SOFIA UNIVERSITY "ST. KLIMENT OHRIDSKI"
FACULTY OF PHILOSOPHY
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"Adverse childhood experiences and health behaviors in adulthood"

ABSTRACT

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The dissertation contains:
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Appendix: Research scales and questionnaires

Scientific jury:
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……. (reviewer)
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The defense of the dissertation will take place on ..... from..... h. in Hall ..... of Sofia University "St. Kliment Ohridski" at an open meeting of the selected specialized scientific jury.

The materials for the defense are available in the office of the specialty "Psychology", room 60, south wing of Sofia University "St. Kliment Ohridski", as well as on the website of the university: www.uni-sofia.bg

CONTENT OF THE DISSERTATION

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RELEVANCE AND SIGNIFICANCE OF THE PROBLEM

Adverse childhood experiences (ACES) are traumatic events that occur between birth and age 18. They occur in family or social settings, vary in intensity, are often chronic, and can cause lasting harm and distress (Kalmakis & Chandler, 2014).

There are different definitions and systems for measuring adverse childhood experiences. In the literature, there are also the concepts of early life stress and adverse childhood events. In the International Classification of Diseases, ACEs is described as "Factors influencing health status and contact with health services", diagnostic category Z61 – "Problems associated with adverse life events in childhood" (WHO, 1990). In the Bulgarian scientific literature, the terms adverse events or adversities in childhood are also used, while in translated scientific works and books the term adverse or traumatic experiences in childhood is used. In the present paper, these terms are used interchangeably.

According to the National Child Health Survey conducted by the Centers for Disease Control and Prevention (CDC) in the United States for 2016, approximately 61% of children in the United States experienced at least one ACE, while 12.5% experienced three or more ACEs. The study found that ACEs are more prevalent among children living in families with lower incomes and lower education (Ghandour et al., 2016).

Two studies have been conducted on ACEs in Bulgarian socio-cultural context. The first study found that the most widespread ACEs are emotional abuse (40.9%), physical violence (28%), sexual abuse (11.3%), emotional neglect (28.6%), and physical neglect (9.3%) (Dinolova-Hodzhadzhikova, 2018). The second study is epidemiological and found that the most frequently reported disadvantage in Bulgaria is the death of a parent (6.2%), followed by a parent with mental illness or drug addiction (2.9%), and in third place is divorce or other loss (separation) of a parent (2.8%). Data from a Bulgarian sample show that the presence of more than one experienced adversity turns out to be the norm among respondents in Bulgaria (Vassilev, 2012).

Earlier studies of ACEs have focused on conventional types of violence (emotional, physical, sexual), neglect (emotional and physical), and dysfunctional family environments (presence of mental illness in the family, domestic violence, divorce, parent in prison, etc.). (Anda et al., 2006; Felitti et al., 1998). More recent studies on ACEs also include cultural and environmental factors (witnessing community violence, bullying at school, collective violence) (WHO, 2012; Mersky et al., 2017) (Table 1).

Table 1. Types of adverse experiences in childhood (WHO, 2012)

Adverse childhood experiences		
Violence	**Neglect**	**Family dysfunction**
Physical	Physical	Mental illness in the family
Sexual	Emotional	Domestic violence
Emotional		Separation or divorce
Bullying		Addictions/substance abuse by family member
Collective violence		Incriminated family member
Witnessing community Violence		

There is numerous studies on the relationship between ACEs and various health behaviors. In their original study, Feliti and colleagues found consistent dose-response relationships between the most common health-risk behaviors and adverse childhood experiences such as suicide attempts, sleep disturbances, drug use, injecting drugs (leg, heroin), alcohol abuse, smoking or e-drug use. cigarettes, cannabis use, teenage pregnancy, sexually transmitted diseases, aggression and violence (domestic violence to a partner or sexual abuse), lower physical activity (Felitti et al, 1998).

A similar study in Bulgaria examined the relationship between ACEs and health-risk behavior in students from helping professions and medicine. The results showed that in the presence of four or more ACEs, there was a threefold increase in the risks of smoking, a fourfold increase in the risk of early smoking, and a threefold increase in the risk of early initiation of sexual activity (12-15 years).

There is a lot of consistent data on the relationship between adverse childhood experiences and somatic illnesses in adulthood. Often the nature of this relationship is dose-response, and with an increase in the number of adversities, the risk of developing various physical diseases progressively increases.

Table 2 summarizes data from studies that report the association of ACEs with some of the most common diseases worldwide.

The detrimental effects of adverse childhood experiences on physical health are becoming more and more comprehensive. The complex interplay between ACEs and chronic disease, cardiovascular health, metabolic disorders, and immune function brings out the need for a holistic approach to healthcare that is trauma-informed, prevention-based, and promotes resilience. By early recognition of the lifelong impact of ACEs on physical health and implementing preventive measures and targeted interventions, health professionals can contribute to mitigating the burden of ACEs and improve the overall well-being of individuals affected by childhood adversities.

Table 2. Physical illnesses associated with adverse childhood experiences in adults (Nelson et al., 2020)

Physical symptoms and illnesses	Odds Ratio Associated with ≥4 ACES
Cardiovascular diseases	2.1
Stroke	2.0
Cancer	2.3
Asthma	1.2
Chronic obstructive pulmonary disease	3.1
Memory disorders (including dementia)	4.9
Diabetes	1.4
Hepatitis	2.4
Kidney diseases	1.7
Obesity	2.1
Headache	2.1 (at ≥5 ACES)
Chronic pain	1.2
Fibromyalgia	1.8 (at ≥1 ACES)
Somatic symptoms without medical explanation (including pain and headache)	2.0-2.7

Exposure to adverse childhood experiences is also associated with the development of maladaptive eating patterns. Some studies have shown that childhood bullying and neglect contribute significantly to the psychological etiology of emotional eating (Burns et al., 2012; Kong & Bernstein, 2009). Furthermore, other authors have revealed that depression plays an important mediating role in the relationship between childhood trauma and emotional eating, and hence with overweight and obesity (Michopoulos et al. 2015; Hays & Roberts, 2008; Cornelis et al., 2014). In addition, subjects with adverse childhood experiences have a higher risk of developing maladaptive coping strategies, including stress-induced emotional eating (Evers et al., 2010).

A series of studies have found a dose-response association of ACEs and chronic binge eating, food addiction, emotional eating, increased concern about food, weight and appearance, increased risk of low fruit and vegetable consumption, increased risk of unhealthy food consumption, and increased risk of eating disorders (Table 3).

Table 3. Eating behaviors in adults associated with adverse childhood experiences (Michopoulos et al., 2015; Lim et al, 2020; Speranza, M. et al, 2003; Wiss & Brewerton, 2020; Russell et al., 2015)

Eating behaviors
Chronic overeating
Emotional eating
Food addiction*
Increased concern for food, weight and appearance*
Increased risk of low fruit and vegetable consumption
Increased risk of consuming unhealthy foods
Increased risk of eating disorders

**mediating factors: emotional dysregulation, poor impulse control, poor emotion recognition and depression*

The information presented so far outlines a worrying trend. On the one hand, the prevalence of adverse childhood experiences is alarmingly high and reflects important observations on contemporary society, family environment and social functioning. On the other hand, adverse childhood experiences are associated with a number of psycho-emotional disorders, as well as with the development of health-risk behaviors, which in turn are a prerequisite for various somatic diseases and pose a serious risk to mental and social functioning. For the past three decades, researchers from various fields of science have theorized and investigated the problem, creating evidence-based multifactorial explanatory models. This dissertation presents an overview of psychological theories and studies on the topic and tests hypotheses derived from these views. A series of psychometric analyses have been carried out to investigate the relationships between adverse childhood experiences, psychological factors, eating behavior, and health status in adulthood.

STRUCTURE OF THE DISSERTATION

The dissertation is composed of an introduction, a theoretical chapter, two empirical chapters, a summary and conclusion, a list of references, and an appendix.

The theoretical chapter is divided into four subchapters. In the first one, the basic concepts are introduced and various research approaches are considered regarding adverse childhood experiences. The second subchapter discusses contemporary theories of chronic stress and health, including the Generalized unsafety theory of stress, Social safety theory, and Toxic stress theory, which is the main one related to research on early traumatic stress. The third subchapter is dedicated to adverse childhood experiences and their relationship with health behaviors and health status. The last subchapter describes the relationships between adverse childhood experiences, patterns of eating behaviors and personality characteristics.

The second chapter presents the theoretical framework of the study, where the rationale of the chosen model, the hypotheses, the goal and the tasks are described. It presents the questionnaires used as well as the descriptive characteristics of the studied sample.

The third chapter includes two chapters that present the conducted pilot qualitative research and the main empirical study**.** After each chapter, analyses of the results, a summary and a discussion of the conducted research are presented.

The last chapter is a summary and conclusion that synthesizes the main conclusions of the dissertation, makes recommendations for consultative practice and future research, and presents the main limitations and contributions of the scientific work.

GENERAL CHARACTERISTICS OF THE DISSERTATION

The conceptual framework of the dissertation research includes state-of-the-art views in various fields of psychological science to understand the effects of adverse childhood experiences on health behavior and health status. The theoretical and experimental focus is on elucidating the relationships between ACEs, psychological factors, eating behaviors and health status. In this regard, the starting point in the organization of the dissertation is the idea that people who have experienced a higher number of adverse experiences will have higher levels of unhealthy eating patterns, as well as worse health status. On the basis of this integrative approach the goal, tasks and organization of empirical research are presented.

3.1 Toxic stress theory

The toxic stress theory is an eco-bio-developmental model that focuses on the impact of prolonged exposure to adverse childhood experiences, known as toxic stress, on health and development throughout life. The theory highlights the critical role of early experiences in shaping the architecture of the developing brain and the body's stress response systems.

The model distinguishes three types of stress response with different effects on the body and physiology. Table 4 examines the different mechanisms of action of the three types, as well as the different events that provoke or mitigate them.

Prolonged exposure to milder stressors can also have toxic effects – events such as exposure to high levels of family instability, staying in disorganized neighborhoods, experiencing constant income insecurity, etc. While the fight-or-flight response is adaptive, when we respond to immediate acute danger, exposure to adverse or chronic stressors can lead to constant activation

of the stress response and subsequent chronic production of stress hormones which McEwan (2007) characterized as allostatic loading. Chronic stress exposure affects brain structures and affects energy metabolism, causing the phenomenon of "biological embedding" - dysregulation of the stress response system (Chrousos, Detera-Wadleigh & Karl, 1993).

Table 4. Classification of Types of Stress in Childhood, National Scientific Council on the Developing Child, 2014)

Positive	Tolerable	Toxic
Physiological response to mild to moderate stressors	**Adaptive response to a time-limited stressor**	**Non-adaptive response to intense and prolonged stressors**
Brief activation of the stress response, which increases blood pressure, heart rate, and hormone levels	Time-limited activation that has a short-term impact on the body	Prolonged activation of the stress response, which negatively affects brain structures
Homeostasis is restored quickly through the body's natural coping strategies	Homeostasis is restored through the buffer effect of a relationship with the caregiver	Prolonged allostasis causes a chronic stress response due to a lack of buffering effect from a secure relationship with the caregiver
Adverse test at school, exams	Death in the family, natural disaster	Violence, neglect, family dysfunction

A recent review of the physiological effects of biological embedding concludes that adverse early childhood experiences have a variety of effects on neuronal, endocrine, immune, metabolic, and intestinal (digestive) axes (Berens et al. 2017). In general, ACE-induced changes can mediate their association with key physical and mental illnesses such as obesity, type 2 diabetes, atherosclerosis, asthma, thromboembolic events (myocardial infarction, stroke), autoimmune diseases, onset and progression of cancer, as well as addictions, different types of psychopathology and adverse social outcomes (Felitti et al., 1998; Danese et al., 2009; Miller et al., 2011; Flaherty et al., 2013; Giovanelli et al., 2016).

3.2 Pyramid of adverse childhood experiences

The evidence presented about the influence of ACEs on the biopsychosocial development and long-term health of the individual can be summarized through the pyramid of adverse childhood experiences, proposed by Feliti in his original study from 1998.

The theoretical model of toxic stress described in the previous section successfully illustrates the early stages of dysfunctional development of the individual exposed to chronic and traumatic stress, which continue into adulthood. The ACEs pyramid clearly illustrates the development and accumulation of the effect of ACEs beginning in childhood and the consequences in subsequent life stages such as neurodevelopmental disorders, social/emotional/cognitive disorders, development of health-risk behaviors and social problems, development of somatic diseases and early death (Anda et al., 2006; Felitti et al., 1998) (Fig. 1). Adverse childhood experiences can be understood as chronic stressors that trigger a series of biological and psychological processes that continue into adulthood (National Scientific Council on the Developing Child, 2014; Shern et al, 2016). This is a comprehensive model for the origin and

development of health-risk behaviors and poor physical health in adulthood, on which the present dissertation is based.

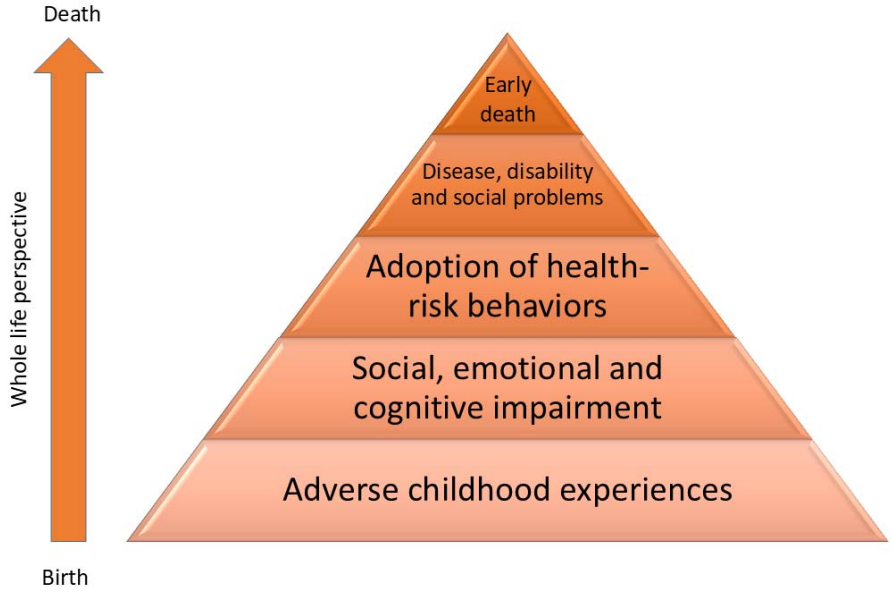


Fig. 1 Pyramid of adverse childhood experiences (The ACEs pyramid, Anda et al., 2006; Felitti et al., 1998)

3.3 Adverse childhood experiences, eating behaviors and psychological characteristics

Eating behaviors

Adverse childhood experiences can have a significant impact on lifelong eating behaviors and eating patterns. They can disrupt the development of a healthy relationship with food and contribute to various problems associated with daily nutrition. A series of studies have found a dose-response association of ACEs and chronic binge eating, food addiction, emotional eating, increased concern for food, weight, and appearance, increased risk of low fruit and vegetable consumption, increased risk of consuming unhealthy foods, and increased risk of eating disorders (Michopoulos et al., 2015; Lim et al, 2020; Speranza, M. et al, 2003; Wiss & Brewerton, 2020; Russell et al., 2015).

Adverse childhood experiences are often associated with the development of eating disorders such as bulimia nervosa, anorexia nervosa, binge eating disorder (hyperphagia), etc. Trauma experienced in childhood can contribute to the psychological factors that contribute to the appearance of these disorders, including emotional dysregulation, poor impulse control, and the development of unhealthy coping mechanisms for chronic stress. Along with the patterns of healthy, unhealthy, emotional, and restricted eating, the current study further explores three new patterns of eating behavior, namely healthy orthorexia, orthorexia nervosa, and symptoms of uncontrolled binge eating. There is still no research in the literature on the relationship of orthorexia with adverse childhood experiences. The dissertation aims to investigate whether the symptoms of orthorexic behavior are associated with a history of ACEs, as well as with psychological characteristics of other disordered eating patterns.

Stress, anxiety, depression

There are consistent links between symptoms of stress, anxiety and depression and traumatic experiences. According to some authors, the symptoms of post-traumatic stress disorder play an important role in understanding the mechanism underlying the relationship between traumatic experiences and the development of unhealthy eating patterns in adulthood (Dedert et al., 2010; Heppner et al., 2009; Roenholt et al., 2012). Mitchell and colleagues argue that PTSD symptoms may partially explain the relationship between trauma and binge eating disorder (Mitchell et al., 2012).

