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Physical activity, stress management, and eating habits: a correlational analysis among Italian high school students

Supervisor
Prof Roberta Sellaro

Submitted by
Delia Bonato
Student no.
2156398

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Abbreviations and acronyms

- ACTH: Adrenocorticotropic hormone
- ANS: Autonomic Nervous System
- BDNF: Brain-derived neurotrophic factor
- BMI: Body Mass Index
- BREQ-2: Behavioral Regulation in Exercise Questionnaire – 2
- CRH: Corticotropin-releasing hormone
- DEBQ: Dutch Eating Behavior Questionnaire
- DHA: Docosahexaenoic acid
- EAT-26: Eating Attitudes Test – 26
- EFSA: European Food Safety Authority
- FSH: Follicle-stimulating hormone
- GABA: Gamma-aminobutyric acid
- GnRH: Gonadotropin-releasing hormone
- HPA: Hypothalamic-Pituitary-Adrenal Axis
- HPG: Hypothalamic–pituitary–gonadal axis
- LH: Luteinizing hormone
- OLS: Ordinary Least Squares
- PFC: Prefrontal Cortex
- PND: Postnatal Day
- PNS: Parasympathetic Nervous System
- PSS-4: Perceived Stress Scale – 4 Item Version
- RAI: Relative Autonomy Index
- SCT: Social Cognitive Theory
- SDT: Self-Determination Theory
- SNS: Sympathetic Nervous System
- TPB: Theory of Planned Behavior
- WHO: World Health Organization

Acknowledgement

Introduction

Biological, psychosocial, and environmental determinants of adolescent health and lifestyle behaviors.

Adolescence represents a critical developmental period characterized by profound biological, psychological, and social transformations. During this stage, individuals experience rapid physical growth, hormonal maturation, and substantial neurodevelopmental changes that influence emotional regulation, cognitive functioning, and behavioral responses (Steinberg, 2008). At the same time, adolescents become increasingly exposed to environmental stressors, including academic pressure, peer evaluation, social expectations, and the growing influence of digital media (Casey et al., 2008). These interconnected changes contribute to heightened emotional sensitivity and increased vulnerability to maladaptive coping strategies.

Among the health-related behaviors most affected during adolescence are eating habits and physical activity patterns.

Adequate nutrition is essential for supporting physiological growth, brain maturation, cognitive performance, and emotional regulation. Similarly, regular physical activity has been associated with positive effects on neuroplasticity, stress reduction, psychological well-being, and long-term health outcomes (Biddle & Asare, 2011). However, chronic stress and psychosocial pressures may negatively influence both dietary choices and motivation for physical activity, potentially leading to emotional eating, sedentary behavior, and unhealthy lifestyle patterns (Macht, 2008).

Although numerous studies have independently examined stress, physical activity, eating behaviors, and motivation during adolescence, fewer investigations have adopted an integrated biopsychosocial perspective capable of simultaneously exploring the relationships among these variables. Understanding how these dimensions interact may provide important insights into both adaptive and maladaptive developmental trajectories and may contribute to the design of more effective preventive interventions.

Therefore, the present study aims to investigate the relationships between perceived stress, physical activity, motivation, and eating behaviors among adolescents within an integrated theoretical framework. Particular attention is given to the role of physical activity as a potential protective factor capable of moderating stress-related maladaptive eating behaviors and promoting psychological well-being.

The thesis is organized into six chapters:

Chapter 1 presents the theoretical background related to adolescent neurobiological and psychosocial development, with particular focus on stress physiology and developmental vulnerability.
Chapter 2 examines eating behaviors, nutrition, physical activity, motivation, and environmental influences during adolescence.
Chapter 3 describes the research rationale and methodology adopted in the empirical study.
Chapter 4 presents the results of the statistical analyses.
Chapter 5 discusses the findings in relation to the existing literature, highlighting the implications and limitations of the study.
Finally, Chapter 6 summarizes the main conclusions and provides suggestions for future research.

Chapter 1

Theoretical Background: adolescent neurobiological and psychological development

1.1 Adolescence as a developmental stage

Adolescence is commonly defined as the transitional period between childhood and adulthood and is generally considered to occur between 10 and 19 years of age according to the World Health Organization (WHO, 2024). This developmental stage is characterized by substantial biological, psychological, cognitive, and social transformations that collectively contribute to the formation of adult identity and behavior (Susman & Rogol, 2004).

From a biological perspective, adolescence begins with puberty, a complex neuroendocrine process regulated primarily by the hypothalamic–pituitary–gonadal (HPG) axis (Figure 1).

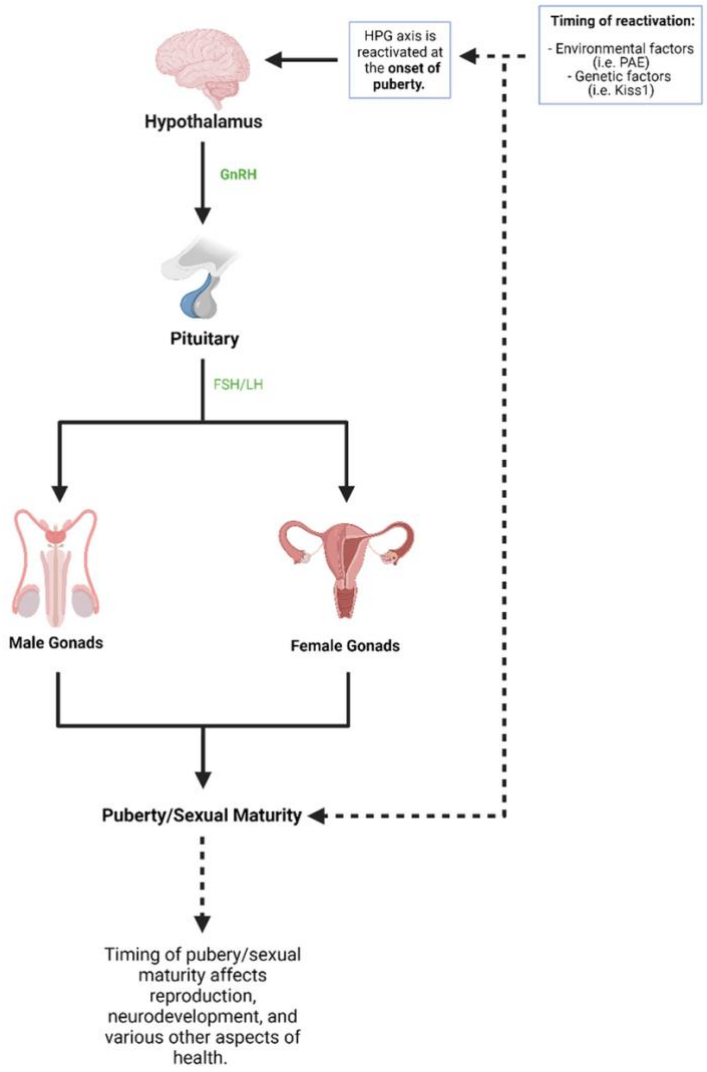

Figure 1 Neuroendocrine activation of the hypothalamic–pituitary–gonadal (HPG) axis during puberty.

Pulsatile secretion of gonadotropin-releasing hormone (GnRH) from the hypothalamus stimulates the anterior pituitary gland to release luteinizing hormone (LH) and follicle-stimulating hormone (FSH). These gonadotropins subsequently act on the gonads to induce gametogenesis and the secretion of sex steroids (estrogens and androgens), which drive gonadal maturation and the development of secondary sexual characteristics.
Adapted from Murray & Clayton (2013).

As illustrated in Figure 1, the activation of this system stimulates the secretion of gonadotropin-releasing hormone (GnRH), which subsequently promotes the release of luteinizing hormone (LH) and follicle-stimulating hormone (FSH), leading to sexual maturation and reproductive development (Murray & Clayton, 2013). Neuroclimatic and longitudinal studies demonstrate that these pubertal hormonal changes do not only drive gonadal maturation and physical growth, but also significantly modulate brain structure and subsequent behavioral adaptations (Blakemore et al., 2010).
In parallel with physical maturation, adolescence is associated with significant cognitive and emotional development. During this period, individuals progressively develop more advanced executive functions, abstract reasoning abilities, emotional awareness, and self-regulatory capacities (Steinberg, 2014). However, these processes do not occur uniformly, and the developmental imbalance between emotional reactivity and cognitive control contributes to increased behavioral vulnerability (Steinberg, 2014).
Adolescence is also characterized by heightened neuroplasticity, meaning that the adolescent brain remains highly sensitive to environmental influences and experiences. While this increased plasticity supports learning and adaptation, it also contributes to greater susceptibility to stress, peer influence, and maladaptive behavioral patterns (Fuhrmann et al., 2015).
Beyond biological maturation, adolescence is further shaped by complex psychosocial challenges involving identity formation, social integration, academic expectations, and increasing autonomy. The following sections will examine these developmental dimensions in detail, beginning with the neurobiological changes that characterize adolescence.

1.2 Neurobiological development during adolescence

As anticipated in the previous chapter, during adolescence, the brain undergoes substantial structural and functional remodeling that significantly influences cognition, emotional processing, and behavioral regulation. Neurodevelopmental research has demonstrated that different brain regions mature at different rates, contributing to the characteristic behavioral patterns observed during this developmental stage (Spear, 2013).

One of the most important neurodevelopmental processes occurring during adolescence is synaptic pruning, a mechanism through which unnecessary neural connections are eliminated while frequently used pathways are strengthened (Germann et al., 2021; Sharma et al., 2013). This process improves neural efficiency and supports the maturation of higher cognitive functions (Giedd et al., 1999). At the same time, increased myelination enhances the speed and efficiency of neural communication between brain regions, facilitating the functional integration of distributed neural networks (Giedd et al., 1999; Paus et al., 1999).

Particularly relevant during adolescence is the asynchronous maturation of limbic and prefrontal brain systems (**Figure 2**; Casey, 2008)

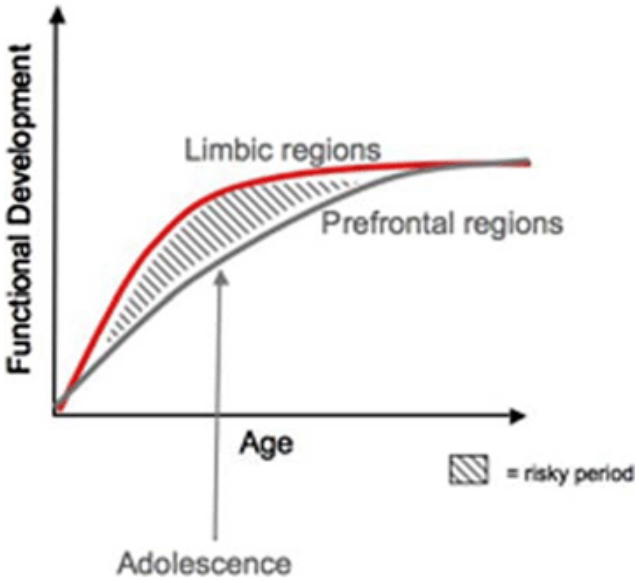

Figure 2 Developmental trajectories of limbic and prefrontal brain regions across age (Adapted from Casey et al., 2008).

The graph illustrates the neurobiological basis for the behavioral vulnerabilities observed during adolescence, depicting the functional maturation of two distinct neural

systems. The red curve represents the limbic regions, which govern emotional processing and reward sensitivity, reaching functional maturity early in development. Conversely, the grey curve shows the more gradual maturation of the prefrontal regions, responsible for executive functions and cognitive control. The shaded area highlights a critical "developmental imbalance" where heightened emotional and reward-driven impulses are not yet adequately regulated by fully developed top-down cognitive control. In the context of this study, this asynchrony is fundamental to understanding the correlation between poor stress management and maladaptive eating habits, as the adolescent brain is biologically predisposed to prioritize immediate gratification over long-term health outcomes.

Limbic structures, including the amygdala and nucleus accumbens, mature relatively early and are strongly involved in emotional processing, reward sensitivity, and motivational responses. In contrast, the prefrontal cortex, which is responsible for executive functions such as impulse control, planning, decision-making, and emotional regulation, develops more gradually and continues maturing into early adulthood (Casey et al., 2008).
This developmental imbalance contributes to heightened emotional reactivity, sensation-seeking tendencies, and increased sensitivity to rewarding stimuli during adolescence. Dopaminergic activity within reward-related neural circuits also increases during this stage, further amplifying adolescents' responsiveness to social rewards, peer approval, novelty, and potentially risky behaviors (Galván, 2010).

1.2.1 Dual systems model

Several neurobiological models have been proposed to explain adolescent behavioral vulnerability. Among these, the Dual Systems Model developed by Steinberg (2008) represents one of the most influential theoretical frameworks. This framework finds its neuroanatomical support in the asymmetrical developmental trajectories of subcortical and cortical structures, as visually conceptualized by the maturational curves model of Casey shown in the previous paragraph by **Figure 2**.

To better understand how these neurobiological trajectories translate into psychological and behavioral outcomes, **Figure 3** provides a comprehensive conceptual mapping of the model.

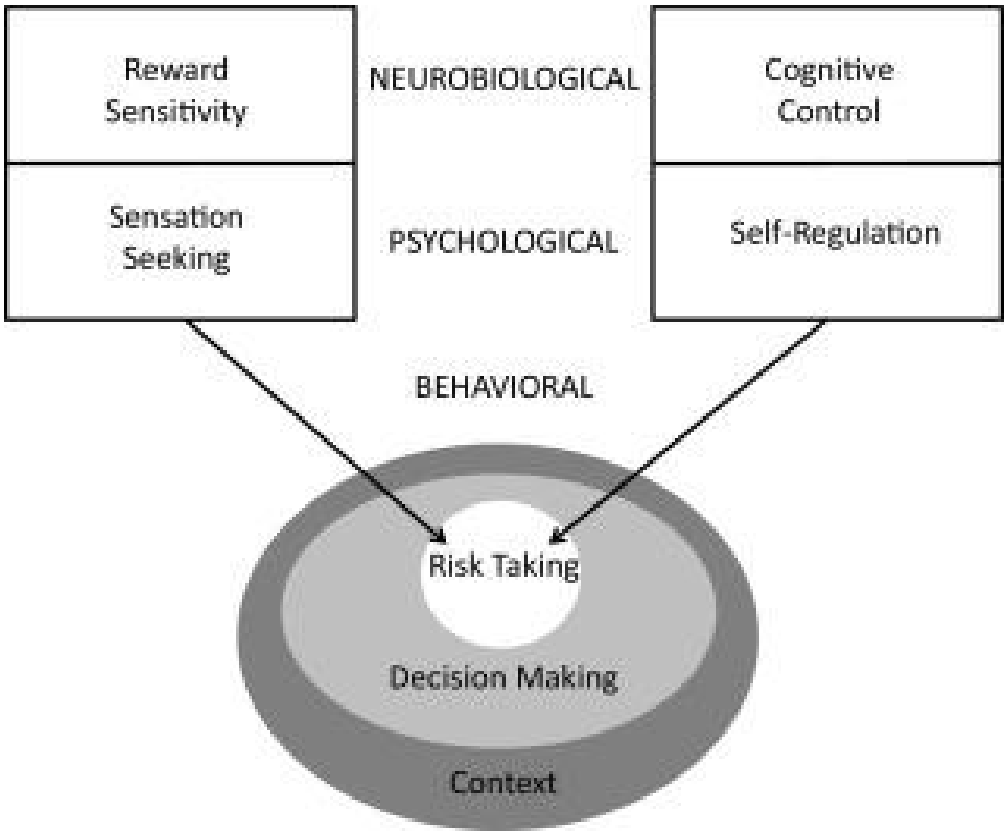

Figure 3 Conceptual representation of the Dual System Model of adolescent brain development (Adapted from Steinberg 2008)

The figure illustrates the interaction between neurobiological (reward sensitivity, cognitive control), psychological (sensation seeking, self-regulation), and behavioural (risk-taking, decision-making) components. The earlier maturation of the socio-emotional system, relative to the cognitive control system, contributes to increased risk-taking and emotional reactivity during adolescence.

Building upon this conceptual framework, heightened reward sensitivity increases the motivational value of rewarding stimuli, such as highly palatable foods, social approval, and immediate gratification. Conversely, the still-developing regulatory systems reduce the capacity to effectively control impulses and emotional responses (Steinberg, 2010). Crucially, within the scope of the present thesis, this neurobiological asynchrony provides a robust explanation for why stress so easily triggers maladaptive eating habits in adolescents. Under stressful conditions, the immature prefrontal cortex fails to exert sufficient top-down control. This regulatory deficit leaves the adolescent biologically

more inclined to seek immediate reward and comfort through emotional eating (Somerville et al., 2010).

Overall, the Dual Systems Model provides a critical neurobiological lens for understanding why adolescence represents a window of heightened emotional reactivity and and behavioral vulnerability to stress. In the next section, we will delve into the concept of stress, examining how it arises biologically and exploring its psychological consequences.

1.3 Stress and the adolescent brain

Stress represents a physiological and psychological response to environmental demands perceived as threatening, challenging, or uncontrollable. (Lazarus & Folkman, 1984).

Although acute stress responses may serve adaptive functions by facilitating survival and promoting rapid behavioral adaptation, chronic exposure to stress can negatively affect both physical and mental health (Cannon, 1932; McEwen, 1998). When an organism is continuously exposed to pressure without adequate recovery, the cost of maintaining stability, known as allostatic load, leads to systemic wear and tear (McEwen, 1998).

The physiological stress response is primarily regulated by the hypothalamic–pituitary–adrenal (HPA) axis, one of the main neuroendocrine systems involved in maintaining homeostasis during stressful situations, as shown in Figure 4 (Sheng, 2021).

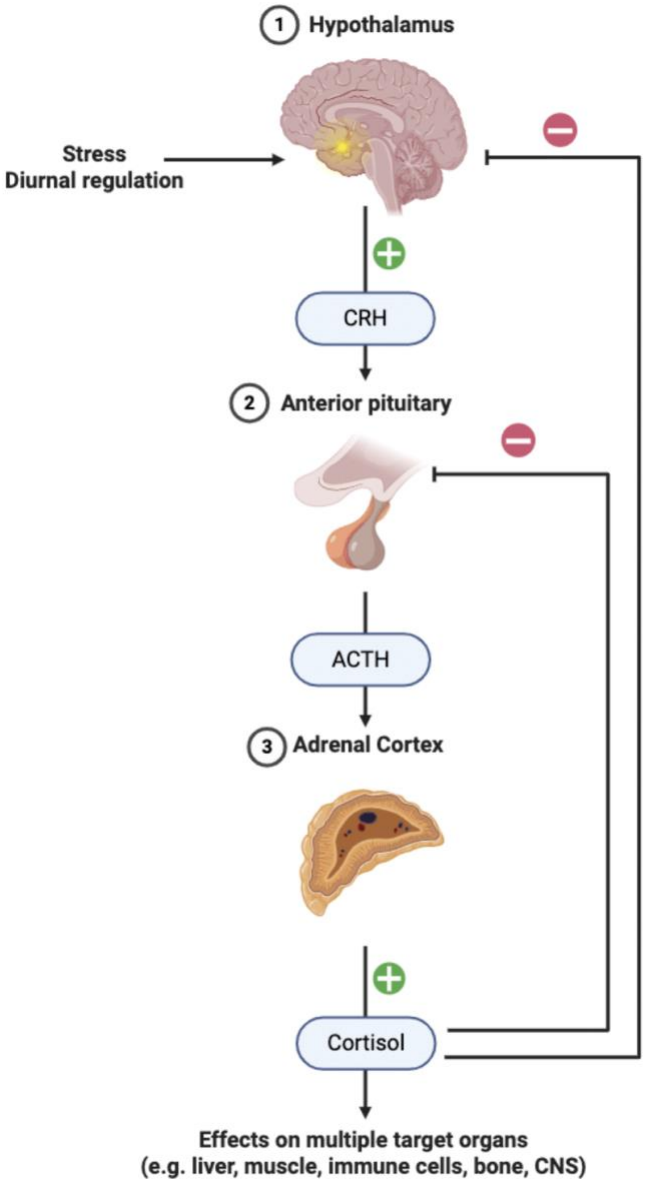

Figure 4. Schematic representation of the neuroendocrine cascade and feedback loops of the hypothalamic- pituitary- adrenal (HPA) axis.

Stressors and diurnal regulation trigger the hypothalamus to release corticotropin-releasing hormone (CRH). CRH stimulates the anterior pituitary to secrete adrenocorticotropic hormone (ACTH), which in turn prompts the synthesis and release of cortisol from the adrenal cortex. Cortisol exerts systemic effects on multiple target organs (e.g., liver, muscle, immune cells, bone, and the central nervous system) and regulates its own production through a negative feedback mechanism (indicated by the minus sign −) at both the pituitary and hypothalamic levels (Adapted from Sheng, 2021).

As illustrated in **Figure 4**, when an individual perceives a stressor, the hypothalamus releases corticotropin-releasing hormone (CRH), which stimulates the pituitary gland to secrete adrenocorticotropic hormone (ACTH). ACTH subsequently promotes cortisol secretion from the adrenal cortex (Lupien et al., 2009).

Cortisol plays an essential role in energy mobilization, glucose metabolism, immune regulation, and adaptation to environmental challenges. Under normal conditions, cortisol secretion follows a temporary and self-regulated pattern that allows the body to cope efficiently with stressors. However, prolonged activation of the HPA axis may lead to chronically elevated cortisol levels, which can negatively affect several brain regions involved in cognition, memory, and emotional regulation (McEwen, 2007).

Building upon the neurodevelopmental framework discussed in the previous section, these structural vulnerabilities directly modulate how adolescents process environmental pressures.

Research has shown that adolescents often exhibit heightened HPA axis reactivity compared to adults, resulting in more intense and prolonged physiological stress cascades (Romeo, 2010).

Furthermore, chronic stress directly interferes with emotional regulation by altering the functional connectivity between limbic structures and prefrontal circuits (Arnsten, 2009; Tottenham & Galván, 2016). Specifically, prolonged high cortisol levels have been associated with increased amygdala activation, which amplifies threat perception and emotional reactivity. Concurrently, it induces structural remodeling in the prefrontal cortex, where dendritic atrophy impairs decision-making and inhibitory processes (McEwen, 2007). Consequently, adolescents exposed to prolonged stress experience greater difficulty managing negative affect and controlling impulsive behaviors.

These clinical observations in humans are strongly supported by translational research in rodent models. Experimental evidence demonstrates that stress exposure during the adolescent period triggers long-lasting neurobiological alterations in key structures involved in cognition and affect, such as the hippocampus, which directly translate into maladaptive behavioral phenotypes (**Figure 5**).

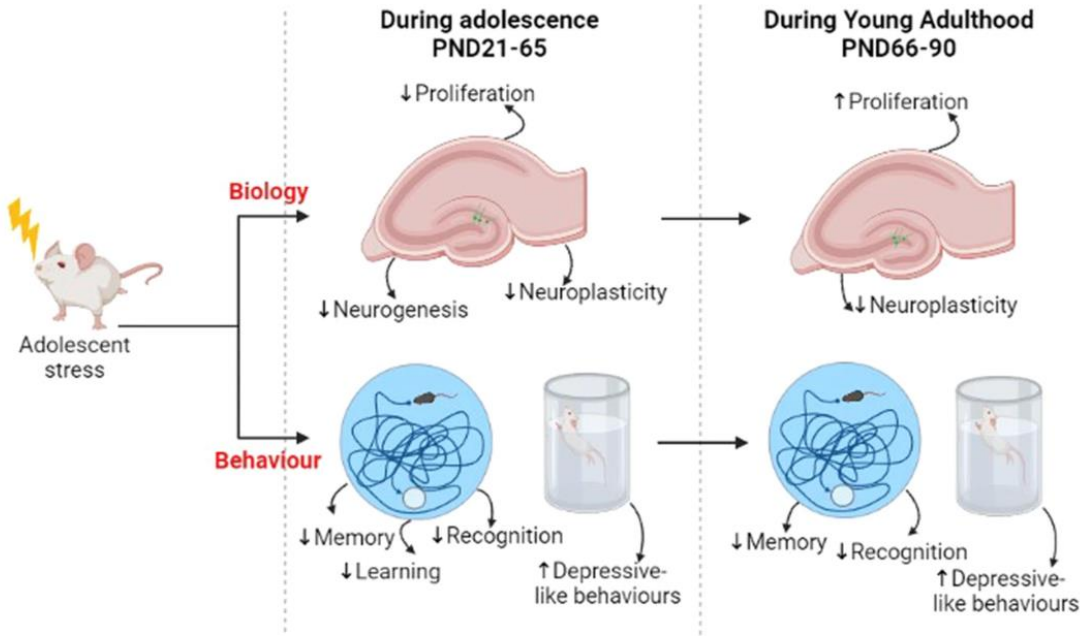

Figure 5 Schematic representation of the effects of adolescent stress on brain biology and behavior in a rodent model (Adapted from Borsini 2023).

The diagram illustrates molecular and structural changes in the hippocampus–specifically showing reductions in cell proliferation, neurogenesis, and neuroplasticity–alongside associated behavioral outcomes during adolescence (postnatal days, PND 21‑65) and their persistence into young adulthood (PND 66‑90). Behavioral impairments include deficits in learning, memory, and recognition (e.g., evaluated via spatial navigation tasks), as well as an increase in depressive-like behaviors (e.g., evaluated via immobility scores). Arrows indicate relative increases or decreases compared to non-stressed control conditions. Abbreviation: PND: Postnatal Day.

In addition to its psychological consequences, stress significantly shapes health-related behaviors, translating neurobiological vulnerabilities into overt actions. Several studies have demonstrated that elevated stress levels are strongly associated with unhealthy dietary choices, the aforementioned tendency toward emotional eating, sleep disturbances, and reduced engagement in physical activity among teenagers (Adam & Epel, 2007; Longo et al., 2023).

While these maladaptive behaviors, particularly the reliance on highly palatable foods to mitigate negative affect, may temporarily function as avoidant coping mechanisms aimed at reducing immediate emotional discomfort, they ultimately contribute to long-term physical and psychological health problems. Taken together, these findings

suggest that stress represents a central component in understanding adolescent behavioral vulnerability. Because stress-regulation systems remain highly plastic during this developmental stage, chronic exposure to psychosocial stressors can significantly distort emotional functioning and lifestyle choices.

1.4 Psychological and social development during adolescence

In addition to profound biological and neurodevelopmental transformations, adolescence is characterized by significant psychological and social changes that contribute to the formation of identity, emotional regulation, and interpersonal functioning. During this stage, adolescents progressively develop greater autonomy while simultaneously becoming increasingly sensitive to peer evaluation, social comparison, and external validation (Steinberg & Morris, 2001).

Because emotional and cognitive systems are still maturing, adolescents often experience fluctuations in self-esteem, emotional stability, and self-perception (Harter, 2012). These psychosocial processes interact closely with neurobiological development, heavily influencing how stress is processed and how behavioral choices are negotiated. One of the most influential theoretical frameworks describing this transition is Erikson’s psychosocial theory.

1.5 Erikson’s psychosocial theory

According to Erikson (1968), adolescence corresponds to the developmental stage of *identity versus role confusion*. During this window, individuals actively explore personal values, core beliefs, long-term goals, and social roles in order to construct a coherent sense of self.

Through continuous interactions with peers, family members, educational contexts, and digital environments, adolescents progressively attempt to understand who they are and how they wish to be perceived by others. Successful resolution of this developmental crisis contributes to psychological stability, self-confidence, and emotional well-being (Meeus, 2011). Conversely, difficulties in identity formation often lead to role confusion, insecurity, persistent emotional distress, and an increased vulnerability to external pressures (Crocetti, 2017).

Importantly, identity development significantly influences health-related behaviors and emotional coping strategies. Empirical evidence suggests that adolescents frequently seek social acceptance through conformity to peer norms and socially valued standards, particularly regarding physical appearance and lifestyle behaviors (Harter, 2012).

Consequently, psychosocial vulnerability and the fear of role confusion can drive adolescents toward maladaptive behaviors, such as emotional eating, restrictive dieting practices, or compulsive exercise, in an attempt to regain control, obtain validation, and improve self-esteem. Moreover, the developmental search for autonomy often coexists with an increased emotional dependence on peer feedback. This inherent contradiction intensifies emotional instability, inflating sensitivity to rejection, criticism, and social comparison.

1.5.1 Social comparison and peer evaluation

As adolescents become increasingly focused on identity formation and social acceptance, social comparison processes acquire greater psychological significance. Social Comparison Theory, originally proposed by Festinger (1954), suggests that individuals evaluate their own abilities, appearance, and social value by comparing themselves to others.

Adolescents rely heavily on external feedback to define self-worth and secure social belonging, which directly shapes their emotional well-being and behavioral choices (Harter, 2012).

The rapid expansion of social media platforms has further intensified these dynamics. Today, adolescents are continuously exposed to idealized, curated, and highly unrealistic representations of beauty, success, and lifestyle standards. These digital environments foster upward social comparisons, in which individuals compare themselves to perceived superior peers or influencers (Holland & Tiggemann, 2016). Frequent upward comparisons have been consistently linked to increased body dissatisfaction, heightened anxiety, depressive symptoms, and elevated perceived stress (Sherman et al., 2016). These emotional consequences directly impair behavioral regulation. Adolescents experiencing social insecurity or body dissatisfaction may adopt restrictive eating behaviors, emotional eating patterns, or compulsive exercise regimes as a dysfunctional coping mechanism to align with perceived social expectations.

Importantly, peer evaluation extends beyond physical appearance.

Academic achievement, athletic performance, popularity, and online validation (such as metrics of digital engagement) all serve as modern sources of comparison and stress. Because the adolescent brain is uniquely attuned to social feedback, peer acceptance or rejection can fundamentally alter psychological well-being and dictate lifestyle trajectories.

1.6 Environmental stressors during adolescence

These interpersonal anxieties do not occur in a vacuum; rather, they operate alongside a wider matrix of environmental stressors that can compromise emotional well-being, cognitive functioning, and behavioral regulation. Because their stress regulation systems are still maturing, adolescents demonstrate a heightened sensitivity to such external pressures compared to adults.

Foremost among these context-driven challenges are academic demands and performance expectations. Modern school environments require adolescents to constantly cope with high-stakes examinations, fierce academic competition, time pressure, and anxieties regarding future educational or professional success. Persistent academic stress has been associated with chronic anxiety, sleep disturbances, emotional exhaustion, and reduced psychological well-being (Pascoe et al., 2020).

In addition to academic pressure, peer relationships represent another major source of emotional stress. As social belonging becomes paramount, adolescents experience significant distress related to social evaluation, fear of exclusion, interpersonal conflict, or bullying. Negative peer experiences are strongly linked to emotional dysregulation, depressive symptoms, and a reliance on maladaptive coping behaviors (Goossens et al., 2015; Prinstein et al., 2018).

As previously noted, the omnipresence of digital technologies has introduced distinct psychosocial stressors. Social media allows adolescents to remain hyper-connected to peer networks, maximizing exposure to continuous feedback. While these platforms can support identity exploration, excessive social media use has been robustly associated with body dissatisfaction, emotional distress, and increased perceived stress due to the continuous exposure to edited and unrealistic representations of reality (Vannucci et al., 2017).

Family dynamics also play an invaluable role in shaping the adolescent stress experience. Interparental conflict, low emotional support, high parental criticism, or economic instability contribute to chronic emotional distress and heighten psychological vulnerability. Conversely, supportive family relationships act as crucial protective factors that foster resilience and adaptive coping strategies (Conger et al., 2010; Repetti et al., 2002).

Importantly, environmental stressors rarely occur in isolation. Academic pressure, social comparison, family expectations, and digital overload frequently interact simultaneously, amplifying the adolescent's emotional burden.

This multi-layered environmental friction frequently overwhelms the baseline resilience of the transitioning brain. The cumulative impact of these chronic stressors transitions from a psychological strain into a profound neuroendocrine tax, dramatically inflating the individual's allostatic load (Evans et al., 2013; McEwen, 2007).

1.7 Integrated developmental vulnerability framework

The literature reviewed throughout this chapter highlights adolescence as a uniquely sensitive developmental stage characterized by a dynamic, bi-directional interaction between neurobiological maturation, psychosocial development, and environmental influences. Rather than operating independently, these dimensions continuously intersect, shaping the adolescent's emotional landscape and behavioral regulation.

From a neurobiological perspective, the asynchronous maturation of emotional and cognitive regulatory systems creates an internal mismatch. Limbic regions involved in emotional processing and reward responsiveness mature relatively early, whereas prefrontal regions responsible for executive functioning and top-down self-regulation continue developing into early adulthood (Casey et al., 2008; Steinberg, 2008). This developmental imbalance underlies the adolescent's baseline vulnerability to impulsive behaviors, emotional dysregulation, and immediate-reward seeking.

At the same time, psychosocial developmental processes layer onto this biological vulnerability. The developmental mandate of identity formation, coupled with an intense focus on peer evaluation and social comparison, amplifies sensitivity to criticism, rejection, and perceived inadequacy (Erikson, 1968; Harter, 2012).

Environmental stressors act as the final catalyst in this framework. Academic demands, family expectations, peer pressure, and digital saturation interact with the adolescent's underlying neurobiological and psychological sensitivity, driving elevated stress levels.

Because stress-regulation systems remain highly plastic, chronic exposure to these psychosocial stressors can alter the neural architecture of the developing brain, further impairing prefrontal control (Arnsten, 2009).

Crucially, this integrated vulnerability directly manifests in health-related behaviors. When emotional distress and chronic stress overwhelm the adolescent's still-developing regulatory capacity, maladaptive coping strategies, such as emotional eating, restrictive dietary behaviors, sleep neglect, and sedentary patterns, are frequently adopted to self-soothe (Adam & Epel, 2007; Longo et al., 2023). Conversely, adaptive coping mechanisms, supportive social networks, and regular physical activity can buffer these risks, promoting resilience and emotional well-being.

Hence, the empirical and theoretical landscape synthesized in this chapter underscores the necessity of adopting an integrated biopsychosocial perspective. Understanding the complex interaction between neurobiological vulnerability, psychosocial transitions, and environmental demands is essential to explain why adolescents differ in their responses to stress and why they remain uniquely vulnerable to lifestyle-related challenges.

Among the behaviors most strongly influenced by these interconnected processes are eating habits, nutritional choices, physical activity patterns, and motivational regulation. For this reason, the following chapter will specifically examine how nutrition, eating behavior, physical activity, motivation, and social influences interact during adolescence to drive either adaptive or maladaptive developmental trajectories.

Chapter 2

Eating habits, physical activity, and lifestyle behaviors in adolescence

2.1 WHO nutritional recommendations during adolescence

As anticipated in the previous chapter, adolescence represents a developmental stage characterized by rapid physical growth, hormonal changes, and increased neurobiological maturation. Because of these profound physiological transformations, nutritional requirements substantially increase during this period. As highlighted by Patton et al. (2016), adequate nutrition is therefore essential not only for supporting physical development but also for promoting cognitive functioning, emotional regulation, and long-term health outcomes.

According to the World Health Organization, navigating this transition successfully requires a balanced dietary pattern rich in fruits, vegetables, whole grains, legumes, healthy fats, and high-quality protein sources. Proper intake during this stage is uniquely impactful; nutritional deficiencies occurring within this critical window can permanently derail immune function, stunt bone development, and impair ongoing neurocognitive maturation. (WHO, 2023).

To support these accelerated metabolic demands, the body requires a precise orchestration of macro- and micronutrients. The European Food Safety Authority (EFSA, 2017) emphasizes that proteins are indispensable for tissue accretion and structural repair, while complex carbohydrates serve as the primary energetic fuel necessary to sustain both physical exertion and cerebral signaling. Concurrently, dietary lipids, particularly omega-3 polyunsaturated fatty acids, provide the structural building blocks for ongoing neural development and optimal cognitive performance (EFSA, 2017).

Micronutrients are equally important during adolescence. Iron deficiency, for example, has been associated with impaired cognitive performance, fatigue, and reduced concentration, particularly among adolescent girls (Beard, 2001; WHO, 2023). Calcium and vitamin D are essential for bone mineralization and skeletal development, whereas zinc and magnesium contribute to metabolic regulation and neurological functioning (EFSA, 2017).

Despite the importance of adequate nutrition, many adolescents fail to meet recommended dietary guidelines. Several studies have reported high consumption of ultra-processed foods, sugar-sweetened beverages, and high-fat snacks among

adolescents, together with insufficient intake of fruits, vegetables, and nutrient-dense foods (Morin et al., 2022). These unhealthy dietary patterns may contribute not only to obesity and metabolic disorders but also to impaired emotional regulation and increased vulnerability to stress-related behaviors (Morin et al., 2022).

Importantly, eating habits developed during adolescence frequently persist into adulthood (Craigie et al., 2011). For this reason, promoting healthy nutritional behaviors during this developmental stage may have long-term implications for both physical and psychological well-being.

2.2 Nutrition and brain development

This baseline nutritional requirement takes on a distinct urgency when mapped onto the neural changes occurring during this stage. As established in Chapter 1, the adolescent brain is defined by heightened neuroplasticity and an enhanced sensitivity to external inputs (Spear, 2013). To sustain this intense period of synaptic pruning and structural remodeling, the central nervous system demands a continuous and uninterrupted supply of specific nutrients to maintain neural communication, neurotransmitter synthesis, and synaptic plasticity (Gómez-Pinilla, 2008).

Among the structural components most critical to this neurodevelopmental process are omega-3 fatty acids, specifically docosahexaenoic acid (DHA). DHA is heavily integrated into neuronal membrane lipid bilayers, directly modulating membrane fluidity, synaptic vesicle fusion, and neurotransmitter receptor kinetics. Clinical trials confirm that optimized omega-3 intake correlates with superior executive functioning, enhanced emotional stability, and a lower incidence of depressive symptoms during adolescence (Larrieu & Layé, 2018).

In parallel, micronutrients dictate the biochemical pace of brain maturation. Iron serves as a mandatory cofactor for oligodendrocyte differentiation, the cells responsible for myelinating axonal pathways, and acts as a rate-limiting element in dopamine synthesis (Beard, 2001). Consequently, juvenile iron deficiency induces microstructural alterations that manifest clinically as attention deficits, working memory impairments, and heightened emotional dysregulation (O'Neil et al., 2014). In a similar fashion, magnesium and zinc modulate N-methyl-D-aspartate (NMDA) receptor excitability, acting as vital neurological anchors against excitotoxicity and stress-induced anxiety (Gómez-Pinilla, 2008).

Beyond providing raw structural materials, nutritional quality actively modulates stress

physiology. Chronic environmental stress alters dietary selections, biasing the individual toward energy-dense, highly palatable foods rich in simple sugars and saturated fats (Macht, 2008). This relationship, however, is bi-directional: poor dietary quality triggers low-grade systemic inflammation, which can disrupt blood-brain barrier integrity and fuel neuroinflammatory cascades, amplifying mood disorders and emotional reactivity (Jacka et al., 2011; O'Neil et al., 2014).

This bidirectional communication is heavily mediated by the gut–brain axis. The gastrointestinal microbiota acts as a metabolic bioreactor, synthesizing key neurotransmitters, such as gamma-aminobutyric acid (GABA) and serotonin, and regulating systemic immune signaling pathways (Cryan & Dinan, 2012). Dietary disruptions during adolescence alter the taxonomic composition of the microbiome, and this dysbiosis has been directly linked to altered HPA axis reactivity, increased cortisol production, and heightened stress sensitivity.

2.3 Eating behaviors during adolescence

To understand how these neurobiological mechanisms manifest in daily life, one must analyze the psychological and environmental forces that govern adolescent eating behaviors. Dietary selections are rarely driven by homeostatic energy requirements alone; instead, they represent the behavioral output of an intricate intersection between biological drives, psychological coping mechanisms, and socio-environmental pressures (Savage et al., 2007).

Foremost among these behavioral adaptations is emotional eating, defined as the consumption of food in response to negative affective states rather than physiological hunger. When coping with emotional distress, adolescents frequently exploit the immediate, hedonic properties of food to downregulate distress. This behavior temporarily dampens negative affect by stimulating dopamine release within the nucleus accumbens and activating the brain's endogenous opioid system (Volkow et al., 2011). However, relying on food as a primary coping mechanism establishes an avoidant behavioral pattern, increasing the risk of metabolic disorders and psychological distress over time.

As detailed in our earlier neurobiological analysis, stress operates as the primary catalyst for this shift from homeostatic to hedonic eating. Prolonged HPA axis activation and the resulting elevations in circulating cortisol actively upregulate orexigenic signaling, shifting consumption preferences toward hyper-palatable, calorie-dense

options (Adam & Epel, 2007). Under these conditions, the immature prefrontal cortex fails to exert top-down inhibition, leaving the adolescent vulnerable to using food as an immediate, visceral mood regulator (Casey, 2008).

This focus on hyper-palatable rewards frequently coexists with its behavioral opposite: restrictive eating and distorted body image perceptions. The developmental drive for identity formation and peer acceptance makes adolescents highly sensitive to idealized physical standards, which are heavily reinforced by digital media environments (Harter, 2012). Attempting to resolve the resulting body dissatisfaction can lead teenagers to adopt unhealthy dieting practices, skip meals, and enforce extreme caloric restriction, which can destabilize metabolic health and pave the way for clinical eating disorders.

Furthermore, these behavioral patterns are strongly reinforced by immediate social ecosystems. Parental modeling, family meal dynamics, cultural traditions, and peer attitudes toward body weight collectively shape how adolescents interact with food (Scaglioni et al., 2018). Dietary habits, therefore, serve a broader psychosocial purpose during adolescence, functioning as markers of identity, conformity, and emotional regulation.

Within this lifestyle matrix, physical activity emerges as a key variable closely intertwined with both stress management and eating behavior regulation. However, this relationship can be a double-edged sword: depending on the underlying motivations and modalities of practice, exercise can function either as a supportive ally or as a detrimental element that exacerbates adolescent vulnerabilities.

2.4 Physical Activity During Adolescence

When properly integrated into an adolescent's routine, physical activity serves as a powerful multi-systemic regulator, supporting both physiological and psychological development. From a biomechanical perspective, the mechanical loading exerted during physical exertion stimulates osteoblast activity, which is critical for maximizing peak bone mass development (Frost, 2003). In addition, regular exercise stabilizes metabolic function, optimizes cardiovascular fitness, and acts as a potent behavioral buffer against emotional distress (World Health Organization, 2020).

At the neurobiological level, aerobic exercise serves as a major driver of structural and functional neuroplasticity. Physical exertion upregulates the transcription and expression of brain-derived neurotrophic factor (BDNF), a premier neurotrophin that supports neuronal survival, dendritic arborization, and synaptic consolidation (Lubans et al.,

2022). This biochemical cascade directly accelerates hippocampal neurogenesis, which translates into objective improvements in spatial memory, learning capacity, and cognitive flexibility (Donnelly et al., 2016).

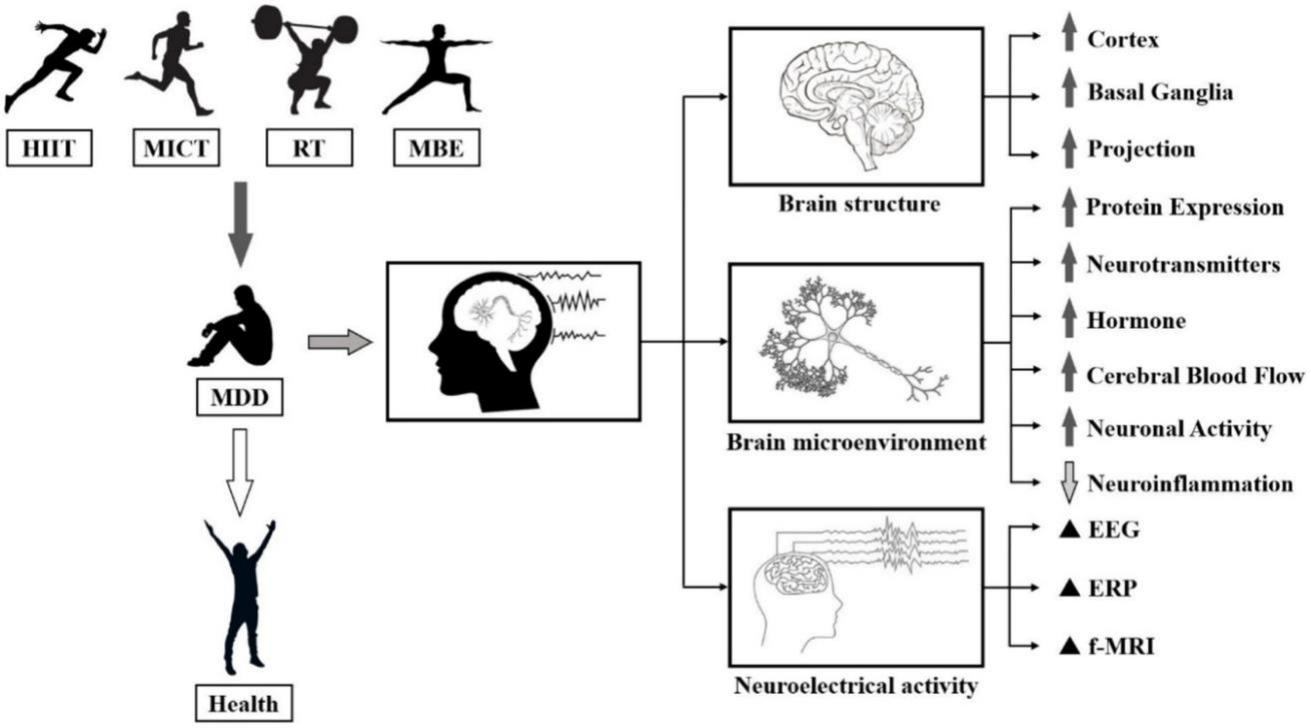

Figure 6 Effects of physical activity on brain structure and function in adolescents (Adapted from Chaddock-Heyman et al. 2020).

Regular aerobic exercise is associated with increased hippocampal volume, enhanced neurogenesis, and improved cognitive performance, mediated in part by BDNF signaling.

Beyond upregulating BDNF, exercise mitigates central neuroinflammation and tunes the microenvironment of the developing brain by optimizing cerebral perfusion and blood-brain barrier transport kinetics (Chaddock-Heyman et al., 2020). This neurobiological optimization helps tone down HPA axis hyper-reactivity, fostering a more resilient physiological response to acute psychosocial stressors (Zschucke et al., 2015). Importantly, exercise-induced structural changes directly support the functional maturation of the prefrontal cortex, enhancing executive functions and top-down cognitive control (Casey et al., 2023). By strengthening these frontostriatal pathways, physical activity can help bridge the developmental gap between hyper-reactive limbic

structures and maturing prefrontal regions, providing adolescents with better behavioral control.
From a psychosocial perspective, organized sports offer structured spaces for identity exploration, the development of self-efficacy, and peer connection. These experiences foster social integration and enhance psychological resilience during times of transition (Cowdrey, 2025).

Yet, despite these clear benefits, modern lifestyle shifts have led to an increase in physical inactivity. The combination of pervasive sedentary behaviors, extended screen time, academic pressure, and decreasing participation in structured sports has led to a global drop in adolescent physical activity levels (Biddle et al., 2019). According to the World Health Organization (WHO, 2020), the majority of adolescents do not meet current activity guidelines, a trend that increases their long-term risk for cardiovascular disease, metabolic syndrome, and persistent emotional distress.
Sustaining regular physical activity depends heavily on the underlying psychological motivation. An adolescent's willingness to exercise is continuously shaped by their emotional experiences, body image perceptions, and immediate social context (Deci & Ryan, 2000). Identifying the psychological drivers of exercise adherence is therefore essential to design effective interventions during this critical developmental window.

2.5 Physical Activity and Stress Regulation

Beyond its physiological benefits, physical activity may also function as an important protective factor against stress and emotional dysregulation during adolescence (Biddle et al., 2019). Given the heightened stress sensitivity associated with adolescent neurodevelopment, exercise may help moderate the negative psychological and neurobiological effects of chronic stress exposure (Mücke et al., 2018).
One of the primary mechanisms through which physical activity influences stress regulation involves modulation of the hypothalamic–pituitary–adrenal (HPA) axis (Klaperski et al., 2014).
As anticipated, the regular exercise has been associated with improved regulation of cortisol secretion and greater physiological adaptability to stressors; adolescents who engage in regular physical activity may therefore demonstrate more efficient stress responses and reduced physiological reactivity during emotionally challenging situations (Tsatsoulis & Fountoulakis, 2006).

This process is closely tied to the adaptations in brain microenvironment and neurobiological signaling previously illustrated (see Figure 6)

Physical activity may also influence emotional regulation through neurochemical changes. As systematized in the overarching framework of Figure 6, exercise stimulates the release of endorphins, serotonin, dopamine, and other neurotransmitters and these neurochemical responses may contribute to reduced anxiety, improved mood, and increased emotional resilience (Heijnen et al., 2016; Meeusen et al., 2016).

In addition to neurochemical effects, exercise may promote stress reduction by improving self-esteem, self-efficacy, and perceived competence (Liu et al., 2015). Adolescents who participate in sports or regular physical activity often report greater confidence in their abilities and increased feelings of control over stressful situations (Fox, 2000). These psychological benefits may reduce vulnerability to emotional distress and maladaptive coping behaviors (Carter et al., 2019).

Physical activity may further support resilience by providing adolescents with adaptive coping strategies. Rather than relying on maladaptive behaviors such as emotional eating or social withdrawal, physically active adolescents may use exercise as a healthy mechanism for managing stress and regulating emotions (Taylor et al., 2015).

Furthermore, participation in sports creates opportunities for social support and interpersonal connection, which act as critical protective factors against psychological distress during the transition to adulthood (Holt et al., 2017).

However, these protective effects may vary depending on exercise intensity, motivational factors, social context, and individual psychological characteristics (Mishra et al., 2020).

Importantly, not all forms of physical activity produce identical psychological outcomes. While moderate and enjoyable exercise is generally associated with positive mental health effects, excessive training pressure, competitive stress, or compulsive exercise behaviors may sometimes contribute to emotional distress rather than well-being (Barton et al., 2021). Consequently, the relationship between physical activity and psychological health should be understood within a broader biopsychosocial framework (Lubans et al., 2016).

Taken together, these findings suggest that physical activity may represent a valuable protective factor capable of moderating stress-related vulnerability during adolescence. Understanding how motivation and environmental influences affect adolescents'

participation in physical activity is therefore essential for promoting adaptive coping strategies and psychological well-being (Biddle et al., 2019).

2.6 Motivation and Physical Activity

Motivation represents one of the most important determinants of adolescents' participation in physical activity and sports-related behaviors. Although the physiological and psychological benefits of exercise are well documented, many adolescents fail to maintain regular engagement in physical activity over time (van Sluijs et al., 2021). Understanding the motivational processes underlying exercise participation is therefore essential for explaining both adherence to and withdrawal from physical activity during adolescence (Cachón-Zagalaz et al., 2023). Motivation for physical activity is influenced by a complex interaction of psychological, social, emotional, and environmental factors. Adolescents may engage in exercise for enjoyment, social interaction, competition, appearance-related goals, stress reduction, or external pressure. The quality of motivation, rather than simply its intensity, appears particularly important in determining long-term behavioral persistence and psychological outcomes (Zou et al., 2023).

2.6.1 Self-determination theory

Self-Determination Theory (SDT), articulated by Deci and Ryan (2000), provides a robust framework for understanding these dynamics by placing human motivation along a continuum of increasing autonomy. This spectrum maps how behavioral regulation shifts from completely non-self-determined states to highly self-determined expressions, directly influencing an individual's psychological well-being.

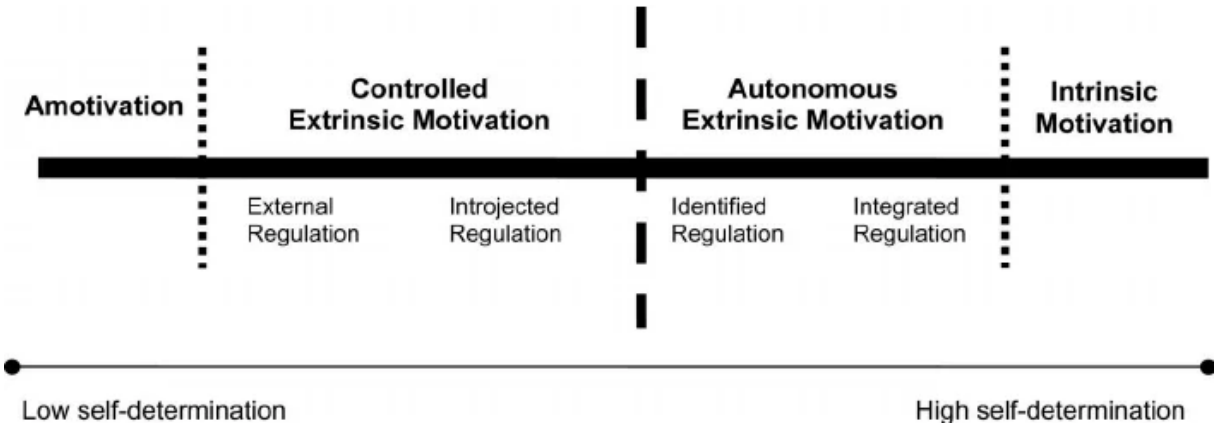

Figure 7 Continuum of motivation according to Self-Determination Theory (Adapted from Deci & Ryan 2000).

The figure illustrates the progression from amotivation to intrinsic motivation, including intermediate forms of extrinsic motivation (external, introjected, identified, and integrated regulation). The continuum reflects increasing levels of self-determination, with higher autonomy associated with improved psychological well-being and sustained engagement in physical activity.

As illustrated in Figure 7, the continuum transitions through distinct regulatory stages. At the far left, amotivation reflects a total lack of behavioral intent or perceived value in physical exertion. Moving rightward, controlled extrinsic motivation emerges, encompassing external regulation, where behavior is dictated by explicit rewards or punishments, and introjected regulation, which is driven by internal pressures such as guilt, anxiety, or ego-preservation (Ryan & Deci, 2017).

Crucially, once the threshold of autonomy is crossed into autonomous extrinsic motivation, the adolescent exhibits identified regulation, valuing the activity for its personal benefits, and integrated regulation, where exercise aligns fully with their core self-concept. Finally, intrinsic motivation occupies the rightmost anchor, representing the pinnacle of self-determination, where physical activity is sustained purely for inherent enjoyment and psychological satisfaction (Deci & Ryan, 2000).

To facilitate the transition toward these autonomous states, Self-Determination Theory proposes that social environments must consistently satisfy three basic psychological needs, specifically defined as autonomy, competence, and relatedness (Ryan & Deci, 2017). Autonomy involves the perception of personal choice, self-governance, and internal control over one's behavioral choices, while competence represents the psychological experience of mastery, effectiveness, and capability in executing specific

tasks. These two dimensions are systematically complemented by relatedness, which reflects the crucial sense of secure social connection, mutual warmth, and deep belonging within a peer group or sporting community (Teixeira et al., 2012).
When youth sports and exercise environments successfully satisfy this triad of core needs, adolescents are structurally supported in internalizing their behavioral goals, a process that shifts their primary focus away from unstable external pressures and toward stable, autonomous regulation (Ntoumanis et al., 2021). During the volatile window of adolescence, this motivational shift becomes particularly critical because identity formation, peer dynamics, and global self-esteem are still fragile and evolving. Under these conditions, exercise motivated predominantly by rigid external control or appearance-related anxieties routinely triggers acute competitive distress, lower physical self-worth, and premature athletic dropout (Bartholomew et al., 2011). Conversely, the presence of autonomy-supportive coaches, positive family modeling, and reinforcing peer relationships serves to foster a healthy, growth-oriented motivational climate. By actively cultivating a sustainable intrinsic drive, these supportive ecosystems successfully convert physical activity from a potential source of evaluative anxiety into a lifelong, adaptive coping strategy capable of buffering environmental stress and promoting enduring psychological resilience (Vallerand & Lalande, 2011).

2.6.2 Theory of planned behavior and social cognitive theory

While SDT emphasizes the fulfillment of basic psychological needs, other prominent cognitive models offer complementary perspectives by focusing on intentionality, self-belief, and observational learning.
The Theory of Planned Behavior (TPB), developed by Ajzen (1991), states that behavioral intention is the most immediate predictor of action. These intentions are shaped by three distinct variables: attitudes toward the behavior (evaluating exercise as inherently beneficial or enjoyable), subjective norms (the perceived social expectations of valued peers and mentors), and perceived behavioral control (the individual's assessment of their capability to overcome practical barriers). During adolescence, subjective norms carry immense weight, as peer approval directly shapes fitness choices and sports participation, while strong perceived control remains an accurate predictor of long-term exercise adherence (Plotnikoff et al., 2022).

To better account for the broader social environment, Social Cognitive Theory (SCT), proposed by Bandura (1986), emphasizes a process of triadic reciprocal determinism—the dynamic, bi-directional interaction between personal cognitive factors, environmental influences, and overt behaviors. Central to this model is self-efficacy, an individual's belief in their ability to execute tasks successfully under challenging conditions (Bandura, 2001). Adolescents with high exercise-specific self-efficacy view barriers as challenges to be mastered, show greater persistence through setbacks, and maintain more consistent activity patterns over time (Dishman et al., 2021).
Furthermore, SCT highlights the importance of observational learning and social modeling. Teenagers routinely adopt health-related behaviors by observing and mimicking significant figures in their environment, including parents, peers, athletes, and digital media influencers (Bandura, 1986; Brown & Bobkowski, 2011). These models can significantly shape an adolescent's attitudes toward physical fitness and body image.
Rather than being mutually exclusive, these theoretical frameworks provide a multi-layered view of adolescent behavior SDT explains the underlying psychological needs that drive quality motivation (Ryan & Deci, 2017); TPB details the cognitive intentions and perceived control involved in decision-making (Ajzen, 1991); and SCT outlines how self-efficacy and environmental modeling reinforce behavioral patterns (Bandura, 1986).

2.7 Sport context and psychological outcomes

The practical environments where these motivational and cognitive processes unfold significantly influence the psychological outcomes of physical activity. When sports programs are structured constructively, they provide key opportunities for identity development, emotional regulation, and social integration. A primary benefit of structured sports participation is the reinforcement of global self-esteem; as adolescents gain tangible physical competencies, they develop a more positive body image and a stronger sense of personal mastery, which enhances overall emotional resilience.
Additionally, team sports provide an effective setting for social integration. Working toward shared goals encourages cooperation, empathy, and interpersonal communication, fostering a strong sense of belonging. Longitudinal data suggest that adolescents engaged in team sports report significantly higher levels of perceived social support and lower rates of loneliness than their sedentary peers (Eime et al., 2013).
However, these positive outcomes are not guaranteed, as sports environments can also

introduce distinct psychological risks if the social climate is unsupportive. