term "self-regulation" without clarifying what self-regulation actually involves. Under the umbrella of self-regulation they place attitudes, intention, other variables from social – cognition models, and scales from Narcissism Inventories in order to identify determinants that predict dietary behavior. It's like applying stage theories without referring to any stages!

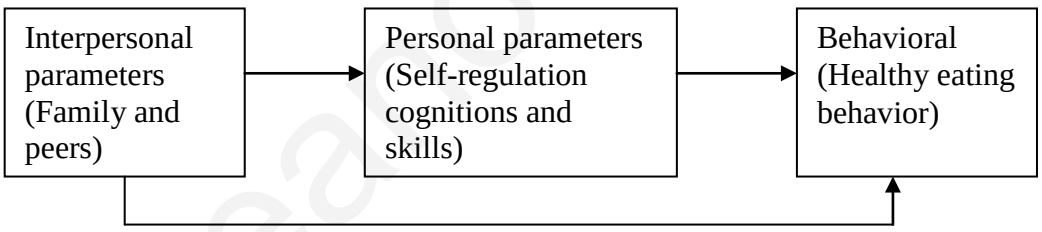
Thus, the present study tried to overcome the theoretical and methodological misconceptions of earlier research. The present study uses clear terms, definitions and theoretical frameworks for self-regulation, family environment and peer influence. For example, self-regulation is measured by means of a valid self-regulation skills battery (Karoly, Ruhlman, Maes, De Gucht & Heiser, 2006) and involves 13 self-regulation skills. Further, family environment is based on a clear theoretical background and involves the relationships developed in the family, and not family practices around meals. Family environment is also measured using a valid scale namely Family Environment Scale (Moos & Moos, 1981, 1986, 2002).

The present study tried to examine a combination of factors (personal and social) on the accomplishment of healthy eating behavior. The aim of the study is to develop a theoretical model that will describe the relations of self-regulation skills, family environment and peer influence on the accomplishment of healthy eating behavior.

The following discussion focuses first on the results of the theoretical model in comparison with the study's hypotheses. In this framework, the factors contributing to healthy and risky eating are examined. Secondly, the results that emerged from the differences between the subgroups on the factors are discussed. Finally, the interactions between the variables of gender and goals on the main factors are also discussed. Within this discussion the results of similar studies are also compared and contrasted.

The present study aimed to confirm the relation between adolescent's personal and interpersonal factors that shape the healthy eating behavior.

Figure 27. The general theoretical framework that was examined in this study



6.2. Discussion of the findings of Phase I

Through a structural equation model the hypothesis that healthy eating behavior is formed through personal and interpersonal parameters is confirmed. It was also confirmed that, as expected, peer influence had a direct effect on eating behavior.

Although, this theoretical framework appeared among the three groups, there are important differences on the effect of the above determinants on healthy and risky eating behavior among the three groups. More specifically, in the model in which adolescents had healthy eating as their goal, self-regulation cognitions toward this goal appeared to have an effect on healthy and risky eating. Further, family

environment appears to have an effect on self-regulation cognitions and on peer influence. Also, peer influence appeared to have a great effect on risky eating for those adolescents who set healthy eating as their goal.

The model with the adolescents' group who set physical exercise as their goal displayed that self-regulation towards physical exercise had a great effect on both eating behaviors, and especially on risky eating. Thus, the more self-regulation cognitions adolescents present the more they will engage in risky eating. One explanation for this, may be the fact that the physical exercise goal has little to do with eating behavior whereas diet and healthy eating has a lot to do with physical exercise. Another, important finding is the fact that peer influence has a great effect on self-regulation cognitions toward physical exercise. One explanation is that peers are important as socializing agents in the physical exercise decision-making process of teens. As in the model describing the adolescents who set healthy eating as their goal, in this model family environment appeared to have great effect on both self-regulation and peer influence.

The model of the adolescents' group who set quitting smoking as their health goal showed that self-regulation towards quitting smoking had a negative effect on both eating behaviors, and especially on risky eating. Thus, the more self-regulation cognitions adolescents present towards quitting smoking goal the less healthy and risky eating they practice. One explanation for this effect may be the fact that the "quit smoking" goal interferes with the eating behavior. Another important effect is the effect of the family environment on peer influence. Therefore, the family environment of those adolescents who set quitting smoking as their health goal, has a negative effect on peer influence. That is, the more cohesion, control and independence experienced in the family environment, the less the influence experienced from the peers. Furthermore, peers appeared to influence eating behaviors through self-regulation. Thus, peers have a great effect on self-regulation cognitions toward quitting smoking. One explanation for this is that peers are important in socializing agents in the quitting smoking decision-making process of teens. Although, studies so far have not examined the combination of self-regulation, family environment and peer influence, the theoretical model of the present study is

supported from studies that examined these factors independently. The literature supports the importance of self-regulation in healthy eating behavior. For instance, goal setting in terms of eating and weight goals has been significantly correlated with loosing weight. Self-efficacy was found to be positively associated with changes in fruit and vegetable intake (Havas, Treiman, Langenberg, Ballesteros, Anliker, Damron, & Feldman, 1998). Furthermore, a study on the regulation of body weight showed that goal directed behaviors such as self-efficacy, outcome expectancy and the emotional consequences of engaging in goal pursuit were sufficient determinants for the performance of dieting activities (Bagozzi & Edwards, 2000).

Clearly, the literature supports the role of family functioning and relationship on eating behavior (Kremers, Pruga, Hein de Vriesa, & Rutger, 2003; Schmitz, Lytle, Phullips, Murray, Birnbaum, & Kubik, 2002). One way that family functioning may be linked to eating behavior is through its role in promoting the development of self-control and coping. In other words, family funtioning contributes to the development of children self-regulation (Dinsmore & Stormshak, 2003).

Furthermore, peer influence contribute to adolescents eating behavior through mechanisms of reinforcement, modeling and social comparison. Several researchers have demonstrated that weight-related attitudes and behaviors among friendship groups may predict body image, dieting onset, chronic dieting, eating disorder symptoms, and general eating behaviors (Huon, Lim, & Gunewardene, 2000; Huon & Walton, 2000). All these are in line with the findings of the present study.

Gender differences and eating behavior

The results of the study imply that female adolescents consume fewer sweets and red meat compared to males. This finding was also reported in the Backman, Haddad, Lee, Johnston and Hodgkin (2002) research study, in which female adolescents consumed significantly fewer calories compared to males, and also reported more positive attitudes toward healthful eating. Furthermore, a study conducted by Dennison and Shepherd (1995), revealed similar results such that female adolescents had more negative beliefs and attitudes concerning the consumption of chocolates and sweets. Thus, within intervention programs for promoting dietary practices among

adolescents, it is important to consider that females may be more receptive to healthful eating messages and interventions. Therefore, it is important to develop interventions that focus on the gender-specific communication strategies.

Further on these results, female adolescents consume less carbohydrates, vegetable, fish and fruits compare to the male adolescents of this study. One possible explanation comes from human biology postulating that the male body needs more calories to function than female's body. This is further supported on the BMI factor, which was expected to be higher for males than females.

Gender differences and peer influence

The results imply that male adolescents take more into account their peer approval on eating behavior, and also they adapt more to peer's eating practices. These results are in agreement with those reported by Monge-Rojas, Nunez, Garita and Cehn-Mok, (2002) a study in which the impact of peers on eating behaviors was associated with the intake of foods rich in saturated fats. Therefore, peers can promote indirect pressure for adoption of unhealthy eating behaviors due to the need to be accepted by the peer group. Also, these findings are in contrast to most of the research in the area of eating behavior. Specifically, evidence shows that female adolescents' eating behavior is influenced more by friends than male adolescents. For instance it was found that female adolescents who have body image concerns, dietary restraint, extreme weight loss behaviors and binge eating, compare their bodies more often with their peers; receive more teasing from friends about weight and shape and perceives their friends as being more important in influencing their decisions to diet and (Paxton, Schutz, Wertheim, & Muir, 1999).

Gender differences and family environment

Results showed that male adolescents experience more independence in their family environment compared to female adolescents. One possible explanation is based on the Cypriots sociocultural background in which males have more freedom within the family setting compared to females. This lack of independence for female adolescents can contribute to the development of disordered eating behavior. For instance, evidence on female adolescents and disordered eating behavior showed that anorexic

females come from families in which they experience less encouragement of expression and autonomy (Humphrey, 1989).

Interactions between gender, health goal on self-regulation cognitions

The results showed that male adolescents who set healthy eating and physical exercise as their goal had higher commitment and self-efficacy towards their goals compared to female adolescents who set the same goals. Whereas female adolescents who set quitting smoking as their goal had higher self-determination compared to male adolescents who set quitting smoking as their goal.

Comparisons between healthy eaters and non-healthy eaters on self-regulation

The results indicate that healthy eaters present more commitment and self-determination cognitions towards their goal than non-healthy eaters. This is further supported by the literature. Specifically, studies on individuals who have successfully maintained weight loss have shown that these individuals self-monitor their diet (usually measured as written record keeping to measure progress toward certain goal), use more strategies to control dietary fat intake, have greater self-efficacy and have more social support compared to those who regained weight (McGuire, Wing, Klem, & Hill, 1999; Wing & Hill, 2001).

Comparisons between healthy eaters and non-healthy eaters on peer influence

The results imply that healthy eaters take more into account their peer's approval and attitudes towards eating compared to non-healthy eaters. This can be at some point supported with the fact that adolescents consume healthy food in order to be thin and thus be more accepted by their peer groups. To further support this statement, in a study in which female adolescents perceived themselves as overweight reported relatively but significantly higher perceived peer isolation than girls who perceived their bodies as underweight or normal (Xie, Liu, Chou, Xia, Spruijt-Metz, Gong, Li, Wang, & Johnson, 2003). Additionally, Lieberman, Gauvin, Bukowski and White (2001) report that girls who had higher levels of dieting had also the following characteristics: they were more popular, they had positive opposite-sex relational

esteem and finally they had higher attributions about the importance of weight and appearance for popularity and dating.

Comparisons between healthy eaters and non-healthy eaters on family influence

The results indicate that healthy eaters experienced more cohesion and control in their families than non healthy eaters. These findings are also supported by the literature. For instance, a study by Young and Fors (2001) indicated that students consuming healthy breakfast, healthy lunches, and more fruits and vegetables had better communication with parents on serious issues, they were closely monitored by their parents, live with one or both parents, and spend less time in the house without other adults. Other studies showed that positive relationships with parents appear to protect young adolescents from the development of eating problems (Swarr & Richards, 1996).

6.3. Discussion of the findings Phase II

The structural equation model confirms the existence of the proposed theoretical model. That is, self-regulation skills is the most important parameter of healthy eating goal accomplishment. Self-regulation skills had a strong effect on goal approximation that in turn had a strong effect on healthy eating. These results are in line with the exiting literature on self-regulation and eating related behaviors. For instance, Senekal, Albertse, Momberg, Groenewald and Visser (1999) in their research study presented the self-regulation skills are associated with weight management. Among these skills for successful weight management are: self-efficacy, emotional control, problem solving and decision-making skills.

The confirmation of the theoretical model proposed suggests that our initial argument stated from the beginning of this study is correct. Specifically, we argued that adolescents' resistance to social pressures is dependent upon key traits and skills such as a strong sense of autonomy and other self-regulatory skills which middle-adolescents do begin to develop in this stage of their life.

However, our results also demonstrated that friends' eating patterns, attitudes and approvals towards eating do play a direct role on the eating behavior of adolescents and especially on risky eating. Thus, it seems that one of the most important factors able to eliminate peer influence on risky eating behavior would be interventions focusing on teaching self-regulation strategies.

Also, a study by Berry, Danish, Rinke, and Smiciklas-Wright, (1989) on nutrition related goals, indicated that individuals who used enhanced attention skills towards their goal setting showed more success compared to those who did not use attention / stimulus control skills. Additionally, in a study examining adolescents trying to lose weight, McCabe and Ricciardelli (2003) argued that emotional control and control of negative affect contribute to participants' effort to accomplish their goal.

Also, the present study confirms the hypothesis that peer influence contributes to the development of risky eating. This resulted from both structural equation analysis and multivariate analysis of variance. Specifically, in the multivariate analysis, it was found that adolescents and especially boys who failed to pursue their goal were more influenced from their peers and thus adapt more to their peers eating behaviors. In

contrast, adolescents who had successfully accomplished their goals were less influenced by their peers. Furthermore, the findings of the present study showed that peer influence has also a negative effect on self-regulation cognitions and a very low effect on self-regulation skills. That means that peers do not facilitate self-regulation towards pursuing healthy eating goal.

Although, there is no previous research on peer influence and self-regulation towards eating behavior, the literature supports our findings for the direct effect of peer influence on eating behavior and hence risky eating behavior. More specifically, Monge-Rojas, Nunez, Garita, and Cehn-Mok, (2002) supported the impact of peers on behaviors associated with the intake of foods rich in saturated fats. In line with this, evidence, Huon, Hayne, Gunewardene, Strong, Lunn, Piira, and Lim, (1999) examined dieting status and several factors such as social influence, vulnerability disposition, protective skills, and familial contexts in adolescents. They found that the strongest predictor of dieting status was peer influence. Peers competitiveness was the most important predictor of dieting status. Another substantial effect was peer modeling. Further, influences from peers maintain a strong predictive capacity even when all the variables were taken into account.

Regarding family influence and adolescents eating behavior, the analysis showed that family environment does not influence eating behavior directly but through self-regulation cognitions and cognitions. Thus, family environment appears to have a strong positive effect on the development of self-regulation cognitions and self-regulation skills. Deci and Ryan (1985) in their theory of Cognitive Evaluation Theory (CET) argued that social-context events facilitate intrinsic motivation only when the individual has the opportunity to experience feelings of autonomy and self-determination. Thus, in the present study adolescents appeared to perceive their families as facilitators toward their goal accomplishment.

The present findings on family influence are in line with some research studies and are in contrast with some others. For instance, Dinsmore and Stormshak (2003) indicated that family functioning was correlated with adolescent's eating attitudes and behaviors. More specifically, deficits in self-control and coping may contribute to the

development of maladaptive eating patterns. Therefore, family functioning may be linked to eating problems through its role in promoting problematic development of self-control and coping. Furthermore, a study on families with anorexic adolescents showed that apart from familial emphasis on achievement, success, appearance and weight, less encouragement of self-expression and autonomy were associated with anorexia problems (Lacey & Moureli, 1986).

On the other hand, our results are not in line with the results of several other studies such as the study by Young and Fors (2001), which indicated that students consuming healthy breakfast, healthy lunches, and more fruits and vegetables were closely monitored by their parents. The present study did not show a strong direct effect of family environment and eating behavior. As it was mentioned above, family environment had a strong indirect effect on eating behavior, through self-regulation cognitions and peer influence. Moreover, the present results are not in contrast with studies, which argue that the best predictor of children's ability to regulate energy intake was parental control (Johnson & Birch, 1994).

However, the present results could have been supported by studies on parenting styles and eating behavior if the existing studies were examining parenting styles on adolescents' self-regulation towards eating behavior. Even though, Kremers, Pruga, Hein de Vriesa, and Rutger (2003) reported that fruit consumption and fruit-specific cognitions were most favorable among adolescents who were being raised under an authoritative parenting style, the results of our research displays that family environment has an impact on eating behavior through self-regulation cognitions. The argument here is that family environment does not have a direct effect on eating behavior whereas family practices (food production in the household, etc) do.

Furthermore, the results showed that family environment has an impact on eating behavior through peer influence. This is also supported by Huon, Hayne, Gunewardene, Strong, Lunn, Piira and Lim (1999). They reported that positive family context that nurture self-other differentiation and respect boundaries lead directly to less responsiveness to social influence, and thus less risky eating. Also, positive

family contexts that nurture the necessary protective skills and enhance the ability to deal constructively with the social influences can lead to healthy eating behavior.

The present study has found no association between BMI and reported eating behavior. This finding is not in line with earlier studies that showed strong association between BMI and eating behavior. For instance, a study on healthy practices among European students (Wardle, Steptoe, Bellisle, Davou, Reschke, Lappalainen, & Fredrikson, 1997) showed that BMI was strongly associated with eating practices for fat and red meat. On the other hand, a study on children aged 12 and 13 years old, also indicated lack of association between BMI and reported energy / fat intake (Sur, Kolotourou, Dimitriou, Kocaoglu, Keskin, Hayran & Manios, 2005). Our outcome on BMI is due to the very small numbers of the obese or overweight individuals that participated in the present study and hence the relatively low power of analyses based on this small number of overweight. Another possible explanation about these findings may be the fact that BMI could be associated with low levels of physical activity rather than energy intake. Lack of exercising and sedentary behavior are major contributors of obesity (Willett & Leibel, 2002; Weinsier, Hunter, Heini, Goran & Sem, 1998).

In contrast to the above mentioned lack of relationship between BMI and risky eating, the results of the second phase showed that risky eating has a strong relation with somatic problems. This outcome is supported by medical research studies. For instance, a study by Scher, Stewart, Ricci and Lipton (2003) showed that obesity was a risk factor for the development of chronic daily headache and that healthy diet in obese individuals with a high baseline frequency of headache may decrease the probability of progression. In addition to this, studies on risky eating and obesity demonstrated that obesity is closely related to low back pain because of the “chronic” loading of the spinal column. (Webb, Brammah, Lunt, Urwin, Allison, & Symmons, 2003). Furthermore, a study by Rodacki, Fowler, Provensi, Rodacki, and Dezan (2005) indicated that healthy eaters and thus non-obese individuals participating in walking tasks in order to change their stature manage to regain approximately 76% of their initial stature in contrast to the obese group who did not recover from loading. Finally, Chinn and Rona (2001) using data from the National Study of Health and

Growth in the UK, demonstrated a strong association between respiratory problems such as asthma and obesity in children.

It is important to note, that in both phases the choice of the method of statistical analysis, namely multiple group, and the use of three subgroups (those who had healthy eating as their goal, those who had physical exercise as their goal and those who had quit smoking as their goal) was conscious. The reason for this is that it was necessary to establish that the same factors describe the behavior of all the groups (the three groups of adolescents understood and answered the scales with the same way), in order to make further analysis (i.e. MANOVA). The results showed that this is the case. The fact that some of the loadings of the two groups (those who had physical exercise and quit smoking as their goals) were inconsistent can be justified by the fact that the instruments used were not design to test these two behaviors (physical exercise and quit smoking). The useful outcome of this procedure allows us to generalize the results to group of adolescents beyond those reported healthy eating as their goal and thus confirm the existence of these personal and interpersonal parameters influencing adolescents.

Gender differences and self-regulation skills

Our findings showed a significant difference between male and female adolescents on self-criticism skills. Thus, it appears that females criticize themselves more while working on their goal accomplishment compared to male adolescents. To our knowledge, there is no study examining the self-criticism skill on eating goal accomplishment between male and female populations. For example, Blatt's (1974) self-criticism construct has generated an impressive amount of research activity over the past three decades but the great majority of these studies have focused on self-criticism role as a specific personality vulnerability factor in depression disorders (Blatt, 2004; Zuroff, Mongrain & Santor, 2004). There are also a few studies that presented a link between self-criticism and the core cognitive psychopathology of eating disorders but they did not examined differences between males and females (Dunkley, Blankstein, Masheb, & Grilo, 2006; Fairburn, Cooper & Shafran, 2003). However, other studies support gender difference on other skills and cognitions. For instance, studies examining healthful dietary behaviors in adolescents showed that

females had more positive attitudes toward healthful eating (Backman et al., 2002), self-discipline and effort (Baker et al., 2003), self-esteem etc (Muris et al. 2005).

Gender differences and eating behavior

The current results from the second phase analysis showed that there is a significant difference between male and female adolescents in eating behavior. Thus, it is demonstrated that male adolescents engage more in risky eating compared to female adolescents. This outcome is supported by previous studies. For example, a study by Luszczynska, Gibbons, Piko and Tekozel (2004) showed that females reported that they choose a healthy diet more frequently than males. Furthermore, in another study on adolescents' body change strategies and eating problems it was indicated that boys displayed higher levels of attempts to become more muscular, whereas girls showed a stronger tendency to lose weight and a greater preoccupation with food (Muris et al., 2005).

Differences between goal status groups and self-regulation skills factors

The results showed that there are significant differences on self-regulation skills between the three goal status groups (those who are still pursuing, those who successfully pursued and those who failed to pursue and stopped trying). Clearly, it was found that those who are still pursuing and those who successfully accomplished their goal used self-regulations skills more than those who failed to pursue and quitted from trying. These results are further supported by other studies in the area of self-regulation. More specifically, studies on individuals who have successfully maintained weight loss have shown that these individuals used more strategies to control dietary fat intake and have greater self-efficacy compared to those who regained weight (McGuire, Wing, Klem, & Hill, 1999; Wing & Hill, 2001). Similarly, a study examining the differences between successful and unsuccessful weight-loss maintainers demonstrated that coping responses help people deal successfully with dietary lapses and that seeking help from others was an ineffective way of coping with a dietary relapse (Dohm et al., 2001). In addition to this, two other studies showed that dieters who used at least one coping strategy such as using positive thoughts were able to overcome the temptations to overeat precipitated by mealtime situations,

emotional upsets (e.g. anxiety) or eating while alone and therefore cope successfully with dietary relapses (Grilo, Schiffman & Wing, 1989 and 1993).

Further, regarding emotional control skills, it was found that unsuccessful weight-loss maintainers were more likely to eat more, sleep more, or wish whatever was causing the stress would go away; in contrast, successful weight-loss maintainers confronted directly the source of the stress (Kayman, Bruvold, & Stern, 1990). Also, another study found that individuals who presented enhanced attention to their goal setting showed more success compared to those who did not (Berry, Danish, Rinke, & Smiciklas-Wright, 1989).

Moreover, an intervention program involving the following processes: setting specific proximal change goals, monitoring progress, solving problems and self-rewarding successes indicated significant positive effects and improvement on participants' dietary behavior (Killen, Robinson, Telch, Saylor, Maron, Rich, & Bryson, 1989). Further on this, evidence coming from a study on food selection and eating patterns among people with Type 2 Diabetes Mellitus, showed that the dietary social support, time management-planning and self-efficacy, were the mediating variables that influenced dietary behaviors (Savoca & Miller, 2001).

Differences between goal status groups and BMI

Our findings suggest that those who had accomplished their goal or still pursuing it had lower BMI compared to those who failed to pursue and they stopped trying. Even though, there are studies that show that BMI is a strong predictor of individuals attempts to lose weight (Holt & Ricciardelli, 2002; Neumark-Sztainer, Story, Flakner, Beuhring & Resnick, 1999) there are limited studies so far supporting evidence on BMI and goal failure. For instance, one experimental study by Schachter and Rodin (1974) which indicated that whereas normal weight individuals were responsive to preload size (e.g. eating more after a small preload and less after a large preload) and thus regulating their food intake, obese individuals (higher BMI) were relatively unresponsive to preload size and seemingly oblivious to this "internal cue". So based on this research, one possible explanation is that individuals with higher BMI have lower strength for self-regulation and therefore fail to pursue their goals. This is in

line with Baumeister, Bratslavsky, Muraven, and Tice (1998) research on the self-regulatory strength model, which proposes that effective self-regulation demands a certain degree of self-regulatory strength.

In contrast to our results, a study by Stice, Mazotti, Krebs and Martin (1998) indicated that body mass was positively correlated with dietary behaviors and prospectively predicted change in dieting over time.

Differences between goal status groups and individual strength-fatigue

The results of the present study demonstrated that those who have successfully accomplished their goals experienced less subjective feeling of fatigue, had more energy and were more motivated compared to those who failed to pursue their goal and stopped trying. Although there are no studies examining goal status and individual strength, one possible interpretation of these results is based on Herman and Polivy's (2004) argument about the defensive changes experienced by dieters. Specifically, feeling of fatigue makes it more difficult to maintain one's customary activity level and therefore quit more easily from trying to accomplish their goal.

Interactions between gender, goal status on adaptation to peers eating behaviors

The current results indicated that male adolescents who failed to pursue their goal adapted more to their peers eating behaviors compared to those male adolescents who successfully accomplished their goal. Overall, the multivariate analysis showed that boys in any goal status appeared to adapt to their peers eating behaviors. There are very few studies that support these findings. For instance, Baker et al. (2003) demonstrated that peer norms predicted directly intentions and behaviors towards eating for boys. On the other hand, there are many studies supporting that peers influence female adolescents' eating behavior (Wertheim, Paxton, Schutz, & Muir, 1997; Balaam & Haslam, 1998; Dohnt & Tiggemann, 2005).

6.4. General Conclusions

The present study indicated that self-regulation cognitions are important parameters of healthy eating behavior. Furthermore, based on the second phase analyses, results demonstrated that the stronger predictor of healthy eating goal accomplishment is the existence of self-regulation skills. Also, interpersonal parameters such as family environment and peer influence do play a significant role in healthy eating behavior. Even though family environment has a mediating role and influences healthy eating behavior indirectly through self-regulation cognitions, self-regulation skills and peer influence. Thus, family environment does contribute to the development of adolescents' self-regulation cognitions and skills. Thus, our results are in line with other research. For instance, family influence facilitates children's self- regulation skills on eating behavior as Golan, Fainaru, and Weizman, (1998) argue.

Furthermore, peer influence appears to have a strong negative impact on self-regulation cognitions and almost no effect on self-regulation skills towards healthy eating. Thus, our results are in contrast with those researchers arguing that adolescents have limited abilities in the areas of psychosocial functioning, such as self-reliance, which in turn is likely to interfere with the ability to act independently from the influence of others (Cauffman & Steinberg, 2000; Steinberg & Cauffman, 1996). The confirmation of the theoretical model proposed suggests that our initial argument stated from the beginning of this study is correct. Specifically, we argued that adolescents' resistance to social pressures is dependent upon key traits and skills such as a strong sense of autonomy and other self-regulatory skills which middle-adolescents do begin to develop in this stage of their life.

However, our results also demonstrated that friends' eating patterns, attitudes and approvals towards eating do play a direct role on the eating behavior of adolescents and especially on risky eating. Thus, it seems that one of the most important factors able to eliminate peer influence on risky eating behavior would be interventions focusing on teaching self-regulation strategies.

Another important outcome of this study is the strong relation of risky eating and somatic problems in adolescents. More specifically, risky eating is the stronger predictor of the following body symptoms: soreness of the muscles, troubles with breathing, hot or cold spells and numbness or tingling in part of the body. In line with

our findings, other studies other studies have found a strong relation between obesity and chronic low back pain, serious chronic respiratory problems, headaches (Webb et al., 2003; Rodacki et al., 2005; Chinn & Rona, 2001; Scher et al., 2003). Further, obesity has been highly interrelated with cardiovascular disease (CVD), and even though CVD is more "silent" during childhood, as its signs are not that obvious in youth, the Bogalusa Heart Study (Tracy, Newman, Wattingney & Brenson, 1995) has shown that atherosclerotic lesions in the aorta and coronary arteries develop early in life, indicating that CVD originates in childhood. Children comprise the adult population of tomorrow and therefore special attention to health and nutrition issues should be given.

The present study suggests that it is important to test simultaneously and not separately as other researches have done so far, the contribution of both personal and interpersonal parameters of healthy eating behavior. This examination gave a clear view of the impact that each of these parameters has on healthy eating behavior. This research increases knowledge about the role of specific predictors of eating behavior among adolescents, thus providing potential targets for clinical intervention. Future research needs to build on these findings by testing whether interventions that target these predictors and especially self-regulation skills produce actual and sustainable behavioral change.

Another very important implication of this study is that interventions should not focus mainly on female adolescents ignoring males. In contrast to what earlier research suggests, the results of our study show that male adolescents are influenced more by their peers and are thus more vulnerable to engage in risky eating behavior.

Furthermore, our tests of the theoretical model using SEM procedures contain various important sources of validity information. The measurement model, for example, established the content validity of the indicators and the construct discrimination among the measured constructs. The order sequence of the constructs, coupled with the time lag of the longitudinal design, strengthens the conclusions regarding the predictors of healthy eating.

In conclusion, this study represents a preliminary step toward a theoretically based understanding of individual factors that influence adolescents' regulation in the healthy eating domain.

6.5. Limitations of the present study

Even though the present study overcame some of the limitations of earlier research in the area of health psychology, several shortcomings are underlined. First, the sole reliance on self-report data raises some questions regarding the validity of the findings. For example, it would be useful to collect data on actual family and friends relations. Also, it would have been more appropriate to use somatometric measures instead of self-reports of body weight and height. Furthermore, using a two-week eating diary would have been more appropriate rather than asking participants to report the frequency of consuming specific types of food, in an effort to rule out reporter bias. Second, the non-experimental nature of this study limits the confidence that may be placed in the inferences. Third, the relatively brief time-lag between the two data collection phases of the present study may have constrained our ability to detect further changes in eating behaviors and more specifically, healthy eating goal accomplishment. Finally, the relatively narrow age range of the present sample limits the generalizability of the findings to other developmental periods.

6.6. Contribution to the literature

Regardless of the above limitations, the present study contributes to the relevant literature in a number of ways:

1. By using a sound theoretical framework, namely self-regulation theory.
2. By using a potent data analysis method, namely the structure equation modeling by means of which a theoretical model was constructed and tested in order to fit the data.
3. By using a longitudinal design and examined data on healthy eating behavior on two points in time.
4. By suggesting several ideas that can be applied in interventions aiming at changing undesirable eating habits and enhancing self-regulation skills.

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APPENDIX

Instruments used in Phase I

SELF-REGULATION COGNITIONS SCALE

This is a questionnaire about intentions you may have regarding your health. It concerns personal goals, plans or projects which you are currently pursuing in relation to your health. This includes any actions you may already be taking or intend to take in order to stay healthy or to become healthier.

We are interested in your ***personal*** goals which could be attained within the coming months.

We have listed some examples below, however, it is of course possible that you have health goals which are not mentioned in this list.

Examples:

'During the coming months I want to ……' EXAMPLE:

'go for a half-hour walk every day; lose 5 kilo's in weight; have breakfast every day; go to the gym three times a week; stop smoking; maintain that I don't smoke anymore; take my medication as prescribed; avoid drinking more than 3 units of alcohol a day; eat less fatty foods; stop eating sweets and snacks; take the dog for a walk every day'.

It is important that you formulate goals which are not restricted to a single behavioral act. For example '*going for a walk in the woods this Friday*' would be a single behavioral act, and is too restricted for this questionnaire. On the other hand, if you intend to '*go for a walk in the woods every week*', this would be a health goal for the coming months.

Take a moment now to consider what would be your most important personal health-related goals for the coming months. Use the space below to write down 3 or more goals that are important to you.

1. ……

2. ……

3. ……

Now turn back to the preceding page and pick the <u>most important</u> personal health-related goal.

My most important health goal is: ……...

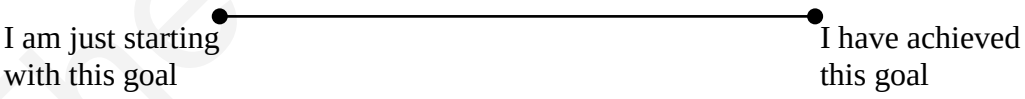
The questions on this and the following pages concern this goal.

1. How long have you been pursuing this goal (*select one answer*)?

   ☐ less than a month

   ☐ more than a month

2. Where would you put yourself in terms of progress towards this goal?
   (*Please put a cross at the place that best indicates your position.)*



The following statements concern this goal. To what extent do you agree with the following statements? Tick √ the box that corresponds to your answer

	Totally disagree	**Disagree**	**Ambivalent**	**Agree**	**Totally agree**
3. It is clear to me how I can achieve this goal					
4. I know for sure that I can reach this goal					
5. I have the necessary skills to attain this goal					
6. I feel very confident that I can achieve this goal					
7. I pursue this goal because other people think it is important					
8. I pursue this goal to avoid conflict with other people					
9. I pursue this goal because it is important to me					
10. I think about how happy other people will be if I achieve this goal					
11. I plan my daily activities so that I have enough time and/or attention left to work on this goal					
12. I have a detailed step-by-step plan to help me achieve this goal					
13. I try to avoid being diverted from this goal by other important things or goals in my life					
14. I don't allow myself to be distracted from this goal by other things					
15. If other things temporarily demand my attention, I try to get back to working on this goal as soon as possible					

FOOD FREQUENCY SCALE

How often do you consume the following types of food; Tick √ the box that corresponds to your answer

	Never	Rare (Once a month)	Sometimes (Once a week)	Frequently (3 to 4 times per week	Very frequently (5-7 times per week)
1. Full fat fresh milk					
2. Semi-skimmed fresh milk					
3. Skimmed fresh milk					
4. Full fat concentrated milk					
5. Semi-skimmed concentrated milk					
6. Skimmed concentrated milk					
7. Canned milk with sugar					
8. Chocolate milk					
9. Full fat yogurt					
10. Semi-skimmed yogurt					
11. Skimmed Yogurt					
12. Feta cheese					
13. Cheddar cheese (sharp type)					
14. White bread (slice or rusk)					
15. Wheat (brown) bread					
16. Cereal					
17. Sugar(tea spoon)					
18. Honey					
19. Jams					
20. Chocolate mousse					
21. Chocolate bars					
22. Wafers					
23. Doughnuts-Croissants					
24. Creams in a ball					
25. Ice-creams					

	Never	Rare (Once a month)	Sometimes (Once a week)	Frequently (3 to 4 times per week	Very frequently (5-7 times per week)
26. Biscuits					
27. Cakes					
28. Sweets in shallow baking-tin					
29. Potato chips/popcorn					
30. Cheese pies or hotdog					
31. Sodas (cans)					
32. Juices					
33. Chicken					
34. Meat or mince meat beef					
35. Meat or mince meat pork					
36. Sheep or goat					
37. Rabbit					
38. Ham, salami, sausages					
39. Canned meat					
40. Canned fish (tuna)					
41. Liver					
42. Fresh or frozen fish					
43. Eggs					
44. Pulse					
45. Potatoes					
46. Rice					
47. Pasta					
48. Fresh salads					
49. Boiled vegetables					
50. Fresh fruits					
51. Fresh Juice					
52. Nuts					
53. Olive oil					
54. Margarine					
55. Kebab/B-b-q meat					
56. Sandwich (ham-cheese)					
57. Sandwich (cheese)					
58. Sandwich (tuna)					
59. Mince meat kebab					
60. Pizza					

FOOD AND FRIENDS SCALE

I. The following statements concern your friends' attitudes towards eating. To what extent do you think **they** agree with the following statements? Tick √ the box that corresponds to your answer

	Totally Disagree	**Disagree**	**Ambivalent**	**Agree**	**Totally agree**
1.Chocolates give energy					
2. Fresh fruits are healthy					
3. White meat (chicken) is healthier than red meat (beef)					
4. Pasta can get you fat					
5. Pizza is tasty					
6. Pulse taste terrible					
7. Snacks are fun					
8. Pulse have iron					
9. Sweets cause tooth decay					
10. We should eat healthy					

II. The following statements concern what your friends approve from your eating patterns. Tick √ the box that corresponds to your answer

	Reject	**Don't approve**	**Neither approve nor disapprove**	**Approve**	**Totally approve**
11. To eat non-fat meat					
12. To avoid chocolates					
13. To prefer fish to meat					
14. To eat fresh fruits					
15. To eat raw vegetables					
16. To eat cereal for breakfast					
17. To eat hamburgers with french fries					
18. To eat pizza					
19.To eat pasta					
20. To eat healthy food					

III. The following statements concern your friends and your eating patterns. Tick √ the box that corresponds to your answer

	Totally disagree	**Disagree**	**Ambivalent**	**Agree**	**Totally agree**
21. It is important to eat similar food with my friends					
22. We feel closer to each other when we share a pizza					
23. I'd rather eat food that my friends also like					
24. When I eat something that my friends don't like, they see me differently					
25. The opinion of the gang about what I eat is important to me					
26. If something is rejected by my friends I avoid it					
27. My friends and I choose to eat similar food					
28. We avoid someone who has different taste on food than the rest of us					
29. It is important to eat with my friends in cool hung-out places					
30. If my friends were eating healthy foods, I would too					

FAMILY ENVIRONMENT SCALE (Adapted version)

The following statements concern families. You are to decide which of these statements are true of your family and which are not. Tick √ the box that corresponds to your answer

	Not true at all	Not true	Ambivalent	True	Absolutely True
1. Family members really help and support one another					
2. Family members often keep their feelings to themselves					
3. We fight a lot in our family					
4. We don't do things on our own very often in our family					
5. We feel that it is important to be the best at whatever you do					
6. Activities in our family are pretty carefully planned					
7. Family members are rarely ordered around					
8. We often seem to be killing time at home					
9. We say anything we want to around home					
10. Family members rarely become openly angry					
11. In our family, we are strongly encouraged to be independent					
12. Getting ahead in life is very important to our family					
13. We are generally very neat and orderly					
14. There are very few rules to follow in our family					
15. We put a lot of energy into what we do at home					
16. Its hard to "blow off steam" at home without upsetting somebody					
17. Family members sometimes get so angry they throw things					
18. We think things out for ourselves in our family					
19. How much money a person makes is not very important to us					
20. Its often hard to find things when you need them in our household					
21. There is one family member who makes most of the decisions					
22. There is a feeling of togetherness in our family					
23. We tell each other about our personal problems					
24. Family members hardly ever lose their tempers					
25. We come and go as we want to in our family					
26. We believe in competition and "may the best man win"					
27. Being on time is very important in our family					
28. There are set ways of doing things at home					
29. We rarely volunteer when something has to be done at home					
30. If we feel like doing something on the spur of the moment we often just pick up and go					

	Not true at all	Not true	Ambivalent	True	Absolutely True
31. Family members often criticize each other					
32. There is very little privacy in our family					
33. We always strive to do things just a little bit better the next time					
34. People change their minds often in our family					
35. There is a strong emphasis on following the rules in our family					
36. Family members really back each other up					
37. Someone usually gets upset if you complain in our family					
38. Family members sometimes hit each other					
39. Family members almost always rely on themselves when a problem comes up					
40. Family members rarely worry about job promotions, school grades, etc					
41. Family members make sure their rooms are neat					
42. Everyone has an equal say in family decisions					
43. There is very little group spirit in our family					
44. Money and paying bills is openly talked about in our family					
45. In there's a disagreement in our family, we try hard to smooth things over and keep the peace					
46. Family members strongly encourage each other to stand up for their rights					
47. In our family, we don't try that hard to succeed					
48. Each person's duties are clearly defined in our family					
49. We can do whatever we want to in our family					
50. We really get along well with each other					
51. We are usually careful about what we say to each other					
52. Family members often try to one-up or out-do each other					
53. Its hard to be by yourself without hurting someone's feelings in our household					
54. "Work before play" is the rule in our family					
55. Money is not handled very carefully in our family					
56. Rules are pretty inflexible in our household					
57. There is plenty of time and attention for everyone in our family					
58. There are a lot of spontaneous discussions in our family					
59. In our family, we believe you don't ever get anywhere by raising your voice					
60. We are not really encouraged to speak up for ourselves in our family					
61. Family members are often compared with other as to how well they are doing at work or school					
62. Dishes are usually done immediately after eating					
63. You can't get away with much in our family					

Instruments used in Phase II

SELF-REGULATION SKILLS BATTERY

When you completed the previous questionnaire, few months ago, you indicated what your most important health goal was.

Your most important health goals was: ……

1. To what extent have you been working on this health goal during the past 2 ½ months? ***(Put into circle the statements that corresponds to your answer)***

Not at all A little Somewhat A lot Extensively

2. Are you still pursuing this goal (**Tick √ the statement that corresponds to your answer**

_____Yes, I am still pursuing this goal.
Continue with <u>questionnaire A</u> on the next page

_____No, I have attained this goal
Skip questionnaire A, but **continue with <u>questionnaire B</u>** on page . .

_____No, I have given up on this goal
Skip questionnaire A, but **continue with <u>questionnaire B</u>** on page **<u>.</u>** .

3. Where would you put yourself in terms of progress towards this goal?
(***Please put a cross at the place that best indicates your position)***

I am just starting with this goal I have achieved this goal

QUESTIONNAIRE A

Only to be completed if you answered '**YES**' to question 2.

The following questions refer to the health goal mentioned above, which you are still pursuing. Tick √ the box that corresponds to your answer.

	Totally disagree	**Disagree**	**Ambivalent**	**Agree**	**Totally agree**
1. I pursue this goal because other people think it is important for me					
2. I possess the necessary skills to attain this goal					
3. I am keen to know whether I am doing well on this goal					
4. When attaining this goal becomes difficult, I will ask other people for help or advice					
5. I evaluate my progress toward this goal in comparison to how well other people are doing in pursuing it					
6. I carefully schedule my activities so I have enough time to pursue this goal					
7. I am on the lookout for potential obstacles that might interfere with my progress on this goal					
8. I tend to criticize myself when I am not making progress toward this goal					
9. I reward myself when I make progress toward this goal					
10. I try not to let other goals interfere with this goal					
11. When problems arise that could hinder my progress toward this goal, I calmly wait and see					
12. I regularly remind myself that I have what it takes to attain this goal					
13. I manage to keep my emotions in control if I fail to make progress toward this goal					
14. I have chosen this goal myself					
15. I have what it takes to reach this goal					
16. I look for information on my progress toward this goal					
17. I like others to support me in attaining this goal					
18. I evaluate my progress on this goal by comparing myself to other people who are also working on it, but are doing worse than I am					
19. I try to plan out in advance the steps necessary to reach this goal					

	Totally disagree	Disagree	Ambivalent	Agree	Totally agree
20. I keep track of my overall progress toward this goal					
21. I routinely criticize myself if I don't work hard enough on this goal					
22. I congratulate myself when things are going well on this goal					
23. I try not to let other people interfere with my work on this goal					
24. I think about the consequences of any solution, before I deal with problems pertaining to this goal					
25. I am confident to find a solution, should problems arise that hinder my progress toward this goal.					
26. If I fail to make progress toward this goal, I do not get stressed out					
27. This is really my own goal					
28. I have the necessary knowledge to reach this goal					
29. I ask other people to inform me regularly about my progress toward this goal					
30. Even when attaining this goal is difficult, I do not like others to help me out					
31. I evaluate my progress toward this goal by comparing myself to other people who are most similar to me					
32. I defined for myself how and when I am working on this goal					
33. I tend to notice my successes while working toward this goal					
34. When working on this goal, I criticize myself for not always having what it takes to succeed					
35. I treat myself to something special when I make progress toward this goal					
36. I do not allow other things to distract me from this goal					
37. When problems arise during the pursuit of this goal, I remind myself that things can not always go smoothly					
38. I like to learn from others, who know how to attain this goal					
39. If things go against me whilst pursuing this goal, I manage to keep my emotions in control.					
40. I think how happy other people will be if I achieve this goal					

	Totally disagree	Disagree	Ambivalent	Agree	Totally agree
41. I have the ability to reach this goal					
42. I am not really interested in information concerning my progress toward this goal					
43. I will not turn to other people for help if attaining this goal gets really difficult					
44. I evaluate my progress toward this goal by comparing myself to others who make about the same or less progress than me					
45. I have a detailed step-by-step plan to help me attain this goal					
46. I am aware of my day-to-day behavior as I work toward this goal.					
47. I routinely criticize myself for unsatisfactory work on this goal					
48. I reward myself for working hard on this goal					
49. If other things require temporarily my attention, I try to get back to working on this goal as soon as possible					
50. When I do not make any progress toward this goal, I try to attain it in a different way					
51. I ask people who are important to me to support me in my conviction that I can attain this goal					
52. If working on this goal is heavy going, I won't be put off					
53. Achieving this goal is not that important for myself.					
54. I evaluate my progress toward this goal by comparing myself to others who make more progress than me					
55. I do not check regularly whether I am getting closer to attaining this goal					
56. I think of myself as a bangler if I do not make progress toward this goal					
57. I feel proud of myself when I am doing well on this goal					
58. When I do not make any progress toward this goal, I try to set a more realistic goal					

If you have completed questionnaire A you can skip questionnaire B, and continue with the questions on page….

QUESTIONNAIRE B

Only to be completed if you answered '**NO**' to question 2.

The following questions refer to the health goal mentioned above, which you either attained or you are no longer pursuing. Tick √ the box that corresponds to your answer.

	Totally disagree	**Disagree**	**Ambivalent**	**Agree**	**Totally agree**
1. I pursue this goal because other people though it was important for me					
2. I possessed the necessary skills to attain this goal					
3. I was keen to know whether I was doing well on this goal					
4. When attaining this goal became difficult, I asked other people for help or advice					
5. I evaluated my progress toward this goal in comparison to how well other people were doing in pursuing it					
6. I carefully scheduled my activities so I had enough time to pursue this goal					
7. I was on the lookout for potential obstacles that might interfere with my progress on this goal					
8. I tended to criticize myself when I was not making progress toward this goal					
9. I rewarded myself when I made progress toward this goal					
10. I tried not to let other goals interfered with this goal					
11. When problems arose that could hinder my progress toward this goal, I calmly waited and see					
12. I regularly reminded myself that I have what it takes to attain this goal					
13. I managed to keep my emotions in control when I failed to make progress toward this goal					
14. I choose this goal myself					
15. I had what it takes to reach this goal					
16. I looked for information on my progress toward this goal					
17. I liked others to support me in attaining this goal					
18. I evaluated my progress on this goal by comparing myself to other people who were also working on it, but were doing worse than I am					
19. I tried to plan out in advance the steps necessary to reach this goal					

	Totally disagree	Disagree	Ambivalent	Agree	Totally agree
20. I kept track of my overall progress toward this goal					
21. I routinely criticized myself if I did not work hard enough on this goal					
22. I congratulated myself when things were going well on this goal					
23. I tried not to let other people interfere with my work on this goal					
24. I thought about the consequences of any solution, before I dealt with problems pertaining to this goal					
25. I was confident to find a solution, when problems arose that hinder my progress toward this goal.					
26. When I failed to make progress toward this goal, I did not get stressed out					
27. This was really my own goal					
28. I had the necessary knowledge to reach this goal					
29. I asked other people to inform me regularly about my progress toward this goal					
30. Even when attaining this goal was difficult, I did not like others to help me out					
31. I evaluated my progress toward this goal by comparing myself to other people who were most similar to me					
32. I defined for myself how and when I was working on this goal					
33. I tended to notice my successes while working toward this goal					
34. When working on this goal, I criticized myself for not always having what it takes to succeed					
35. I treat ed myself to something special when I made progress toward this goal					
36. I did not allow other things to distract me from this goal					
37. When problems arose during the pursuit of this goal, I reminded myself that things can not always go smoothly					
38. I liked to learn from others, who know how to attain this goal					
39. When things went against me whilst pursuing this goal, I managed to keep my emotions in control.					
40. I thought how happy other people were when I achieved this goal					

	Totally disagree	Disagree	Ambivalent	Agree	Totally agree
41. I had the ability to reach this goal					
42. I was not really interested in information concerning my progress toward this goal					
43. I did not turn to other people for help when attaining this goal got really difficult					
44. I evaluated my progress toward this goal by comparing myself to others who made about the same or less progress than me					
45. I had a detailed step-by-step plan that helped me to attain this goal					
46. I was aware of my day-to-day behavior as I worked toward this goal.					
47. I routinely criticized myself for unsatisfactory work on this goal					
48. I rewarded myself for working hard on this goal					
49. When other things required temporarily my attention, I tried to get back to working on this goal as soon as possible					
50. When I did not make any progress toward this goal, I tried to attain it in a different way					
51. I asked people who are important to me to support me in my conviction that I could attain this goal					
52. When working on this goal was heavy going, I did not put off					
53. Achieving this goal was not that important for myself.					
54. I evaluated my progress toward this goal by comparing myself to others who made more progress than me					
55. I did not check regularly whether I was getting closer to attaining this goal					
56. I thought of myself as a bangler when I did not make progress toward this goal					
57. I felt proud of myself when I was doing well on this goal					
58. When I did not make any progress toward this goal, I tried to set a more realistic goal					

FOOD FREQUENCY SCALE

How often do you consume the following types of food; Tick √ the box that corresponds to your answer

	Never	Rare (Once a month)	Sometimes (Once a week)	Frequently (3 to 4 times per week	Very frequently (5-7 times per week)
1. Full fat fresh milk					
2. Semi-skimmed fresh milk					
3. Skimmed fresh milk					
4. Full fat concentrated milk					
5. Semi-skimmed concentrated milk					
6. Skimmed concentrated milk					
7. Canned milk with sugar					
8. Chocolate milk					
9. Full fat yogurt					
10. Semi-skimmed yogurt					
11. Skimmed Yogurt					
12. Feta cheese					
13. Cheddar cheese (sharp type)					
14. White bread (slice or rusk)					
15. Wheat (brown) bread					
16. Cereal					
17. Sugar(tea spoon)					
18. Honey					
19. Jams					
20. Chocolate mousse					
21. Chocolate bars					
22. Wafers					
23. Doughnuts-Croissants					
24. Creams in a ball					
25. Ice-creams					

	Never	Rare (Once a month)	Sometimes (Once a week)	Frequently (3 to 4 times per week	Very frequently (5-7 times per week)
26. Biscuits					
27. Cakes					
28. Sweets in shallow baking-tin					
29. Potato chips/popcorn					
30. Cheese pies or hotdog					
31. Sodas (cans)					
32. Juices					
33. Chicken					
34. Meat or mince meat beef					
35. Meat or mince meat pork					
36. Sheep or goat					
37. Rabbit					
38. Ham, salami, sausages					
39. Canned meat					
40. Canned fish (tuna)					
41. Liver					
42. Fresh or frozen fish					
43. Eggs					
44. Pulse					
45. Potatoes					
46. Rice					
47. Pasta					
48. Fresh salads					
49. Boiled vegetables					
50. Fresh fruits					
51. Fresh Juice					
52. Nuts					
53. Olive oil					
54. Margarine					
55. Kebab/B-b-q meat					
56. Sandwich (ham-cheese)					
57. Sandwich (cheese)					
58. Sandwich (tuna)					
59. Mince meat kebab					
60. Pizza					

MY PHYSICAL CONDITION

The following statements concern your physical condition. Tick √ the box that corresponds to your answer

Usually I have…..	**Not true at all**	**A little true**	**Somewhat true**	**True**	**Very true**
1. Headaches					
2. Faintness or dizziness					
3. Pains in heart or chest					
4. Pains in lower back					
5. Nausea or upset stomach					
6. Soreness of muscles					
7. Trouble getting your breath					
8. Hot or cold spells					
9. Numbness or tingling in part of the body					
10. Lump in your throat					
11. Feeling weak in parts of your body					
12. Heavy feeling in your arms or legs					

MY STRENGTH

The following statements concern your strength. With these statements we wish to get an impression of how you have felt during the past two weeks. Tick √ the box that corresponds to your answer

	1 Yes, that is true	**2**	**3**	**4**	**5**	**6**	**7 No, that is not true**
1. I feel tired							
2. I feel very active							
3. Thinking requires effort							
4. Physically I feel exhausted							
5. I feel like doing all kinds of nice things							
6. I feel fit							
7. I do quite a lot within a day							
8. When I am doing something, I can concentrate quite well							
9. I feel weak							
10. I don't do much during the day							
11. I can concentrate well							
12. I feel rested							
13. I have trouble concentrating							
14. Physically I feel I am in a bad condition							
15. I am full of plans							
16. I get tired very quickly							
17. I have a low output							
18. I feel no desire to do anything							
19. My thoughts easily wander							
20. Physically, I feel in a good shape							