Alvarez and colleagues found that the level of perceived stress may also explain the association between childhood bullying and the development of unhealthy eating behaviors in adulthood (Alvarez et al., 2007). Activation of the stress response can lead to emotional dysregulation, which is associated with increased appetite, preference for foods high in sugar and fat (Adam & Epel, 2007; Dallman, 2010; McEwen, 2007; Torres & Nowson, 2007), and subsequent visceral fat accumulation and obesity in adults and adolescents (Cohen et al., 2007; Torres & Nowson, 2007; De Vriendt et al., 2012). Laboratory studies have shown that acute physical or emotional stress is followed by high cortisol reactivity, which triggers an increased intake of "comfort" foods (Epel et al., 2001; Garg et al., 2007; Newman et al., 2007). States of repetitive or uncontrollable chronic stress are followed by higher cortisol levels and tend to activate a state of allostatic load that leads to neural and emotional dysregulation, which contributes to maladaptive behaviors, such as chronic consumption of high-calorie food, lack of control over eating, and a tendency to overeat (McEwen, 2007; Gluck et al., 2004; Groesz et al., 2012).

Also, some researchers have suggested that depression may be the only significant variable explaining the link between childhood abuse and adult obesity (Moyer et al., 1997; Katz et al., 2000). Anxiety, in turn, does not have a mediating effect, but has a positive relationship with obesity, eating disorders, and other health-risk behaviors (Strine et al., 2008; Sanders et al., 2021). These results suggest that symptoms of stress, anxiety and depression may influence subsequent eating behaviors and therefore may also mediate the link between trauma and eating disorders.

Big 5 personality traits

Some psychological characteristics have been found that act as mediators in the relationship between childhood abuse, eating disorders and obesity, such as depression, anxiety, anger and neuroticism as a personality trait and level of perceived stress (Moyer et al., 1997; Midei et al., 2010; Brunault et al., 2018; Alvarez et al., 2007). In terms of personality traits from the Big Five questionnaire, the results are heterogeneous. Some research suggests that conscientiousness and agreeableness are positively associated with healthy food choices and negatively associated with unhealthy food choices, while neuroticism is positively associated with unhealthy foods and obesity and negatively associated with healthy foods (Pristyna et al., 2022).

A systematic review of personality traits and dietary preferences shows that personality traits neuroticism and alexithymia (the inability to identify and describe emotions) are associated with unhealthy eating patterns such as low consumption of fruits and vegetables and increased consumption of sugar and saturated fats. Conversely, openness, agreeableness, extroversion, and conscientiousness are associated with increased consumption of fruits and vegetables (Esposito et al., 2021).

Body dissatisfaction

Adverse childhood experiences can negatively affect the perception of body image and self-esteem. A study found that physical and sexual abuse in childhood predicted the outcomes of body dissatisfaction, overeating, and obesity. In addition, body dissatisfaction and overeating are predictors of obesity (Rhode et al., 2008). Individuals who have experienced childhood trauma tend to internalize the negative messages they have received, which results in a distorted body image (Diaz et al., 2019). The emotional and psychological impact of ACEs can create a deep sense of shame and self-loathing that can be projected onto body image. (Striegel-Moore et al., 2001). ACEs are often associated with low self-esteem, which can also affect how a person perceives their body. People with low self-esteem are predisposed to have a negative self-image, body dissatisfaction, and a constant desire to meet unrealistic beauty standards (van Geel et al., 2015; Carrard et al., 2014).

There is a well-established link between body dissatisfaction and eating behaviors in literature. A number of studies (Yean et al., 2014; Lewer et al., 2017; Vartanian et al., 2018) show that a negative evaluation of weight and body shape is a strong predictor for engaging in dietary restrictions, and the greater the discrepancy between the perception of the real and desired figure, the higher the risk for disordered eating (Hyun et al., 2014). On the other hand, negative emotions and psychological states can be a disinhibitor of control over eating and lead to compensatory and excessive eating, respectively to overweight, obesity and adverse health consequences.

Overweight, obesity and health status

A significant amount of research has been devoted to investigating the relationship between adverse childhood experiences, the development of unhealthy eating patterns, and subsequent obesity in adulthood (Grilo et al., 2005; Grilo et al., 2006; Salwen et al., 2014; Wildes et al., 2008). Several longitudinal studies have reported a positive association between bullying in childhood and obesity later in life. Two of them showed that physical abuse, sexual abuse, and neglect in childhood were positively associated with obesity, BMI, and an increase in waist circumference in adulthood (Midei et al., 2010; Power et al., 2015).

Overweight and obesity, in turn, are major risk factors for a number of diseases such as cardiovascular diseases (mostly heart attack and stroke), diabetes, musculoskeletal diseases, certain types of cancer (including endometrial cancer, breast cancer, ovarian cancer, prostate cancer, liver cancer, bladder cancer, kidney cancer and colon cancer), reproductive problems and lung diseases, and the risk of these diseases increases with the increase in body mass index (Guh et al, 2009).

In summary, the development of unhealthy eating behaviors is a combination of many eco-bio-developmental factors in people of the individual's growth. Figure 2 presents a schematic model for this process, which begins with the presence or absence of adverse experiences in the most vulnerable developmental period of childhood.

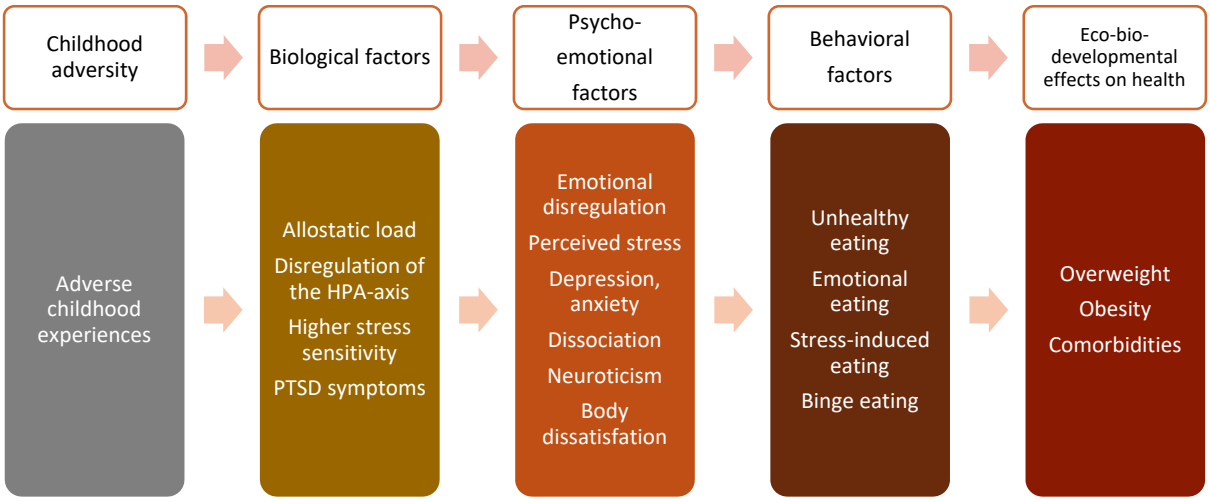


Fig. 2. Eco-bio-developmental model of the relationship between adverse childhood experiences, eating behaviors, obesity and health status in adulthood. CKD – hypothalamic-pituitary-adrenal glands

Subsequent neurobiological disturbances contribute to the development of psycho-emotional impairments such as emotional dysregulation, depressive symptoms, anxiety, increased reactivity of stress and body dissatisfaction, which in turn provoke the development of maladaptive eating behaviors such as emotional and stress-induced eating, tendency to unhealthy eating and binge eating and increase the risk of eating disorders. These health-risk behaviors are a mediating factor between adverse childhood experiences and obesity and numerous physical illnesses in adulthood. The model is in sync with pyramid of adverse experiences in childhood, the theory of toxic stress and visually presents the biopsychosocial dimensions of adverse experiences in childhood and subsequent health behavior and health status in adulthood.

ORGANIZATION OF THE EMPIRICAL STUDY

4.1 RATIONALE FOR THE PILOT QUALITATIVE STUDY

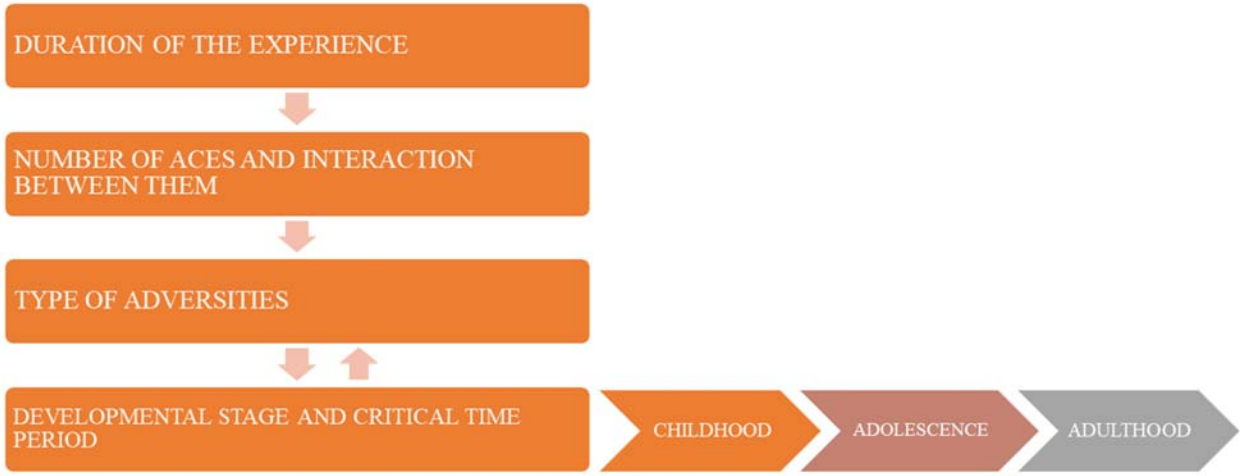
The main goal of the qualitative study is to investigate individual understandings of adverse childhood experiences, as well as their intensity, number and subjective perception of the traumatic event as well as their relationship with eating behaviors. These findings can help further understand the general semantic cores of the constructs we are investigating and therefore help us refine and decide on the research tools and measures that will be verified in the empirical part of the dissertation.

Typically, adverse childhood events are operationalized through retrospective self-reported questionnaires for life events, which take into account both the number of adverse experiences and their frequency. The intensity of the response to the event can also be included in the measures. An individual's interpretation of the event is important and may reflect a resilience strategy as well as socio-cultural environmental factors that are important for measuring toxic stress. The most prevalent criticism of the ACEs research measures are related to their retrospective nature and focus on the number of ACEs experienced. Despite consistent dose-response data on the relationship between the number of ACEs and health status and behavior, some researchers have

placed emphasis on individual understanding and meaning of ACEs, as well as the interactions between them, which may explain the heterogeneity of stress response, health behaviors, and health status in adulthood (Brown, 1981).

A recent study in the field found that the effect of ACEs on health behavior and health status depends not only on the number of adverse events, but also on the interaction between the number, type, duration, stage of neurological development and environmental factors. The pattern of these connections is presented in Figure 5.

fig. 5. Interaction between difficult childhood experiences, context, and stage of human development (Nelson et al., 2020)



In this regard, it was decided for the dissertation to include a pilot qualitative research method to check individual understandings of the interaction of difficult childhood experiences and the development of eating behaviors. For this purpose, a semi-structured interview was developed with 11 questions concerning eating patterns and behaviors in childhood, the presence of adverse experiences and the interaction between them.

4.2 RATIONALE FOR THE EMPIRICAL STUDY

The empirical part in this project is constructed within the eco-bio-developmental model of toxic stress and the pyramid of adverse childhood experiences.

Based on the analysis of the research literature on the topic, the proposed theoretical research model below includes many factors (variables) that can directly or indirectly affect the psycho-emotional health of the individual, as well as the eating behavior and health status. The applied theoretical model of the study is presented in Figure 3.

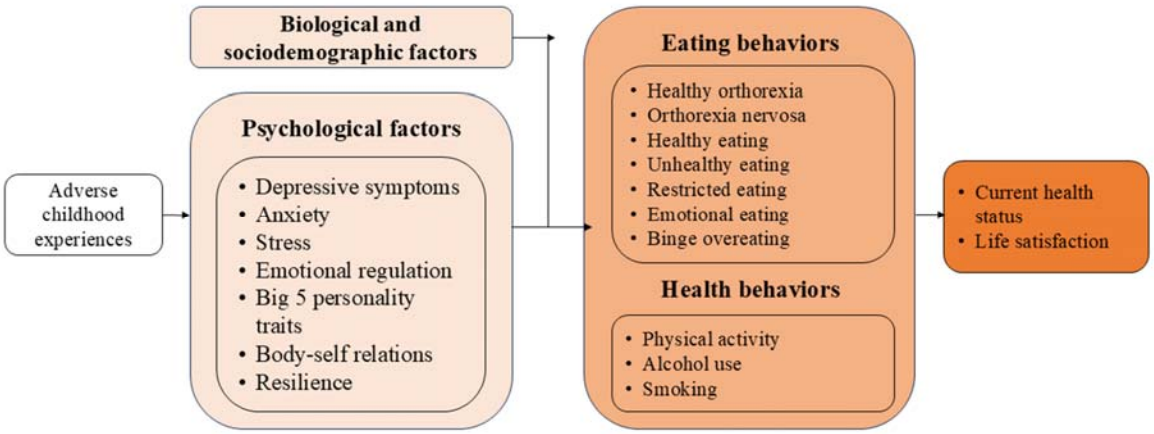


Figure 3: A theoretical model for investigating the psychosocial correlates of eating and other health behaviors and health status

Through this model, the relationships between adverse childhood experiences, psychological, emotional and sociodemographic factors, eating patterns and other health behaviors, which in turn can have an effect on health status, will be tested.

4.3 PURPOSE, HYPOTHESES AND TASKS OF THE STUDY

The aim of the present study is to investigate the associations and levels of interaction between adverse childhood experiences, eating behaviors, other health behaviors, and health status, taking into account psycho-emotional correlates.

To achieve the goal, the following hypotheses are proposed:

- **Hypothesis 1:** It is expected that socio-demographic characteristics will significantly differentiate the number and type of reported adverse childhood experiences. It is assumed that gender, age, educational level, place of residence, marital status, financial status, BMI and health status will significantly differentiate the number and type of reported ACEs. We expect that the higher number of reported ACEs will be observed in people who are single, with lower income, lower educational qualification, a higher BMI and with chronic diseases.
- **Hypothesis 2:** It is assumed that sociodemographic characteristics will significantly differentiate eating patterns. It is expected that emotional and restricted eating, as well as higher levels of healthy orthorexia and orthorexia nervosa, will be more prevalent in women and in young and middle-aged people with lower BMI. Furthermore, we expect that men, older people and people who live in small towns, with lower incomes, with a higher BMI and with chronic diseases, will have a more pronounced orientation towards unhealthy eating behaviors.
- **Hypothesis 3:** People with more self-reported ACESs are expected to eat less healthy, have higher levels of orthorexia nervosa, emotional and restricted eating, and symptoms of binge eating. We also expect that these respondents will have lower levels of healthy eating and healthy orthorexia. We assume that the type of ACEs will significantly differentiate different eating behaviors.

- **Hypothesis 4:** It is assumed that the number and type of reported ACEs will be positively associated with unhealthy eating patterns and negatively associated with healthy eating patterns. Additionally, we assume that the number and type of reported ACEs will be positively associated with higher levels of psychological factors stress, anxiety and depression, weight concern, emotional suppression, the personality trait neuroticism, as well as worse subjective health status. Furthermore, we expect a negative interaction between the number and type of reported ACES and higher levels of psychological factors resilience, appearance evaluation, cognitive reappraisal, personality characteristics conscientiousness and agreeableness, as well as life satisfaction.
- **Hypothesis 5:** It is assumed that psychological correlates will be significantly correlated to eating patterns. More specifically, we expect that healthy eating patterns will be positively associated with the psychological factors of resilience, appearance evaluation, cognitive reappraisal, personality traits conscientiousness and openness and life satisfaction and negatively associated with symptoms of stress, anxiety, depression, overweight preoccupation, emotional suppression, the personality trait neuroticism and worse subjective health status. Conversely, we expect that unhealthy eating patterns will be positively associated with symptoms of stress, anxiety, depression, overweight preoccupation, emotional suppression, the personality trait neuroticism and worse subjective health status, and negatively associated with psychological factors resistance, appearance evaluation, cognitive reappraisal, personality traits conscientiousness and openness and life satisfaction.
- **Hypothesis 6:** The number and type of ACEs, as well as psychological factors, are expected to have a significant effect on eating behavior. We expect the number and type of ACEs experienced, psychological factors stress, anxiety, depression, weight concern, emotional suppression, and the personality trait neuroticism will contribute to unhealthy eating patterns, and positive appearance evaluation, resilience, cognitive reappraisal, and personality traits conscientiousness and openness will contribute to healthy eating patterns. We also assume that ACEs, psychological factors, and eating behavior will have a significant effect on overall life satisfaction and health status.

  For the verification of the hypotheses raised, the following tasks are set:
  - Check the structural organization of the questionnaires and scales used.
  - Establish the differentiating effect of sociodemographic characteristics on the number of reported PIPs, eating behaviors and health status;
  - Examine the differentiating effect of ACEs on eating behavior, health behavior and health status;
  - Examine and establish the relationships between the studied phenomena;
  - Examine the effects of psychological and emotional correlates on eating and health behavior and health status.

4.4 Research measures

To study the patterns of eating behavior, as well as their relationships with adverse experiences in childhood and in accordance with the tasks set, the goals and hypotheses raised, a battery of questionnaires was used, which are described below. The study consists of administering the questionnaires of people of different socioeconomic status and age who have given their consent to participate.

The methodology is composed of eleven questionnaires as follows:

- ***Questionnaire on eating behavior*** (*Pandurova, Karabelyova, 2022)*

The questionnaire consists of 24 statements. The included items are divided into three scales, taking into account a trend towards respectively: healthy eating, unhealthy eating and physical activity. The scale is of the Likert type with five possible answer options: "*1-Very rarely or never", "2-Rarely", "3-Sometimes", "4-Often", "5-Very often or always".* For the purposes of the study, the scales for eating behavior were used alone, as follows:

The Healthy Eating Scale is designed to assess the trend towards food consumption and diet associated with a positive effect on health and maintaining weight within healthy limits. The scale includes 11 statements such as: "My daily menu includes complete and varied food", "During the day I have between 3 to 5 meals (3 main and 2 lighter snacks)", "I eat fresh and varied fruits every day", "I eat a variety of fresh or cooked vegetables every day", etc. For the purposes of the study, a short version with 5 items with the highest factor weights was used. The overall score on the scale has parameters from 5 to 25, and with an increase in the score, the tendency towards healthy eating also increases.

The "Unhealthy Diet" scale is composed of 8 statements of the type: "I eat meat with a high fat content (pork, beef, etc.)", "I eat fast/dry foods (the so-called fast food or junk food), such as doners, burgers, sandwiches, pizzas, pies, snacks, etc.", "I eat sweets, desserts, pastries, cakes", "I eat fried and/or breaded foods"

They reflect a trend towards the selection and consumption of foods associated with health risks and weight gain. For the purposes of the study, a short version with 5 items with the highest factor weights was used. The overall score on the scale is with parameters from 5 to 25. The statements are positively formulated, which means that with an increase in the score, the tendency to unhealthy eating increases.

- ***Dutch Dietary Behavior Questionnaire*** (DEBQ, van Strien, et. al., 1986)

The Dutch Dietary Behavior Questionnaire is an internationally recognized tool for assessing eating styles. It is a practical and useful research tool, as it operationalizes three of the main eating behaviors associated with adverse childhood experiences and obesity. The questionnaire is made up of 33 statements distributed in three scales that measure emotional, external and restricted eating. The rating scale is five-point of the Likert type. The statements were evaluated as follows: "*1 - Never", "2 - rare", "3 - sometimes", "4 - often", "5 - very often".* For the purposes of the study, only 2 of the scales were used, as follows:

Emotional Eating Scale - consists of 13 questions that take into account the eating trend in response to negative emotions. For example: "Do you feel like eating when you are angry?", "Do you want to eat when you are anxious, worried or tense?" etc. . For the purposes of the study, a short version is attached with the 5 items with the highest factor weights. The limits of the calculated score are from 5-25, and its increase reflects a higher commitment of respondents to emotional eating.

The "Restricted Eating" scale is associated with cognitively determined eating restriction. It consists of 10 questions such as: "If you have gained weight, do you eat less than usual?", "How often do you refuse the foods or drinks offered to you because you are concerned about your weight?", "Do you deliberately consume food that makes you lose weight", etc. For the purposes of the study, a short version is attached with the 5 items with the highest factor weights. Here again, an increase in the score shows a higher tendency towards cognitive control over nutrition.

- ***Teruel orthorexia scale*** (TOS, Teruel, Barrada & Roncero, 2018)

The scale measures two dimensions of orthorexic attitudes – healthy orthorexia and orthorexia nervosa. The initial version consists of 17 items with a 4-point likert scale. The

statements were evaluated as follows: "*1 – I disagree", "2 – I slightly agree", 3 – I largely agree", "4 – I strongly agree".* The questionnaire includes the following scales:

Healthy orthorexia scale - consists of 9 items, taking into account the trend of healthy interest in nutrition, which is independent of psychopathology and even inversely related to it. For example, "I feel good when I eat healthy food", "I think my diet is healthier than that of most people." The score on the scale is from 0 to 27, and the higher score indicates interest in healthy eating, which is not related to psychopathology.

Orthorexia nervosa scale – consists of 8 items that assess the negative social and emotional impact of trying to achieve a restricted diet. This dimension represents a pathological concern about healthy eating. For example, "I feel guilty when I eat food that I do not consider healthy", "I feel overwhelmed or sad if I eat food that I consider unhealthy", etc. The score on the scale is from 0 to 24. and the higher score indicates a higher tendency to pathological concern for healthy eating.

- ***Binge eating disorder screening scale*** (BED-7, Herman et al., 2013)

The scale was created as a screening tool for binge eating and assesses the frequency of behaviors characteristic of this eating disorder. It consists of 6 statements that are evaluated on a 4-point scale (from "1- *Never or Rarely"* to "4-Always*").* you couldn't stop eating, you felt a strong desire to eat)?", "In the last 3 months, how often did you continue to eat even though you weren't hungry?" etc. The score on the scale is from 5 to 20, with a higher score reporting a higher tendency to overeat.

- ***A short version of a questionnaire on personality traits*** (BFI, John & Srivastava, 1999; Stoyanova and Karabelyova, 2020).

The questionnaire for the study of personality traits was developed by P. John and S. Srivastava. It operationalizes the model of the "Big Five" (Goldberg, 1993), in which five dimensions are distinguished: "***Extraversion"*** (Extraversion); "Agreeableness"; "Conscientiousness"; "***Neuroticism***"; "***Openness***". The original contains 44 statements, assessed on a 5-point Likert scale, and the possible answers range from "1-I *disagree at all"* to "5-I *strongly agree".* For the purposes of this study, a short version of the questionnaire containing 10 items was used. This revised version was developed in 2020 (Stoyanova and Karabeleva, 2020) and includes selected items with high factor weights derived in the adaptation and standardization of the questionnaire for the Bulgarian socio-cultural context (Stoyanova and Karabelyova, 2019).

- ***Scale for depressive symptoms, anxiety and stress*** (DASS-21, Lovibond & Lovibond, 1995; Ivanova, Mitev & Karabeliova, 2016).

The scale measures negative emotional states associated with depression, anxiety and stress. The original questionnaire was developed by Lovibond and includes a total of 42 items. The abbreviated version used in the present work was published by the authors in 1995. It consists of three scales with 7 statements related to the symptoms of the respective condition. referring to feelings of hopelessness, anhedonia and apathy (for example: ".... I don't have any positive feelings", "... I feel that life is meaningless", etc.). Anxiety includes feelings of fear, panic and tension ("... I feel scared for no reason"). The stress scale describes states of chronic nervous agitation and irritability ("... I feel that I am quite irritable", etc.). Respondents rated each item using a Likert-type scale ranging from 1 to 4 as follows: "*1-It does not apply to me in any way", "2-It refers to me to some extent or part of the time", "3-It refers to me to a significant extent or most of the time", "4-It refers to me to a very large extent or almost all of the time".* The tool has been adapted for different cultures and has been used in numerous studies, and its validity and consistency have been confirmed many times. For the Bulgarian socio-cultural environment, the

questionnaire has been adapted and standardized by S. Karabelova and colleagues (Ivanova, Mitev & Karabeliova, 2016)

- ***A short version of the Emotional Regulation Scale*** (ERQ-S; Preece et al., 2023)

The scale measures the ability to manage and express emotional experiences. The original questionnaire included a total of 10 items (Gross & John, 2003). The abbreviated version used in this work was published by the authors in 2023. It consists of three scales of 6 statements related to 2 of the most common strategies for emotional regulation – cognitive reassessment (for example, changing the way a person thinks about a situation to change its emotional impact) and expressive suppression (for example, suppressing the behavioral expression of emotions). It consists of two scales with 3 statements related to the respective strategy for emotional regulation. The cognitive reassessment scale includes statements such as "When I want to experience a more positive emotion (such as joy or fun), I change what I think about," while the expressive suppression scale contains statements such as "I control my emotions by not expressing them."

- ***Resilience Scale*** (BRS; Smith, Dalen, Wiggins, Tooley, Christopher & Bernard 2008).

The scale consists of 6 statements, which are evaluated on a 5-point scale (from "1-I *disagree at all"* to "5-I *strongly agree"). The* tool shows good validity and reliability, as well as stability of the results, regardless of the cultural context. For the Bulgarian socio-cultural context, the scale is adapted and standardized (Kareva, 2021).

- ***Adverse Childhood Experiences Questionnaire (ACE-IQ)***

The ACE-IQ instrument examines 13 elements from two groups of ACEs.

Conventional ACEs: physical abuse; emotional abuse; sexual abuse; alcohol and/or drug abuser in the household; incarcerated household member; someone chronically depressed, mentally ill, institutionalized, or suicidal; mother or household member who has been abused; single or unparented, separated or divorced parents; emotional neglect; physical neglect.

The questionnaire is intended for use in people over the age of 18, is also valid in measuring ACES in low- and middle-income countries, and can be included in broader health surveys (WHO, 2012). For the Bulgarian socio-cultural context, the scale is adapted and standardized (Dinolova-Hodzhadzhikova, 2018).

The questions are divided into 6 sections: relations with parents up to the age of 18, family environment up to the age of 18, peer violence, witnesses of violence in the community, exposure to war / collective violence. The options for answering most of the questions are: (1) "Many times", (2) "Several times", (3) "Once", (4) "Never" and (5) "I prefer not to answer". To the questions from section 2 "Relations with parents/guardians of questions 2.1. " Did your parents understand your problems/Preoccupation?" and 2.1. "Did your parents really know what you were doing when you weren't at school?", the answer options are: (1) "Always", (2) "More often yes", (3) "Rarely", (4) "Never" and (5) "I prefer not to answer". The answers to the questions from section 4 "Family environment until your 18th year" are: (1) "yes", (2) "no", (3) "I prefer not to answer". Two methods of analysis are allowed to determine which is the most appropriate approach to determine an accurate overall ACES assessment of the participant – binary and frequency versions. The binary score reflects the number of ACESs regardless of the frequency of the experience, while the frequency version reflects the frequency of experienced ACESs, and in both versions the final score varies between 0-13.

- ***Multidimensional Body Relations Questionnaire*** (MBSRQ-AE; Cash, 2000)

The questionnaire for attitudes towards the body and health is a battery of 69 items for assessing aspects of attitudes towards oneself, health and the construct of body image. Body image is perceived as attitudes towards the physical body and health, and these dispositions include

evaluative, cognitive and behavioral components. which contain 11 statements distributed in four scales, which are evaluated on a 5-point scale (from "1-Strongly *disagree"* to "5-Strongly *agree").*

Appearance evaluation scale – contains 7 items that reflect the attitude towards one's own body, the feeling of physical attractiveness or unattractiveness; satisfaction or dissatisfaction with appearance. For example, "I like my appearance exactly as it is", "Most people think I look good", etc. The score on the scale is from 7 to 35, with a higher score reporting a mostly positive attitude towards one's appearance, and the lower result - dissatisfaction with the appearance.

Weight preoccupation scale - contains 4 items that evaluate a construct reflecting anxiety about weight gain, vigilance about weight, dieting and dietary restriction. For example, "I am constantly worried about whether I am or will become fat", "I recognize even small changes in my weight", etc. The score on the scale is from 4 to 16, with a higher score indicating a higher concern about gaining weight and concern for the body.

- ***Life Satisfaction Scale*** (SWLS, Pavot & Diener, 1993; Ivanova, 2011).

The scale for assessing the subjective perception of global satisfaction, which reflects the cognitive aspects of the sense of subjective well-being. The scale consists of 5 statements, which are evaluated on a 5-point scale (from "1-I *disagree at all"* to "5-I *strongly agree").* The tool shows good validity and reliability, as well as stability of the results, regardless of the cultural context. adapted and standardized (Ivanova, 2011).

4.5 Respondents

722 people took part in the study, with the majority of them being women - 87% and 13% of the respondents were men respectively. The participants were between 16 and 72 years old (X = 38.56; SD = 9,940), divided for the purposes of the analysis into three groups: from 16 to 32 – 25.3%, from 33 to 42 – 47.4% and from 43 to 72 – 27.3%. In terms of weight, BMI ranged from 14.67 to 68.78 (X = 24.0528; SD = 5,52412). The subjects were divided into groups according to the set BMI standards: underweight (6%), normal weight (61.2%), overweight (20.4%), obesity (12.3%). According to marital status, respondents were divided into two groups: in a relationship (70.4%) and single (29.6%). In terms of place of residence, the participants from the capital are 53%, and 47% determine that they live in the countryside. According to the educational level, the people who took part in the survey were divided into two groups, with the respondents with higher education being 89.6%, and with secondary education 10.4% respectively. To determine the economic status, the participants were asked about their monthly income, according to which they were divided into three groups: up to BGN 1000 (10%), from 1001 to 2000 BGN (36.7%), over 2000 BGN (53,3%). Respondents who do not exercise are 24.5%, 41.7% answered that they exercise 1-2 times a week, and 33.8% exercise 3 or more times a week. According to health status, respondents were approximately equal, with those who did not report chronic diseases – 47.6%, and 52.4% of participants reported having chronic diseases.

5. Psychometric characteristics and structural organization of the tools used

To establish the factor structure and internal consistency of the questionnaires and scales used in this study, exploratory factor analysis by the method of the main components and orthogonal rotation by the method of Varimax with Kaiser normalization was applied. The results are presented in Table 5. From the data obtained, it can be seen that the scales included in the study demonstrate good levels of internal consistency. The α values range from 0.911 to 0.304. These results provide the necessary certainty for further work and analysis of the results.

Table 5: Coefficients of internal consistency of scales

Rocks	Number of statements	Cronbach's Alpha (α)
Eating Behavior Questionnaire		
Unhealthy eating	5	0,713
Healthy eating	5	0,791
Teruel's Questionnaire for Orthorexia		
Healthy orthorexia	8	0,836
Orthorexia nervosa	6	0,815
Social orthorexia	3	0,558
Dutch Eating Behavior Questionnaire		
Emotional eating	5	0,793
Restricted eating	5	0,740
Binge overeating	6	0,865
Depressive symptoms, anxiety and stress		
Depressive symptoms	5	0,753
Anxiety	5	0,718
Stress	5	0,851
Adverse childhood experiences Questionnaire		
Physical abuse	5	0,618
Sexual abuse	4	0,781
Family dysfunction	5	0,689
Collective violence	3	0,687
Bullying	3	0,656
Community violence	2	0,572
Physical neglect	2	0,304
Physical violence with an object	2	0,521
Emotional neglect	2	0,512
Emotional Regulation Scale		
Cognitive reappraisal	7	0,771
Emotional suppression	5	0,721
Body Attitudes Questionnaire		
Appearance evaluation	7	0,911
Weight preoccupation	4	0,740
Life Satisfaction scale	5	0,881
Resilience Scale	6	0,859
Short version of the big 5 personality traits questionnaire	10	0,607

6. Verification of working hypotheses and discussion of results

Pilot qualitative research

The pilot study consisted of 13 participants between the ages of 24 and 41, 7 of which were women and 6 were men. Participants were interviewed live and via online video meeting. The interviews were conducted in Bulgarian, recorded and then analyzed. During the interviews, notes were taken, which were then taken into account in the analysis. The data are transcribed, analyzed and presented using thematic content analysis, comparative techniques are also used. Every data element received is analyzed. The participation of the participants in the study is voluntary and unpaid. Each of them is informed in advance that the content of the interview will be recorded and will be used only for scientific purposes, and their written consent for this has been taken.

The results show that a large part of the respondents find a connection between the family environment, adverse experiences in their childhood and their eating patterns in adulthood.

An equal number of respondents report the presence of a healthy and unhealthy eating pattern – 30%. Another 40% share patterns that include both home-cooked fresh food and too much meat, white bread, fried and sugary foods, which reflect a rather unhealthy eating pattern. These results reflect similar trends with data from the 2020 National Survey of Health Risk Factors among the Population in Bulgaria, which indicate worrying trends in nutrition among Bulgarians - low frequency of consumption of whole grain bread, fish, dairy products, nuts and other whole grains. At the same time, high consumption of white bread, meat and sausages is reported. In contrast to respondents' responses, which reflect eating trends in the 1980s and 1990s, modern data report growing unhealthy trends in children - the daily intake of highly processed foods such as chocolate products, fried and extruded foods and snacks is increasing. There was also an increase in the daily use of sugary soft drinks in children aged 10-18 and the daily use of energy drinks in adolescents aged 14-18. Some positive results are also reported, such as high consumption of fresh fruits and vegetable fats, high consumption of legumes, as well as a gradual decline in the consumption of fried foods and snacks in adults (NCPHA, 2020).

In terms of eating patterns, half of the respondents noted overeating, binge eating and emotional eating as prevalent. These findings are also supported by other studies in Bulgarian context, which confirm that with age, there is an increase in overeating as a result of negative emotions (Pandurova, 2023). A possible explanation for this is that adulthood is associated with increased psychosocial stress as a result of a number of life responsibilities, which is a prerequisite for an increase in negative emotionality and a subsequent change in eating behavior and/or emotional eating (Gariepy, G., et al., 2010; Brumpton, B., et al., 2013)

Overall, all interviewees found a link between traumatic childhood events and changes in their eating behaviors, with three of them reporting that these patterns continue into adulthood. There are also trends for eating cessation, overeating, as well as alternating between the two. These results are consistent with other studies on youth eating patterns, which have found that decreased appetite is a typical response to stress (van Strien & Oosterveld, 2008). Other research, on the other hand, shows that more than 60% of children aged 5-13 years report overeating in response to emotional states and mood swings (Shapiro et al, 2007), taking into account a moderating effect of emotional regulation and body image on emotional eating and overweight (Shriver et al., 2019; Shriver et al., 2020). Together with the respondents' responses, these findings confirm the trend that in moments of mental and emotional stress in childhood, eating behaviors can be formed that remain as models for coping with stress in adulthood.

In terms of adverse childhood experiences, half of the respondents reported that they had experienced more than 4 adversities, and the remaining 50% less than 4 adverse experiences, with the most common ACEs representing various types of family dysfunction such as domestic violence, psychological, emotional and verbal violence and a combination of them, parental divorce and a family member's health problem. These results are consistent with the results of our quantitative study, presented in the next section, where the most common types of adverse childhood experiences are domestic violence (71.1%), emotional neglect (61.8%), bullying (61.1%), emotional (60.2%) and physical violence (44.5%).

An interesting finding is that all respondents believe that adverse childhood experiences have an impact on their eating behaviors in adulthood, both in a positive and negative direction. Respondents share that childhood adversities have an impact on the creation of a healthy or

unhealthy eating patterns, the development of emotional eating or a decrease in appetite under stress, body and weight control, as well as personal growth.

These results are consistent with previous research that has found associations of ACEs with emotional dysregulation, anxiety, depression, as well as negative body image and low self-esteem, all of which may contribute to the development of unhealthy eating behaviors (Kaye, 2008; Briere & Scott, 2007; Dakanalis et al., 2014). On the contrary, 30% of respondents say that their adversities have contributed to personal growth, the creation of a healthy diet, which can be explained by the construct resilience. Resilient individuals possess higher levels of self-efficacy and believe in their ability to influence and control the environment (Luthar et al., 2000). These beliefs foster a proactive approach to problem-solving and achieving goals, which can help people deal with the challenges and setbacks associated with ACEs (Masten, 2014; Bonnanao, 2004; Olsson et al., 2003; Rutter, 2007).

In terms of health status, half of the respondents believe that it is related to their diet, taking into account the influence of mental stress, which affects health both directly and indirectly through eating and other health behaviors. In addition, these changes, according to several of the respondents, are expressed in overweight and obesity in the long term, as a result of unhealthy coping patterns. These results are not surprising and find support in a number of other studies that have found a link between mental stress on eating patterns and an overall effect on health (Adam & Epel, 2007; Epel et al., 2001; Danese & Tan, 2014; Dedert et al., 2010; Heppner et al., 2009; Felitti et al., 1998).

In summary, the results show that all respondents found a relationship between the family environment and their eating in terms of eating habits, everyday diet, building a healthy or unhealthy eating styles, as well as creating an emotional connection with family members. The most common adverse experiences in the family environment that affect eating behaviors are divorce in the family, domestic violence, physical or mental illness of a family member. There is also frequent parental control over eating behaviors and body image through dietary rules, meal structure and limiting messages and food rules. Eating behaviors often arise or intensify during adverse experiences and remain as an eating pattern into adulthood.

The results of the pilot study confirm our expectations for the model of the emergence and development of eating behaviors as a result of adverse childhood experiences and it was decided to proceed with quantitative verification of the hypotheses.

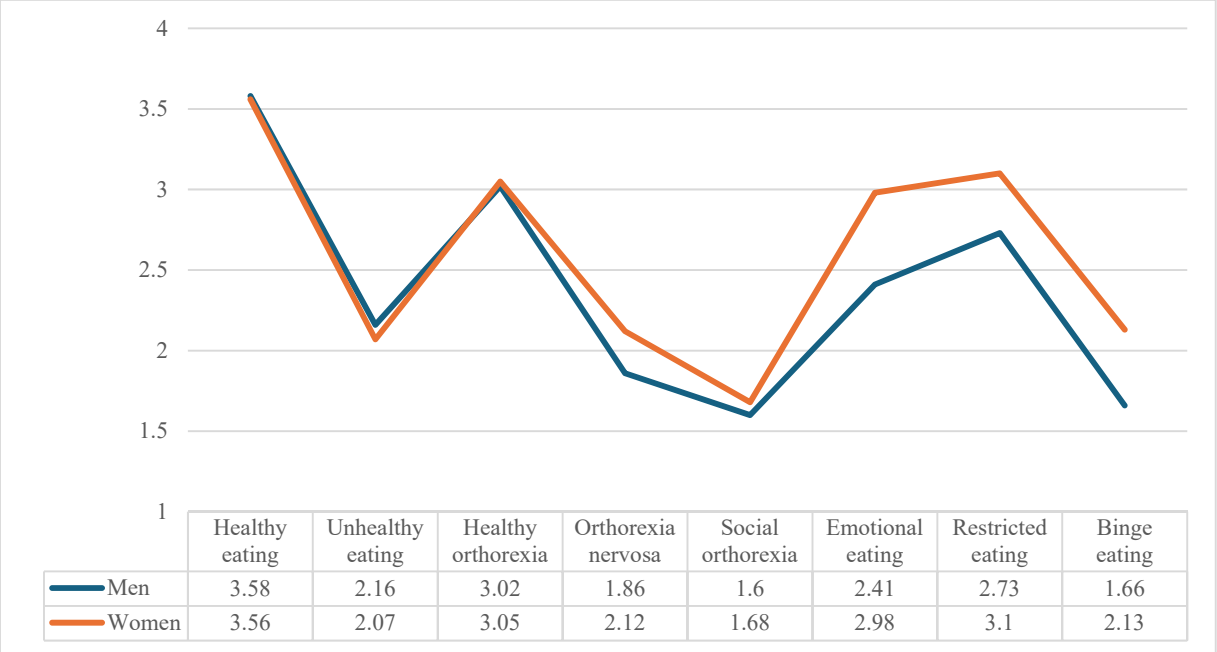
6.1 Differences in eating behavior depending on sociodemographic characteristics

The series of statistical results presented and analyzed in this part aims to examine the expectations made in Hypothesis 1. To investigate the differentiating effect of sociodemographic characteristics on the number and type of reported ACEs, t-tests for independent samples (Independent Samples Test) and one-way analysis of variance (One-Way ANOVA) were conducted, which allow the comparison of parameters (mean and variance) of more than two samples and establish the presence of statistically significant differences between them. The differentiating effect of the factors: gender, age, education, place of residence, family, economic and health status on the number and type of reported ACEs are analyzed.

Gender and age

A comparative analysis of the means on the eating behavior scales demonstrated higher levels of **orthorexia nervosa, emotional and restricted eating, and binge eating** in women. For

other types of eating behaviors, the results of the two sexes are quite identical, as illustrated in Figure 4.



	Healthy eating	Unhealthy eating	Healthy orthorexia	Orthorexia nervosa	Social orthorexia	Emotional eating	Restricted eating	Binge eating
Men	3.58	2.16	3.02	1.86	1.6	2.41	2.73	1.66
Women	3.56	2.07	3.05	2.12	1.68	2.98	3.1	2.13

Figure 4. Differences in eating behavior according to gender

From the presented results, it is evident that statistically significant differences between women and men are found on the scales of **orthorexia nervosa** ($t_{(720)}$=-3.504; p=0.000), **emotional eating** ($t_{(720)}$=-6.113; p=0.000)), **restricted eating** ($t_{(720)}$=-4.314; p=0.000) and **binge eating** ($t_{(720)}$=-5.155; p=0.000).

It was found that age significantly differentiated only the scale for **unhealthy eating** ($F_{(2,719)}$ = 6,611; p = 0,001). For the variables in which a significant difference was found, a Tukey post-hoc test was applied, which compared the groups by pairs.

The analysis showed that the arithmetic means for the first group aged 16 to 32 years were statistically significantly higher than the mean values for the third group aged 43 to 72 years.

Education

The results on the differentiating effect of education on eating behavior are introduced in Table 8.

Statistically significant differences in the mean values were found on the scales measuring **unhealthy eating** ($t_{(720)}$=2.902; p=0.005), **healthy eating** ($t_{(720)}$=-2.022; p=0.044), **social orthorexia** ($t_{(720)}$=2.065; p=0.039) and **binge eating** ($t_{(720)}$=2.994; p=0.003).

Participants with lower education level tended to eat less healthy, as well as to show signs of social orthorexia and binge eating, compared to participants with higher education level. Higher mean values on the scale for healthy eating were reported in people with higher education.

Place of residence

In the present study, the place of residence differentiated significantly only the **social orthorexia scale** ($t_{(720)}$ = 3.058; p = 0.002). The results reported a tendency for participants living outside the capital to demonstrate higher levels of social orthorexia.

Marital status

Marital status is a differentiating factor only for **healthy eating** ($t_{(720)}$=2.770; p=0.006). The results report a tendency for participants who reported are in a relationship to eat healthier.

Economic status

The comparative analysis of the mean values on the scales for eating behavior does not register a differentiating effect of economic status on the studied variables.

Health status

In terms of health status, chronic disease is a differentiating factor for **unhealthy eating** ($t_{(720)}$=-2.081; p=0.038), **healthy orthorexia** ($t_{(720)}$=1.988; p=0.047), **orthorexia nervosa** ($t_{(720)}$=-2.663; p=0.008), **emotional eating** ($t_{(720)}$=-4.084; p=0.000), **restricted eating** ($t_{(720)}$=-2.613; p=0.009) and **binge eating** ($t_{(720)}$=-4.043; p=0.000). There is a tendency for people who suffer from a chronic disease to eat less healthy and to demonstrate more orthorexic behavior, emotional and restricted eating, as well as binge eating (Table 6).

Conversely, people who do not suffer from chronic disease have higher values for healthy orthorexia.

Table 6. Differentiating effect of health status on eating behavior

Dependent variable	T-test for independent samples				
	Chronic disease	N	X	SD	t (720)
Unhealthy diet	No	344	2.01	0.798	**-2.081***
	Yes	**378**	**2.14**	**0.857**	
Healthy orthorexia	**No**	**344**	**3.09**	**0.553**	**1.988***
	Yes	378	3.00	0.603	
Orthorexia nervosa	No	344	2.02	0.677	**-2.663****
	Yes	**378**	**2.15**	**0.706**	
Emotional eating	No	344	2.77	0.861	**-4.084****
	Yes	**378**	**3.03**	**0.854**	
Restricted eating	No	344	2.97	0.794	**-2.613****
	Yes	**378**	**3.13**	**0.802**	
Binge eating	No	344	1.94	0.801	**-4.043****
	Yes	**378**	**2.19**	**0.859**	

BMI

The results obtained for the effect of groups according to BMI: underweight, normal weight, overweight and obesity on the scales measuring eating behavior (diet and patterns) are presented in Figure 5 and Figure 6. Several trends can be implicated from the graphical presentation. The visualization of the data illustrates that with the decrease of healthy eating an increase in weight is reported. Unhealthy eating is highest in obese people and the lowest in underweight and normal people. As for healthy orthorexia scale, a decrease in the scale is reported with the increasing of weight, which is one of the expectations in Hypothesis 2.

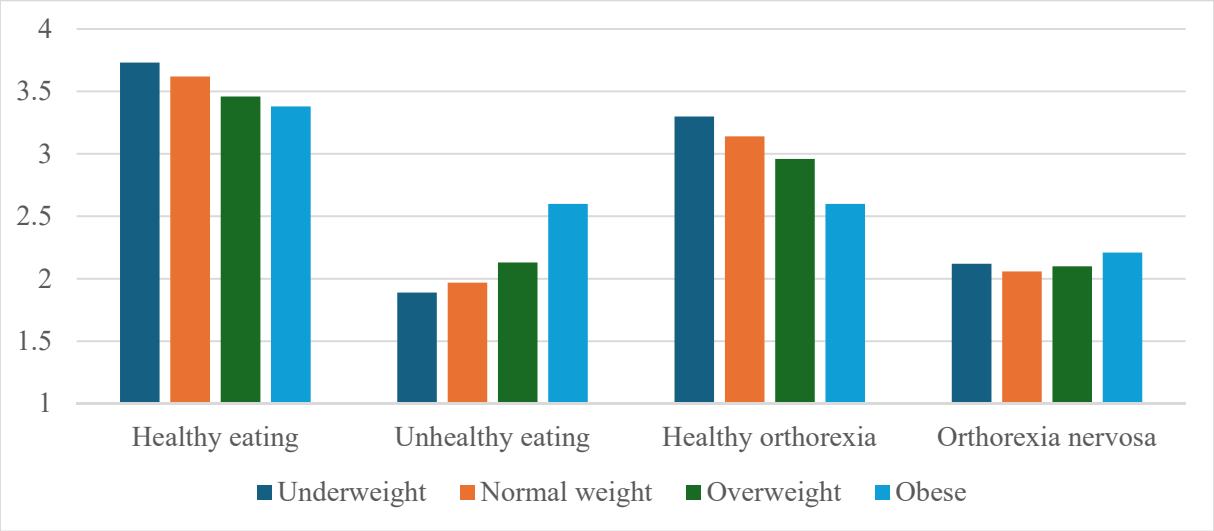


Figure 5: Differences in eating behavior according to BMI

In order to examine the differences, a one-way analysis of variance (One Way ANOVA) was performed. The procedure registers that body mass index is a differentiating factor for **unhealthy eating**, **healthy orthorexia**, **emotional eating**, **restricted eating** and **binge eating**.

For **unhealthy eating** ($F_{(3,718)}$=16,039; p=0,000), the post-hoc test registered a significant statistical difference between the mean values for the groups of obese people, compared to the underweight, normal weight and overweigh groups. As expected, the results showed that obese respondents had a less healthy diet, compared to the subjects with underweight, normal and overweight.

With regard to **healthy orthorexia** ($F_{(3,718)}$=27,334; p=0,000), similarly, the arithmetic mean for the obese group is significantly different from the arithmetic mean values of all other groups - the respondents with underweight, overweight and normal weight. Also, a significant difference was found between overweight people and those with underweight and normal weight. No statistical significance was registered only between the groups with underweight and normal weight. There is a tendency for people with normal or underweight to have healthier habits and behaviors compared to overweight and obese participants.

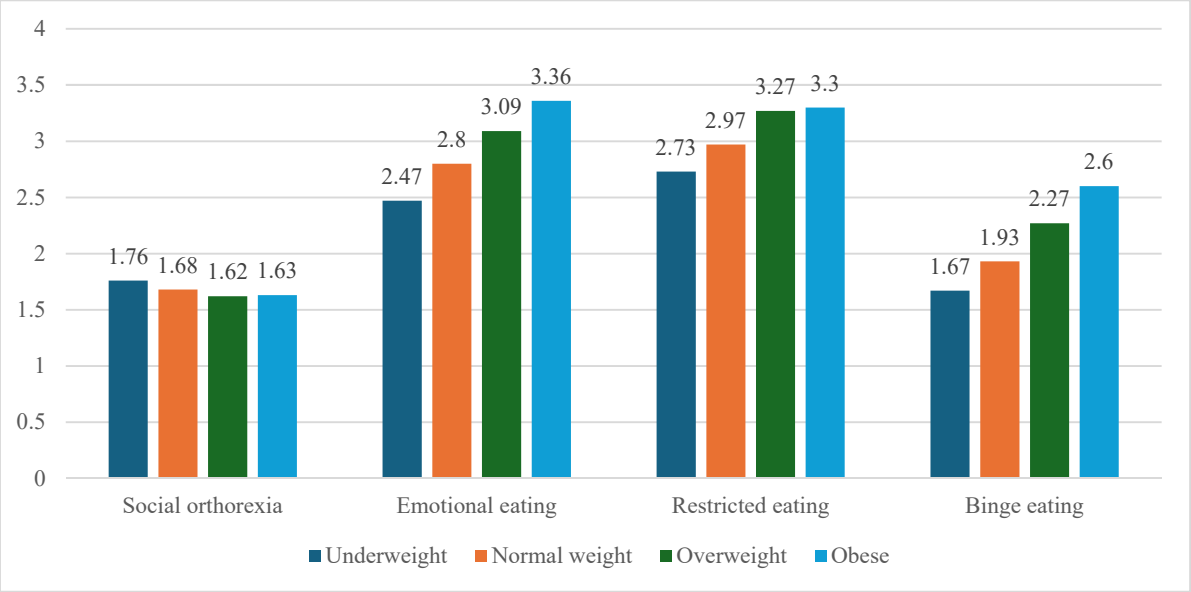


Figure 6: Differences in eating behavior according to BMI

BMI significantly differentiated the subjects in terms of **emotional eating** ($F_{(3,718)}$= 17,182; p=0,000). A statistically significant difference was found between the mean values of obese respondents, where the highest levels were registered, compared to the groups of people with normal and underweight. Also, the level of emotional eating in overweight respondents was significantly higher than subjects with normal and underweight. There was no significant difference between overweight and obese participants.

For **restricted eating** ($F_{(3,718)}$=11,013; p=0,000), the results were similar. The analysis revealed a significant difference between the obese group compared to all other groups, as well as between the overweight group and all other groups. There was no significant difference between overweight and obese participants. Lower levels are registered in individuals with under and normal weight, indicating lower cognitive control over food intake in these groups.

With regard to the scale for **binge eating** ($F_{(3,718)}$=24,002; p=0,000), the results are similar to those for unhealthy, emotional and restricted eating scale. Significant differences were reported between the group of obese subjects and the other three groups: underweight, normal weight and overweight. The overweight group is significantly different from all the others. No significant difference was found only between the underweight and normal weight groups. The results show a tendency for obese and overweight people to show more signs of binge eating compared to people who are underweight or normal weight.

There is a general tendency that with an increase in BMI lower levels healthy eating and higher levels of unhealthy eating behaviors related to emotional, restricted and binge eating are observed.

6.2 Differences in eating behavior depending on ACEs

Total number of ACEs

As we discussed in the first chapter of this study, a history of four or more adverse childhood experiences is associated with a significantly higher risk of health-risk behaviors. Numerous studies have compared the risk of individuals with up to three ACEs and individuals

with four or more ACEs for developing different health behaviors, eating disorders, and health conditions. The present analyses follow these distinctions established in the literature on ACEs.

It was found that the higher number of ACEs significantly differentiated only the scale for unhealthy eating ($T_{(720)}$ = -2.264; p = 0.024). The analysis showed that people who experienced four or more ACEs demonstrated higher levels of unhealthy diets compared to people with up to 3 ACEs.

Emotional neglect

Emotional neglect is a differentiating factor for **orthorexia nervosa** ($t_{(720)}$=2.187; p=0.029), **emotional eating** ($t_{(720)}$=2.523; p=0.012) and **binge eating** ($t_{(720)}$=2.737; p=0.006). The results report a tendency for participants who experienced emotional abuse in the current sample to demonstrate lower levels of emotional eating scales, binge eating and orthorexia nervosa (Table 7).

Table 7. Differentiating effect of Emotional Neglect on Eating Behavior

Dependent variable	T-test for independent samples				
	Emotional neglect	N	X	SD	t (720)
Orthorexia nervosa	**No**	**276**	**2.16**	**0.699**	**2.187***
	Yes	446	2.04	0.690	
Emotional eating	**No**	**276**	**3.01**	**0.810**	**2.523***
	Yes	446	2.84	0.896	
Uncontrolled overeating	**No**	**276**	**2.17**	**0.841**	**2.737****
	Yes	446	2.00	0.834	

Physical neglect

The results on the differentiating effect of physical neglect on eating behavior are presented in Table 8.

Significant differences in the responses of the studied individuals who experienced physical neglect were registered on the scales of **orthorexia nervosa** ($t_{(720)}$=-4.414; p=0.000) and **binge eating** ($t_{(720)}$=2.233; p=0.026).

The results report a tendency for participants who experienced physical neglect in the current sample to demonstrate higher levels on the orthorexia nervosa and binge eating scales.

Table 8. Differentiating effect of Physical Neglect on Eating Behavior

Dependent variable	T-test for independent samples				
	Physical Neglect	N	X	SD	t (720)
Orthorexia nervosa	Not	613	2.04	0.687	**-4.414****
	Yes	**109**	**2.36**	**0.685**	
Binge eating	Not	613	2.04	0.832	**-2.233***
	Yes	**109**	**2.23**	**0.870**	

Alcohol/drug abuse and convicted family member

With regard to family dysfunction, the presence of a parent/caretaker who has abused alcohol/drugs and the presence of an incriminated family member are not differentiating factors **for any of the eating behaviour scales.**

Mental illness in the family

It was found that the presence of mental illness in the family significantly differentiated only the scale for **restricted eating** ($t_{(720)}$ = -2.264; p = 0.024). The analysis showed that people who experienced this type of family dysfunction demonstrated lower values of restricted eating compared to people who were not exposed to this type of ACEs.

Loss of a parent, divorce

In the current study, the parent/divorce factor significantly differentiated only the **healthy eating scale** ($t_{(720)}$ = 2.478; p = 0.013). The analysis showed that people who experienced this type of family dysfunction demonstrated lower values on the healthy eating scale compared to people who were not exposed to this type of ACEs.

Witnessing domestic violence

The results on the differentiating impact of domestic violence on eating behavior are presented in Table 9.

Significant differences in the responses of the subjects who experienced domestic violence were registered on the scales measuring **orthorexia nervosa** ($t_{(720)}$=-2.716; p=0.007), **emotional eating** ($t_{(720)}$=-2.923; p=0.004), **restricted eating** ($t_{(720)}$=-2.808; p=0.005) and **binge eating** ($t_{(720)}$=-2.804; p=0.005) .

The results reveal a tendency for participants who witnessed domestic violence in the current sample to demonstrate higher levels on the scales for orthorexia nervosa, emotional and organic eating, and uncontrolled binge eating.

Table 9. Differentiating effect of Domestic Violence on Eating Behavior

Dependent variable	T-test for independent samples				
	Home violence	N	X	SD	t (720)
Orthorexia nervosa	No	209	1.98	0.664	**-2.716***
	Yes	**513**	**2.13**	**0.703**	
Emotional eating	No	209	2.76	0.857	**-2.923***
	Yes	**513**	**2.97**	**0.865**	
Restricted eating	No	209	2.92	0.827	**-2.808***
	Yes	**513**	**3.11**	**0.785**	
Binge eating	No	209	1.93	0.790	**-2.804***
	Yes	**513**	**2.12**	**0.855**	

Emotional abuse

The experience of emotional abuse in childhood is a differentiating factor on the scales measuring **emotional eating** ($t_{(720)}$=- 2.391; p=0.017), **restricted eating** ($t_{(720)}$=-2.602; p=0.009) and **binge eating** ($t_{(720)}$= -2.872; p=0.004). The results on the differentiating effect of domestic violence on eating behavior are presented in Table 10.

The results report a tendency for participants who experienced emotional abuse in the current sample to demonstrate higher levels on the scales for emotional, restricted and binge eating.

Table 10. Differentiating effect of Emotional Abuse on Eating Behavior

Dependent variable	T-test for independent samples				
	Emotional violence	N	X	SD	t (720)
Emotional eating	No	287	**2.81**	0.881	**-2.391***
	Yes	435	**2.97**	0.853	
Restricted eating	No	287	**2.96**	0.823	**-2.602****
	Yes	435	**3.12**	0.781	
Binge eating	No	287	**1.96**	0.827	**-2.872****
	Yes	435	**2.14**	0.843	

Physical violence

The results for physical violence are similar with a significant differentiating effect on the scales measuring **emotional eating** ($t_{(720)}$=-2.658; p=0.008), **restricted eating** ($t_{(720)}$= -2.672; p=0.008) and **binge eating** ($t_{(720)}$= -2.812; p=0.005). The results on the differentiating effect of physical violence on eating behavior are presented in Table 11.

The results reveal a tendency for participants who experienced physical violence in the current sample to demonstrate higher levels on the emotional, restricted and binge eating scales.

Table 11. Differentiating effect of Physical Violence on Eating Behavior

Dependent variable	T-test for independent samples				
	Physical violence	N	X	SD	t (720)
Emotional eating	No	401	**2.83**	0.872	**-2.658****
	Yes	321	**3.00**	0.852	
Restricted eating	No	401	**2.98**	0.790	**-2.672****
	Yes	321	**3.14**	0.807	
Binge eating	No	401	**1.99**	0.843	**-2.812****
	Yes	321	**2.16**	0.828	

Sexual violence

The results on the differentiating influence of sexual violence on eating behavior are presented in Table 12.

Significant differences in the responses of the subjects who experienced physical neglect were registered on the scales measuring **orthorexia nervosa** ($t_{(720)}$=-2.716; p=0.007), **emotional eating** ($t_{(720)}$=-2.923; p=0.004), **restricted eating** ($t_{(720)}$=-2.808; p=0.005) and **binge eating** ($t_{(720)}$=-2.804; p=0.005) .

The results report a tendency for participants who experienced sexual violence in the current sample to demonstrate higher levels on the scales for orthorexia nervosa, emotional and organic eating, and binge eating.

Table 12. Differentiating effect of Sexual Violence on Eating Behavior

Dependent variable	T-test for independent samples				
	Sexual violence	N	X	SD	t (720)
Orthorexia nervosa	Not	569	**2.04**	0.673	**-3.418****
	Yes	153	**2.26**	0.749	
Emotional eating	Not	569	**2.87**	0.865	**-2.107***
	Yes	153	**3.04**	0.863	
Restricted eating	Not	569	**3.02**	0.794	**-2.135***
	Yes	153	**3.18**	0.817	
Binge eating	Not	569	**2.03**	0.834	**-2.291***
	Yes	153	**2.20**	0.851	

Bullying

In the current study, the bullying factor significantly differentiated only **the unhealthy eating scale** ($t_{(720)}$ = 2.478; p = 0.013. The analysis showed that people who experienced this type of ACE showed higher levels unhealthy eating compared to people who were not exposed to this type of ACE.

Witnessing Community Violence, Collective Violence

In terms of the experience of community violence and collective violence, the results show that the experience of these ACEs does not differentiate any of the eating behavior scales.

6.3 Correlations between ACEs, psychological correlates and eating behavior

Total number of ACEs

Significant correlations are found between the total number of ACEs, the total number of experienced abuse and the constructs investigated (Table 13).

Table 13: Relationship between total number of ACEs, psychological factors and eating behaviour

	Total number of ACEs	**Total number of abuse** (domestic violence, emotional, physical, sexual abuse)
Eating behavior		
Emotional eating	0.037	**0.107****
Restricted eating	0.043	**0.111****
Binge eating	0.079	**0.131****
Psychological factors		
Stress	**0.172****	**0.194****
Anxiety	**0.179****	**0.182****
Depression	**0.196****	**0.188****
Body relations		
Weight preoccupation	**0.144****	**0.205****
Big 5 personality traits		
Neuroticism	**0.104****	**0.187****
Conscientiousness	-0.050	-0.062
Agreeableness	**-0.107****	-0.086*
Health status and life satisfaction		
Health status	**0.101****	**0.110****
Life satisfaction	**-0.212****	**-0.221****

** $p \leq 0{,}01$; * $p \leq 0{,}05$;

Emotional and physical neglect

The significant correlations between emotional and physical neglect, psychological correlates and eating behavior are presented in Table 14.

Table 14. Relationship between childhood neglect, psychological factors, and eating behavior

	Emotional neglect	**Physical neglect**
Eating behavior		
Orthorexia nervosa	-0.081*	**-0.162****
Binge eating	**-0.101****	-0.083*
Psychological factors		
Stress	**-0.146****	0.085*
Anxiety	**-0.128****	-0.084**
Depression	**-0.153****	**-0.114****
Big 5 personality traits		
Neuroticism	**-0.131****	0.047
Conscientiousness	**0.104****	-0.010
Health status and life satisfaction		
Health status	-0.047	**0.117****
Life satisfaction	**-0.149****	**-0.148****

*** p ≤ 0,01; * p ≤ 0,05;*

Family dysfunction

The significant correlations between different types of family dysfunction, psychological correlates and eating behavior are presented in Table 15.

Table 15: Relationship between family dysfunction in childhood, psychological factors and eating behavior

	Alcoholism/Drugs	**Psych. illness in the family**	**A convicted family member**	**Divorce/Loss of a Parent**
Psychological factors				
Stress	**0.105****	**0.125****	0.022	0.075*
Anxiety	**0.075***	**0.184****	-0.022	0.079*
Depression	**0.134****	**0.162****	-0.027	0.072
Big 5 personality traits				
Agreeableness	-0.076*	**-0.109***	-0.001	0.009
Openness	**0.108**	-0.012	-0.078*	-0.011
Health status and overall satisfaction				
Life satisfaction	**-0.126****	**-0.113****	0.037	-0.096*

*** p ≤ 0,01; * p ≤ 0,05*

Domestic and peer violence

The results of the correlation analysis reveal the most statistically significant associations of the studied constructs are different types of abuse in childhood. The significant relationships are presented in Table 16.

Table 16: Relationship between childhood violence, psychological factors and eating behaviour

	Witness of the domestic violence	**Emotional abuse**	**Physical violence**	**Sexual violence**	**Bullying**
Eating behavior					
Orthorexia nervosa	**0.101****	0.039	0.044	**0.126****	-0.009
Emotional eating	**0.108****	-0.089*	0.099*	0.078*	-0.034
Restricted eating	**0.104****	-0.097*	0.099*	0.079*	-0.027
Binge eating	**0.101****	**0.106****	**0.104****	0.085*	0.016
Psychological factors					
Stress	**0.137****	**0.173****	0.088*	0.066	**0.138****
Anxiety	**0.101***	**0.162****	**0.117****	0.074*	**0.110****
Depression	**0.133****	**0.146****	**0.106****	0.090*	**0.111****
Body relations					
Weight Preoccupation	**0.172****	**0.151****	0.099*	**0.103****	**0.119****
Emotional regulation					
Cognitive reappraisal	-0.025	-0.049	-0.022	0.000	**-0.103****
Big 5 personality traits					
Neuroticism	**0.126****	**0.147***	0.083*	0.021	**0.101***
Conscientiousness	-0.007	-0.079*	**-0.112****	-0.007	-0.086*
Agreeableness	-0.075*	**-0.115***	-0.085*	-0.011	-0.081*
Health status and life satisfaction					
Life satisfaction	**-0.141****	**-0.133****	**-0.173****	-0.097*	**-0.143****

** $p \leq 0,01$; * $p \leq 0,05$

6.4 Relationships between psychological correlates and eating behavior

The results of the correlation analysis reveal that the relationships between psychological correlates and eating behavior patterns are the strongest significant ones.

Healthy eating

The significant correlations between healthy eating and the studied constructs are presented in Table 17.

Table 17: Relationship between healthy diet, psychological factors and health status

	Healthy eating
Psychological factors	
Stress	**-0.111****
Anxiety	**-0.166****
Depression	**-0.176****
Body relations	
Appearance evaluation	**0.215****
Weight Preoccupation	**-0.137****
Emotional regulation	
Emotional suppression	**-0.117****
Big 5 personality traits	
Conscientiousness	**0.107****
Health status and life satisfaction	
Health status	**-0.209****
Life satisfaction	**0.192****

*** p ≤ 0,01; * p ≤ 0,05*

Unhealthy diet

The significant correlations between unhealthy diet, psychological correlates and health status are evident from Table 18.

Table 18: Relationship between unhealthy diet, psychological factors and health status

	Unhealthy diet
Psychological factors	
Stress	**0.143****
Anxiety	**0.175****
Depression	**0.112****
Body relations	
Appearance evaluation	**-0.253****
Emotional regulation	
Emotional suppression	**0.153****
Big 5 personality traits	
Neuroticism	**0.141****
Conscientiousness	**-0.266****
Health status and life satisfaction	
Health status	**0.220****
Life satisfaction	**-0.128****

*** p ≤ 0,01; * p ≤ 0,05*

Healthy orthorexia

The significant correlations between healthy orthorexia, psychological correlates and health status are evident from Table 19.

Table 19. Relationship between healthy orthorexia, psychological factors and health status

	Healthy orthorexia
Psychological factors	
Resilience	**0.110****
Body relations	
Appearance evaluation	**0.289****
Emotional regulation	
Cognitive reappraisal	**0.109****
Emotional suppression	**-0.109****
Big 5 personality traits	
Conscientiousness	**0.203****
Openness	**0.107****
Health status and life satisfaction	
Health status	**-0.243****
Life satisfaction	**0.144****

** $p \leq 0,01$; * $p \leq 0,0$

Orthorexia nervosa

The significant correlations between orthorexia nervosa, psychological correlates and health status are evident from Table 20.

Table 20. Relationship between orthorexia nervosa, psychological factors and health status

	Orthorexia nervosa
Psychological factors	
Stress	**0.262****
Anxiety	**0.295****
Depression	**0.260****
Resilience	**-0.259****
Body relations	
Appearance evaluation	**-0.202****
Weight preoccupation	**0.464****
Emotional regulation	
Emotional suppression	**0.190****
Big 5 personality traits	
Neuroticism	**0.239****
Extraversion	**-0.111****
Health status and life satisfaction	
Health status	**0.181****
Life satisfaction	**-0.150****

** $p \leq 0,01$; * $p \leq 0,05$

Emotional eating

The significant correlations between emotional eating, psychological correlates and health status are evident from Table 21.

Table 21. Relationship between emotional nutrition, psychological factors and health status

	Emotional eating
Psychological factors	
Stress	**0.218****
Anxiety	**0.212****
Depression	**0.107****
Resilience	**-0.127****
Body relations	
Appearance evaluation	**-0.220****
Weight preoccupation	**0.475****
Big 5 personality traits	
Neuroticism	**0.183****
Health status and life satisfaction	
Health status	**0.187****
Life satisfaction	**-0.102****

*** p ≤ 0,01; * p ≤ 0,05*

Restricted eating

The results of the analysis of the relationships between cognitively restricted eating and the constructs included in the study show weaker interaction associations of this eating pattern compared to emotional eating, orthorexic and binge eating (Table 22).

Table 22. Relationship between restricted nutrition, psychological factors and health status

	Limited nutrition
Psychological factors	
Stress	**0.198****
Anxiety	**0.127****
Body relations	
Appearance evaluation	**-0.157****
Weight preoccupation	**0.593****
Big 5 personality traits	
Neuroticism	**0.154****

*** p ≤ 0,01; * p ≤ 0,05*

Binge eating

The significant correlations between binge eating, psychological correlates and health status are presented from Table 23.

Table 23. Correlation between binge eating, psychological factors and health status

	Uncontrolled overeating
Psychological factors	
Stress	**0.295****
Anxiety	**0.316****
Depression	**0.247****
Resilience	**-0.244****
Body relations	
Appearance evaluation	**-0.373****
Weight preoccupation	**0.531****
Emotional regulation	
Emotional suppression	**0.188****
Big 5 personality traits	
Neuroticism	**0.294****
Conscientiousness	**-0.193****
Health status and life satisfaction	
Health status	**0.328****
Life satisfaction	**-0.208****

*** $p \leq 0,01$; * $p \leq 0,05$*

The results of correlation analyses show that there are many correlations between eating behavior and different levels of psychological correlates. Most correlation coefficients are low, as well as a few moderate ones. These findings are a prerequisite for assuming that more factors have an impact on the phenomena under study and a basis for the next statistical procedure in the study. The eco-bio-developmental model lays down various correlates that have a potential effect on eating behavior, satisfaction and health status. In order to verify the hypothesis of their prognostic function, a step-by-step regression analysis was carried out. The statistical procedure by which the verification of the last 5th Hypothesis can be carried out involves the construction of a regression equation with dependent and independent variables.

6.1 Effect of ACEs and psychological correlates on eating behavior

Initially, a step-wise regression analysis was performed with a dependent variable of eating behavior (healthy, unhealthy, healthy orthorexia, orthorexia nervosa, social orthorexia, emotional, restricted, binge eating). As independent variables, all factors operationalized in the present study that can theoretically be predictors of eating behavior (left column of the model) are set in order to validate their effect on the dependent variable (Fig. 7).

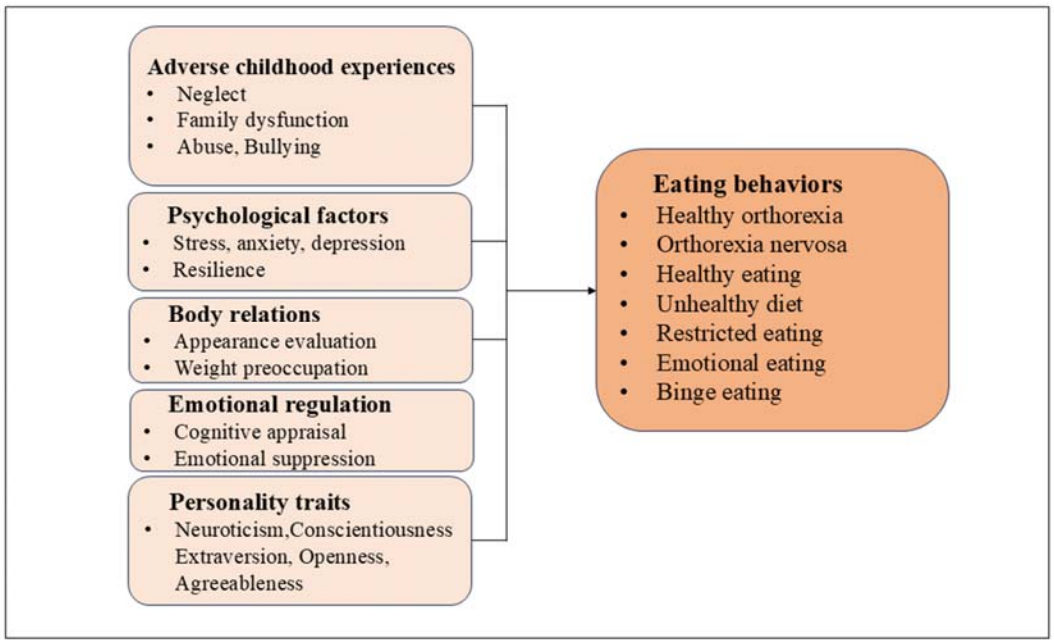


Figure 7: Psychological predictors of eating behaviors

Unhealthy diet

The analysis found that the combination of the variables: ***Appearance evaluation*** (β=-0.216, p=0.000), ***Conscientiousness*** (β=-0.208, p=0.000), ***Emotional Suppression*** (β=0.108, p=0.003), ***Bullying*** (β=-0.089, p=0.013) for the prediction of unhealthy eating was statistically significant ($F_{(4.676)}$= 28,547, p=0.000). The value of the adjusted coefficient of determination is ΔR2 = 0.139. This shows that 13.9% of the measurements in healthy eating can be explained by the regression model presented (Fig. 8).

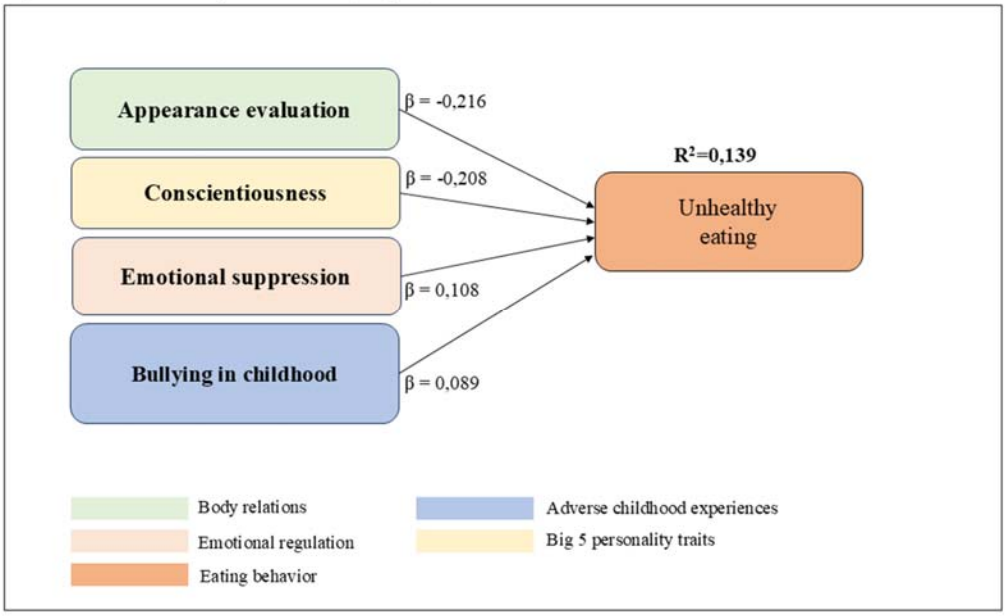


Figure 8: Significant effect of independent variables on unhealthy eating

Healthy orthorexia

The analysis shows that in the final model of healthy orthorexia, significant predictors are: ***Appearance evaluation*** (β=0.292, p=0.000), ***Conscientiousness*** (β=-0.134, p=0.000), ***Weight preoccupation*** (β=0.104, p=0.006), ***Openness*** (β=0.088, p=0.015) for prognosis of healthy orthorexia is statistically significant (F(4.676)=24.256, p=0.000). The value of the adjusted coefficient of determination is ΔR2 = 0.120. This indicates that 12% of measurements in healthy orthorexia can be explained by the regression model presented (Fig. 9).

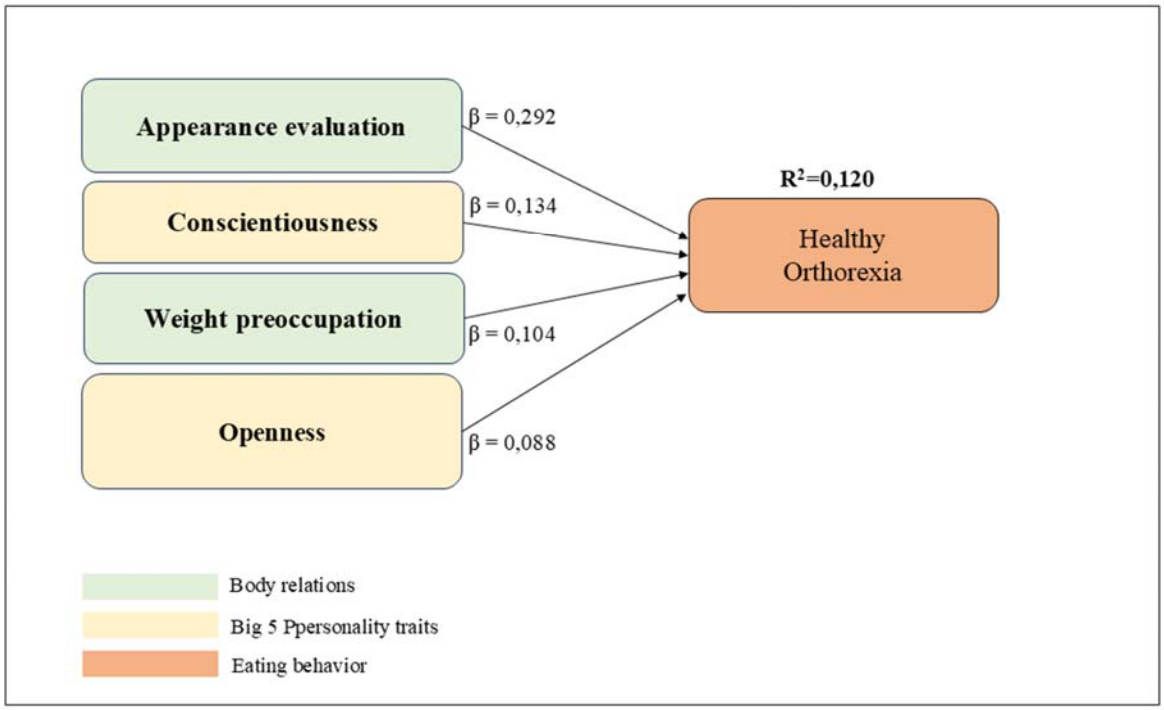


Figure 9: Significant effect of independent variables on healthy orthorexia

Orthorexia nervosa

The analysis shows that in the final model of orthorexia nervosa, significant predictors are: ***Weight*** preoccupation(β=0.397, p=0.000), ***Anxiety*** (β=0.145, p=0.000), ***Resilience*** (β=-0.109, p=0.003), ***Physical neglect*** (β=0.117, p=0.000), ***Bullying*** (β=0.109, p=0.001), ***Emotional suppression*** (β=0.085, p=0.011) and ***Sexual violence*** (β=0,077, p=0,033). The value of the adjusted coefficient of determination (Δ R2=0.294, $F_{(5.706)}$= 41.403, p=0.000) shows that 29.4% of the measurements of orthorexia nervosa can be explained by the regression model presented (Fig. 10).

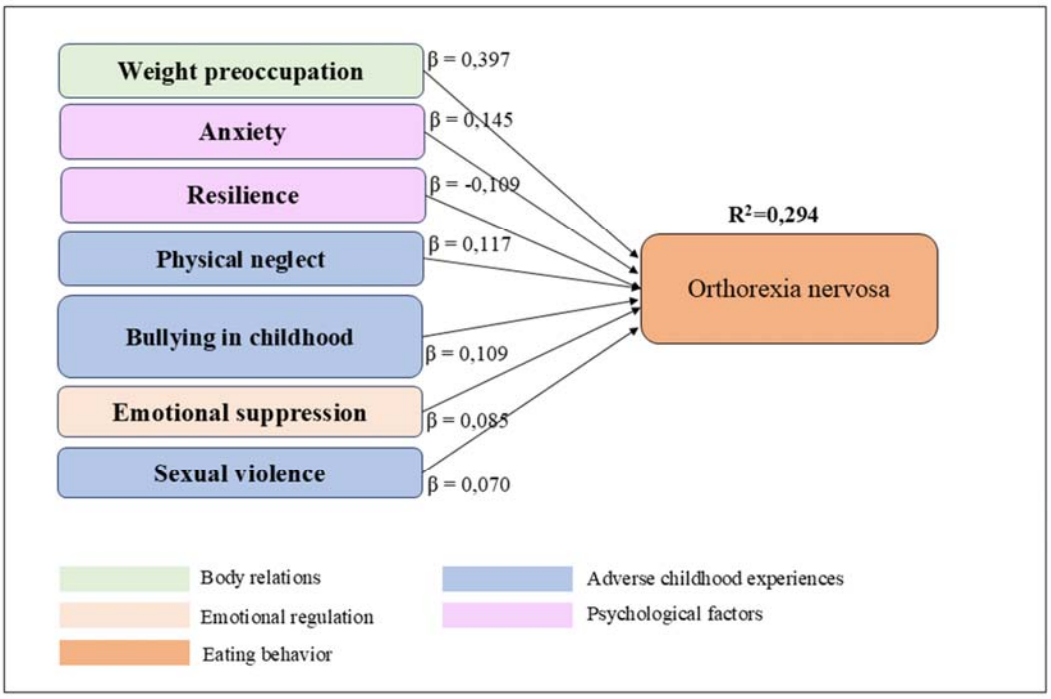


Figure 10: Significant effect of independent variables on orthorexia nervosa

Emotional eating

In terms of emotional eating, seven variables were confirmed as significant predictors: ***weight preoccupation*** (β=0.423, p=0.000), ***anxiety*** (β=0.116, p=0.000), ***bullying*** (β=-0.120, p=0.000), ***domestic violence*** (β=0.146, p=0.000), ***alcoholism or drug abuse in the family*** (β=0.090, p=0.010), ***appearance evaluation*** (β=-0.085, p=0.016) ***and extraversion*** (β=0.071, p=0.038). Their combination contributes significantly to the prediction of emotional eating ($F_{(7.673)}$ = 37.581, p= 0.000). The value of the adjusted coefficient of determination is R2=0.274. This shows that 27.4% of the changes in emotional eating for the current sample can be explained by the regression model presented (Fig. 11).

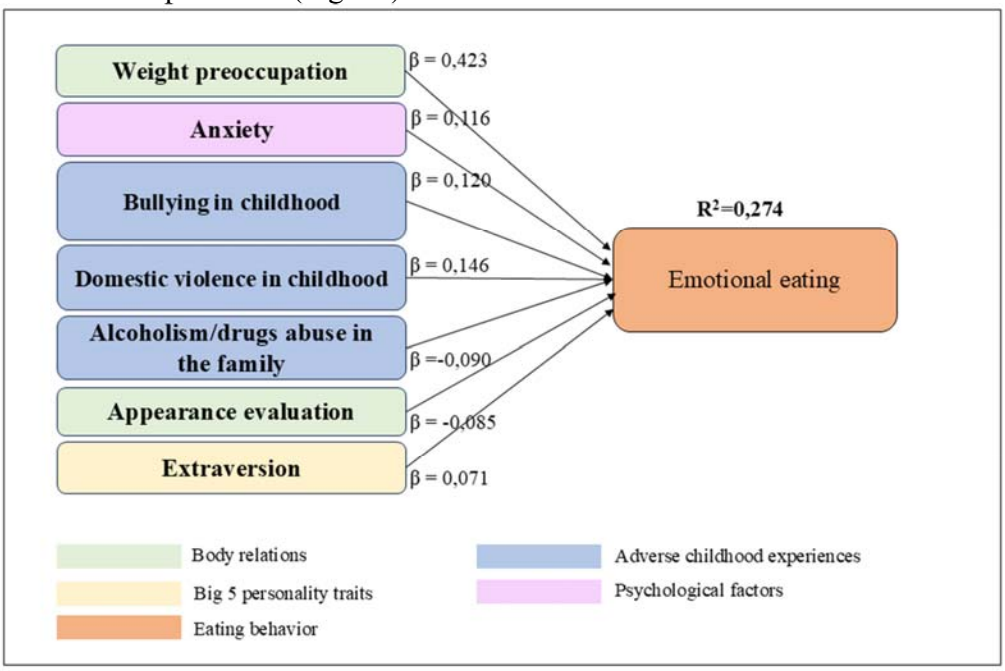


Figure 11: Significant effect of independent variables on emotional eating

Restricted eating

The regression model of cognitively restricted eating includes six variables that have been confirmed as significant predictors: ***weight preoccupation*** (β=-0.582, p=0.000***), bullying*** (β=-0.122, p=0.000), ***domestic violence*** (β=0.113, p=0.000***), mental illness in the family*** (β=-0.091, p=0.003), ***stress*** (β=0.078, p=0.013), ***and emotional suppression*** (β=-0.062, p=0.038), Their combination contributes significantly to the prediction of dietary restrictions (F(6.7674) = 75.161, p=0.000). The value of the adjusted coefficient of determination is R2=0.382. This shows that 38.2% of the changes in restricted eating can be explained by the derived statistical regression model (Fig. 12).

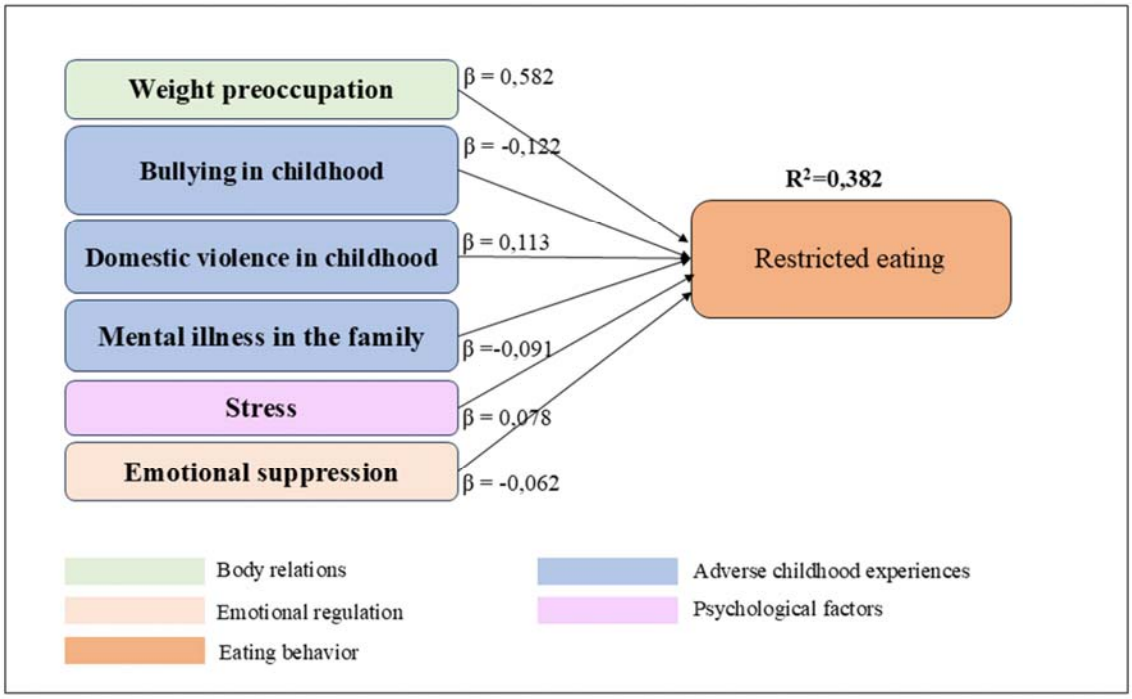


Figure 12: Significant effect of independent variables on restricted eating

Binge eating

The regression model presented in Figure 13 includes eight variables that could significantly predict binge eating ($F_{(8.713)}$= 59.535, p=0.000): ***weight preoccupation***(β=0.440, p=0.000), ***appearance evaluation***(β=-0.170, p=0.016), ***anxiety*** (β=0.114, p=0.001), ***conscientiousness (***β=-0.147, p=0.000), ***bullying in childhood*** (β=-0.077, p=0.009)***, neuroticism*** (β=0.110, p=0.003), ***emotional suppression*** (β=0.078, p=0.012) ***and extraversion*** (β=0.070, p=0.029). The value of the adjusted coefficient of determination is R2=0.394. This shows that 39.4% of the changes in binge eating can be explained by the constructed regression model.

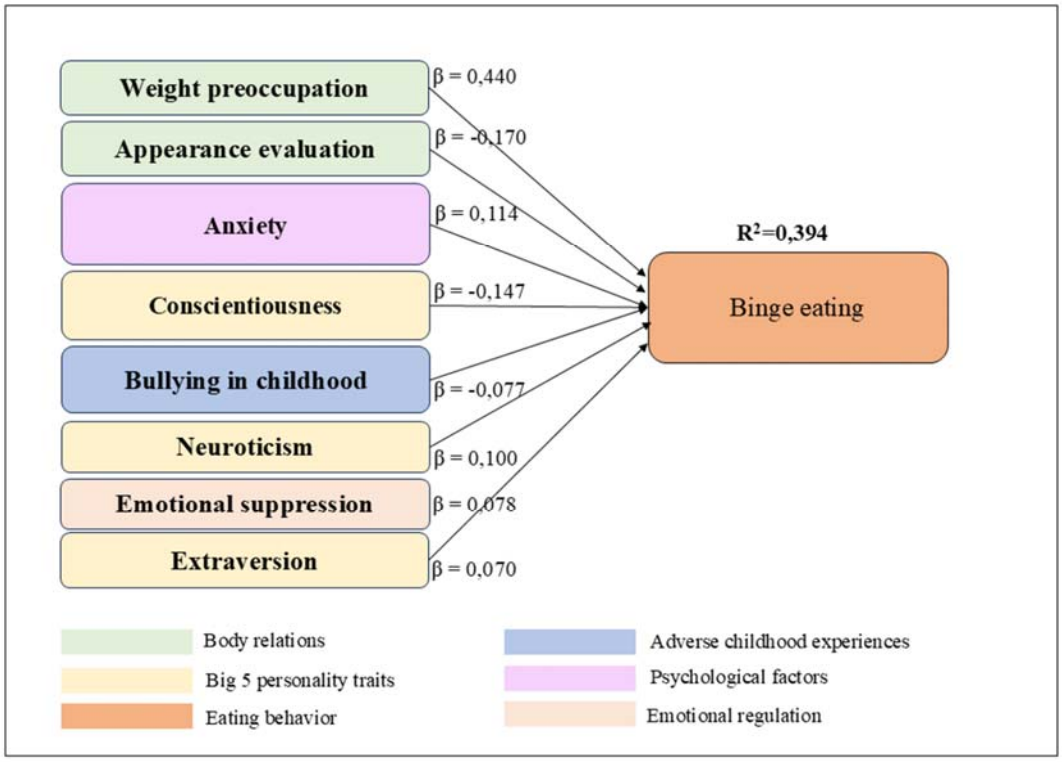


Figure 13: Significant effect of independent variables on binge eating

Effect of psychological correlates and eating behavior on life satisfaction and health status

A regression analysis was also used to check the effect of psychological correlates and eating behavior on health status and life satisfaction. A multiple regression analysis was performed with a dependent variable of health status and life satisfaction, and psychological correlates and eating behavior were defined as independent (Fig. 14).

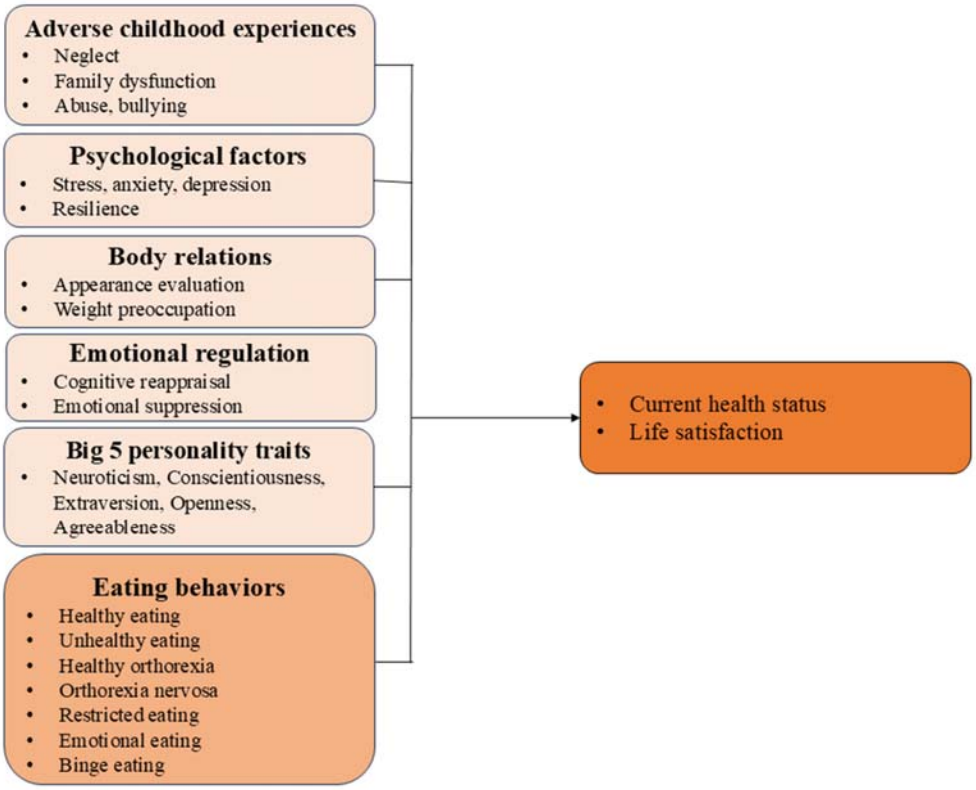


Figure 14: Predictors of health status and life satisfaction

Life satisfaction

The regression model presented in Figure 15 includes eight variables that could significantly predict life satisfaction ($F_{(8.713)}$=41.527, p=0.000): ***depression*** (β=-0.286, p=0.001), ***appearance evaluation*** (β=0.172, p=0.016), ***resilience (***β=0.123, p=0.000), ***total ACEs core*** (β=-0.123, p=0.009), ***emotional suppression*** (β=0.-088, p=0.008) ***cognitive reappraisal*** (β=0.082, p=0.012), ***emotional neglect*** (β=0.070, p=0.027) and ***healthy eating*** (β=0.067, p=0.036). The value of the adjusted coefficient of determination is R2=0.310, which shows that 31% of the changes in life satisfaction can be explained by the constructed regression model.

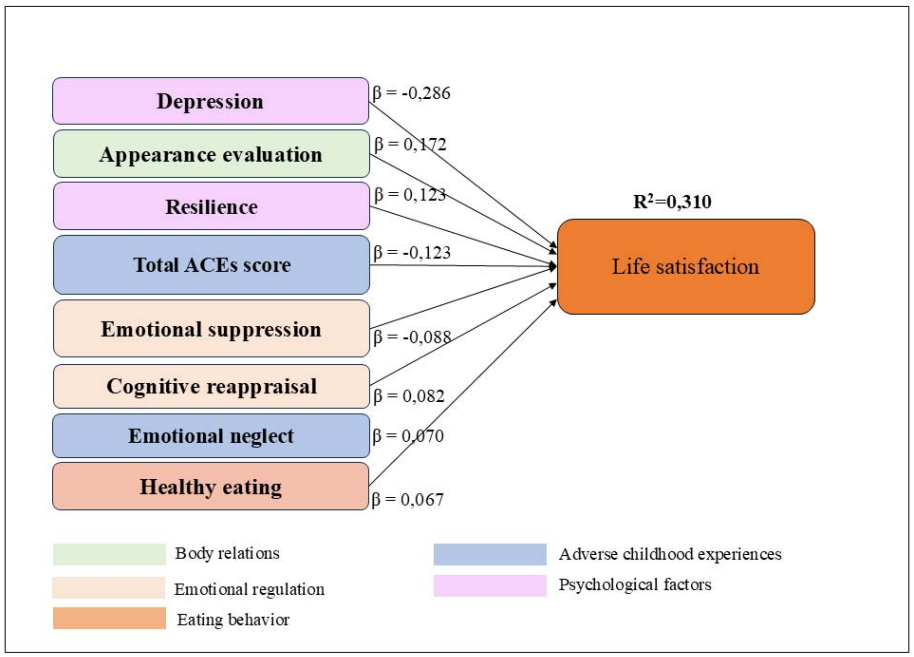


Figure 15: Significant effect of independent variables on life satisfaction

Health status

In terms of health status, seven variables were confirmed as significant predictors: ***appearance evaluation*** (β=-0.225, p=0.000), ***resilience (***β=-0.142, p=0.000), ***binge eating*** (β=0.142, p=0.000), ***healthy orthorexia*** (β=-0.125, p=0.000), ***bullying*** (β=0.092, p=0.005), ***emotional suppression*** (β=0.078, p=0.022), ***and anxiety*** (β=0,084, p=0,026). Their combination contributes significantly to the prediction of emotional eating ($F_{(7,714)}$=34,465, p=0,000). The value of the adjusted coefficient of determination is R2=0.245. This shows that 24.5% of the changes in health status for the current sample can be explained by the regression model presented (Fig. 16).

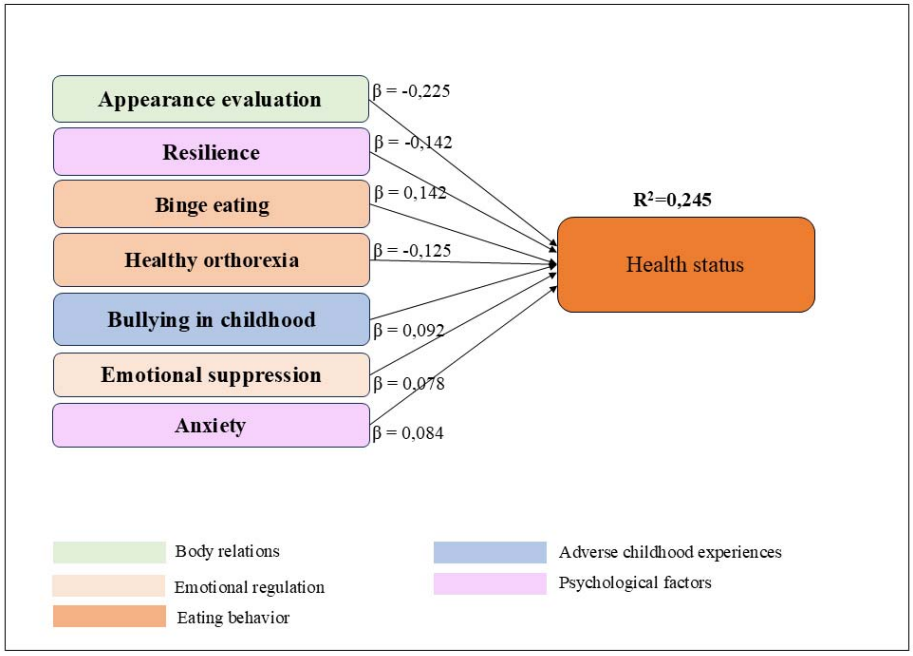


Figure 16: Significant effect of independent variables on health status

The topic of the dissertation research is widely represented and discussed in multidisciplinary scientific circles. Its relevance is due to the growing number of studies on the role of early traumatic stress on the development of health-risk behaviors and chronic disease in adulthood. The consequences of adverse childhood experiences are associated with a number of risks to subjective well-being and a serious challenge to the public healthcare system. At the heart of this scientific work is the intention to study and better understand the factors that lead to the development of different eating patterns, as well as have an effect on overall satisfaction and health status.

The first chapter presents a literature review of theoretical views and research related to the effects of traumatic and chronic stress in childhood on mental processes, behavior and health. The main and most comprehensive theoretical model on which this work is based is the theory of toxic stress. Prolonged exposure to stressors — events such as exposure to various types of family dysfunction and violence — can also have toxic effects and lead to a constant activation of the stress response. This phenomenon is operationalized with the research constructs stress, anxiety, depression, resilience. When these biological disturbances persist during vulnerable periods of development, they can lead to allostatic load, as well as structural changes and various psycho-emotional disorders that lead to problems with eating behavior. The psychosocial correlates derived from this theoretical framework are: emotional regulation, body attitudes, big 5 personality traits as well as patterns of healthy, unhealthy, emotional, restricted and binge eating, healthy orthorexia and orthorexia nervosa, which can affect life satisfaction and health status.

Based on the literature review, a research model and measurement tools covering the multidimensional structure of the problem under study have been developed. The analysis of the psychometric characteristics of the questionnaires and scales used shows high validity and internal consistency, which allows us to move on to statistical procedures investigating the relationships between the phenomena under study.

The descriptive characteristics of the sample show that the prevalence of adverse childhood experiences is significantly higher than those found in other countries, as well as in another study in Bulgarian context. These results are disturbing and outline adverse trends for the wide range of domestic violence, emotional neglect, bullying, emotional and physical abuse, which were reported by the majority of the individuals studied.

Pilot study

The results of the pilot study show that all respondents found a connection between the family environment and the way of eating in terms of eating habits, daily diet, building a healthy or unhealthy eating pattern, as well as creating an emotional connection with family members.

- **In terms of eating patterns**, half of the respondents noted binge eating and emotional eating as prevalent.
- **In terms of adverse childhood experiences**, half of the respondents reported that they had experienced more than 4 adversities, and the remaining 50% less than 4 adverse experiences, with the most common ACEs representing various types of dysfunctional family patterns such as domestic violence, psychological, emotional and verbal abuse and a combination of them, parental divorce and a family member's health problem.
- All respondents believe that **adverse childhood experiences have an impact on their behavior and eating patterns** in adulthood, both in a positive and negative direction. Respondents share that childhood adversities have an impact on the development of a healthy

or unhealthy eating pattern, the development of emotional eating or a decrease in appetite under stress, body and weight control, as well as personal growth.

- **In terms of health status**, half of the respondents believe that it is related to their diet, taking into account the influence of mental stress, which affects health both directly and indirectly through their eating styles. In addition, according to several of the respondents, these changes are expressed in overweight and obesity in the long term, as a result of unhealthy coping strategies.

The results of the pilot study confirm our expectations for the model of the emergence and development of eating behavior as a result of adverse experiences in childhood and it was decided to proceed with quantitative verification of the hypotheses.

Basic empirical research

The differentiating effect of socio-demographic characteristics on adverse childhood experiences takes into account the following trends:

- Higher rates of **sexual and domestic violence** were reported among women, and higher rates of **bullying, community violence and collective violence were reported among men.**
- Older people report **fewer childhood adversities**, including less frequent **emotional abuse**, **bullying, and community violence.**
- Single participants in this sample experienced **emotional, sexual violence and bullying more often than** people in a relationship.
- **A greater number of ACEs, emotional abuse, loss of a parent and the presence of mental illness in the family** were reported in people with secondary education.
- **Higher rates of ACEs, bullying and collective violence** are reported in people living in the capital.
- In the studied persons with chronic diseases, a **higher number of ACESs** was registered, as well as **more frequent domestic, emotional and physical violence.**
- People who are underweight report **a higher number of ACEs**, as well as have experienced **loss/divorce of parents and mental illness in the family**, and the trend weakens with an increase in BMI.

The differentiating effect of sociodemographic characteristics on eating behavior outlines some significant trends:

- Higher levels of **healthy eating were reported** among people in a relationship compared to single participants.
- **Unhealthy eating** is higher in younger people, people with secondary education, with a higher body mass index and with chronic disease.
- Higher values on the **healthy orthorexia scale** were registered in people with higher education, without chronic disease and with a lower BMI.
- **Orthorexia nervosa** has higher rates in women and people with chronic disease.
- **Emotional eating** is more prevalent in women, subjects with a higher BMI and with chronic disease.
- Women, people with a higher BMI and chronic disease have higher levels on the **restricted eating scale**
- Symptoms of **binge eating** are higher in women, people with secondary education, as well as in people with higher BMI and chronic disease.

Regarding the differentiating effect of adverse childhood experiences on eating behavior, the following trends are reported:

- **Unhealthy eating** was higher in people who have reported more than four ACEs, as well as in people who have experienced bullying.
- **Orthorexia nervosa, emotional eating, and binge eating** are lower in people who have experienced emotional neglect.
- **Orthorexia nervosa and binge eating** are higher in people who have experienced physical neglect.
- People who have experienced a family member's mental illness have lower levels of **restricted Eating.**
- People who have experienced divorce/loss of a parent have lower levels of **healthy Eating.**
- Higher levels of **orthorexia nervosa, emotional eating, restricted eating, and binge eating** were reported in subjects who witnessed domestic violence and experienced childhood sexual abuse.
- Higher levels on the scales of e**motional eating, restricted eating and binge eating** were reported in people with a history of emotional and physical abuse in childhood.

The results of this study partially confirm the assumptions made that people with a higher number of reported ACEs will have higher levels of unhealthy eating behaviors, and that different types of ACEs will have a differentiating effect on eating patterns. The analyses carried out show that these assumptions are relevant only for people with more than four ACEs, as well as survivors of bullying in relation to unhealthy eating. The adverse experiences with the strongest effect on the patterns of emotional, restricted and binge eating and orthorexia nervosa are different types of violence – emotional, physical, sexual, as well as witnessing domestic violence.

A series of correlation and regression analyses have been carried out to investigate the relationship between the phenomena under study and their impact on eating behavior, life satisfaction and health status.

In summary, some tendencies based on the correlational analysis on the relationship between the phenomena under study can be made. First, the results showed that adverse childhood experiences were more consistently associated with psychological factors than with eating behavior, and the type of adversities show consistent trends as previous analyses. As expected, the higher number of ACEs, as well as the experience of domestic, emotional, physical, and sexual abuse, are in weak positive but consistent associations with symptoms of stress, anxiety, depression, weight preoccupation, neuroticism, and poorer subjective health status. History of alcohol/drug abuse and mental illness of a family member are the only adversities in the family dysfunction category which they are positively associated with symptoms of stress, anxiety and depression and negatively related to life satisfaction.

Second, regarding the relationships between eating patterns and psychological factors, the results showed that the behaviors under study were grouped. Healthy eating and healthy orthorexia are positively associated with life satisfaction, conscientiousness, and positive evaluation of appearance and negatively associated with poor health status, weight preoccupation, and emotional distress. Healthy eating is additionally associated with lower levels of stress, anxiety and depression, and healthy orthorexia is in a positive relationship with the adaptive strategy for emotional regulation and resilience. On the other hand, unhealthy eating patterns such as orthorexia nervosa, emotional eating, and binge eating are positively associated with symptoms of stress, anxiety and depression, weight preoccupation, emotional suppression, neuroticism, and poor health status. They are also negatively associated with the mental constructs resilience, appearance evaluation, cognitive reappraisal as an adaptive strategy for emotional regulation,

conscientiousness as a personality trait, and life satisfaction. Patterns of unhealthy eating and restricted eating partially demonstrate some of the established associations in unhealthy eating behaviors.

This means that eating behaviors from the negative cluster correspond to certain psychological characteristics and factors associated with reduced mental well-being and physical health, while healthy eating patterns are more prevalent in people with higher resilience, life satisfaction and better health status.

In order to test the hypothesis of the significant effect of adverse childhood experiences and psychological factors on eating behavior, a series of regression analyses were conducted. The obtained results confirm the influence of factors from different levels of the Adverse childhood experiences pyramid. Unhealthy eating can be directly and/or indirectly influenced by the effect of adverse childhood experiences, body relations, emotional regulation and personality traits.

With regard to healthy orthorexia, the influence of personality traits and body relations has been reported, which points to possible topics and guidelines for counseling work. The regression analysis of orthorexia nervosa includes body relations, psychological factors and three types of ACEs as the main predictors in the model, an outcome that emphasizes the need for individual psychological work related to a history of childhood adversity. The model of emotional eating draws analogous relationships and points to recommendations for screening and working on traumatic experiences in childhood in order to alleviate their effect on eating behavior in adulthood. The results showed that weight preoccupation played the strongest predictive role in cognitively restricted eating. The regression equation also derives three types of ACEs, again pointing to a deeper understanding of the role of early stress on eating behavior. In the current study, binge eating is associated with factors from different levels of Adverse childhood experiences pyramid, such as body relations, anxiety, emotional suppression, bullying, as well as three personality traits from the Big 5 model. In summary, the predictors with the greatest effect on eating patterns are body relations, psychological factors stress, anxiety and resilience, adverse childhood experiences and in particular bullying and domestic violence, emotional regulation and personality traits.

In order to test the hypothesis of the significant effect of adverse childhood experiences, psychological factors and eating behavior on life satisfaction and health status, the relevant regression analyses were conducted.

The regression model of life satisfaction points to the psychological factors depression and resilience, appearance evaluation, total ACEs score, emotional regulation, as well as healthy eating.

According to the results of the regression model of health status, two behavioral trends have a direct effect on lowering health status – a decrease in appearance evaluation, the level of resilience and healthy eating habits, and higher levels of binge eating, emotional suppression, as well as bullying in childhood. The results suggest that promoting positive body image, adaptive eating patterns, and emotional regulation are key to better health management.

Limitations of the study

Along with advantages related to the wide scope of the study and the ability to track the relationship and effect of more factors, the scope of the methodology has its limitations. Participation in the study takes an average of about 15-20 minutes, a time that some of the subjects described as too long and exhausting. This could affect the accuracy of the results of the studied variables.

Another limitation of the study is related to the sample, which is not homogeneous in terms of gender. In order to build a more comprehensive picture of the studied phenomena and generalize the results for the entire population, a more complete representation of the male representatives is needed. This implies a careful interpretation of the results of comparative analyses.

Another limitation of the study is that it uses retrospective methods to measure adverse childhood experiences, which may be a factor in the inaccurate reporting of results, due to changes in the respondents' memory and subjective perception of childhood events, as well as the delicate nature of some of the traumatic experiences studied.

Despite these limitations, the study has contributed to a deeper understanding of the relationships between the theoretical constructs under study and the effect of adverse childhood experiences and psychological factors on eating behavior and health status.

Recommendations for the consultative practice

The results of the study, in addition to theoretical significance for a deeper study and understanding of the relationships between ACEs, eating patterns and health status, are also applicable in counseling practice.

The study shows a scale of prevalence of ACEs that is unexpectedly higher than reported in other countries around the world, as well as in previous studies conducted in Bulgaria. This points to the development of screening and early prevention programs in order to reduce the negative effect of traumatic stress and prevent the development of psycho-social disorders and health-risk behaviors in the long term. In addition, the high levels of reported domestic violence, emotional neglect, bullying, emotional and physical violence indicate the need for interventions at individual, family and systemic level to provide social support for children and adolescents who are once or chronically exposed to excessive stress.

Another direction for counseling practice in terms of supporting health-protective behaviors is the need to improve the qualifications of health professionals, such as doctors, dieticians, nutritionists, psychologists and psychiatrists, on the role of ACEs and psychological correlates for eating habits. From the results, it is inferred that people who report a higher number of ACEs, as well as various types of abuse and bulling, have higher levels of unhealthy eating behaviors, including unhealthy, emotional and restricted eating, binge eating and orthorexia nervosa, but not healthy orthorexia. In this sense, it is important that in the process of health promotion and change in eating behavior, the potential effect of childhood adversity on maladaptive health behaviors is checked, reported and addressed. On the other hand, in view of the ever-growing interest and focus on healthy eating for prevention and health, the study shows a clear distinction between the two types of orthorexic behavioral patterns, focusing on screening and prevention of symptoms of orthorexia nervosa and supporting and promoting healthy eating habits specific for healthy orthorexia.

Such an integrative preventive strategy could lead to a higher success rate of specialized interventions in health promotion, health behavior change and treatment of eating disorders.

Last but not least, the study shows the importance of different types of ACEs, psychological factors, body relations, personality traits and eating behaviors that contribute to improving or deteriorating health status and overall life satisfaction. In support of the biopsychosocial model of health, the current results provide evidence to build comprehensive evidence-based intervention programs to prevent and improve the mental and physical well-being of the individual.

Guidelines for future research

Guidelines for future research and further development on the results are outlined.
First of all, the analysis of the sample shows a worrying prevalence of adverse experiences in childhood, compared to other countries, as well as in previous studies in Bulgarian context. A possible direction for a more comprehensive understanding and addressing of the problem of adverse childhood experiences would be to conduct a nationally representative survey on the scale of ACEs incidence and the health-risk behaviors and somatic disease related to them.

It is also useful to explore other health and eating behaviors and psychological constructs potentially associated with adverse childhood experiences to enrich the pattern and their relationships with different aspects of health and well-being.

Nutrition is an important factor on quality of life with a direct impact on physical and psychological functioning, so it is important to investigate and implement constructs that promote effective healthy eating patterns in everyday life and prevent maladaptive patterns and strategies leading to poor health.

In conclusion, the current dissertation study investigating the effects of adverse childhood experiences on eating behavior and health status in adulthood provides a good basis for developing an evidence-based screening and intervention program that addresses factors of all levels of health influences – developmental, psycho-emotional and behavioral.

SCIENTIFIC CONTRIBUTION OF THE STUDY

The scientific contribution of the dissertation can be taken into account at a methodological, empirical and practical level.

1. An overview of the psychological theories related to early traumatic stress in recent decades is made, which justifies the applied integrative methodological framework of the study. At the moment, this is the first study in Bulgaria to include correlates from the different levels of the Adverse childhood experiences pyramid. The data collected through the methodology developed allow to expand the scope of the study, with individual, developmental, psycho-emotional and behavioral influences related to eating behavior.
2. In accordance with the purpose of the study and the in-depth review of the specialized literature, three new questionnaires have been adapted that operationalize current eating patterns (orthorexia nervosa, healthy orthorexia, uncontrolled overeating), as well as two new questionnaires measuring respectively emotional regulation (cognitive reappraisal and emotional suppression) and body relations (appearance evaluation and weight preoccupation). This makes it possible to collect and analyze quantitative data on the theoretical constructs under study and to empirically assess the relationship between childhood adversity, psychological factors and eating behavior.
3. The results of the study enrich empirical knowledge about the influence of sociodemographic characteristics on history of childhood trauma and eating behavior. Also, the study found differences in eating behavior and levels of psychosocial factors according to the adverse experiences in childhood.
4. The study deepens the empirical knowledge regarding the predictive role of developmental and psycho-emotional factors for each of the studied eating behaviors, life satisfaction and health status. Last but not least, it brings out adverse experiences, as well as eating behaviors with the most pronounced effect on overall satisfaction and health status.
5. The patterns identified by the empirical study and the trends identified have potential practical significance in the framework of preventive interventions aimed at public health, as well as in

counseling and psychotherapeutic work related to people affected by traumatic experiences in childhood.

LIST OF PUBLICATIONS

- **Beloreshka, M.** (2023). Predictors of Eating Attitudes in the Bulgarian Socio-Cultural Context. Yearbook of Sofia University "St. Kliment Ohridski", Sofia, Univ. Ed. "St. Kliment Ohridski"
- **Beloreshka, M.** (2024). Adverse Childhood Experiences and Eating Behavior in Adulthood. Bulgarian Journal of Psychology, 2024. Nos. 1-4, Ed. Society of Psychologists in the Republic of Bulgaria, Sofia
- **Beloreshka, M.** (2024). Psychological Correlates of Orthorexia Nervosa in a Bulgarian Socio-Cultural Context. Bulgarian Journal of Public Health, 2024 Sofia, Vol. 16, Vol. 3
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- Kambouridis, J., **Beloreshka, M**., Petrov, A., Karabelyova, S. (2024). Health behavior, stress, and coping strategies. Bulgarian Journal of Psychology, 2024. Nos. 1-4, Ed. Society of Psychologists in the Republic of Bulgaria, Sofia

PARTICIPATION IN SCIENTIFIC FORUMS AND PROJECTS

Forum Name: **EHPS 2023: 37th Annual Conference of the European Health Psychology Society**
Dates: 04.09.2023 – 08.09.2023
Topic of the report (poster): Psychological aspects of orthorexia nervosa in Bulgarian context.

Name of the forum: **International Congress of Psychology, Sofia, 2023**
Dates: 03.11.2023 – 05.11.2023
Topic of the report (presentation): Levels of health anxiety in people with chronic diseases.

Name of the forum: **International Congress of Psychology, Sofia, 2023**
Dates: 03.11.2023 – 05.11.2023
Topic of the report (presentation): Health behavior, stress and coping strategies. Bulgarian Journal of Psychology

Name of the forum: **International Congress of Psychology, Sofia, 2023**
Dates: 03.11.2023 – 05.11.2023
Topic of the report (presentation): Adverse experiences in childhood and eating behavior in adulthood

Forum name: **EHPS 2024: 38th Annual Conference of the European Health Psychology Society**
Dates: 02.09.2024 – 06.09.2024
Topic of the report (poster): Adverse childhood experiences and eating behaviors in Bulgarian context. The role of stress, anxiety and depression

Project: **"Psychological Aspects of Health Inequalities and Quality of Life",** Faculty of Philosophy of Sofia University "St. Kliment Ohridski". St. Kliment Ohridski", National Science Fund, Coordinator: Prof. Sonya Karabelyova, 2023, finished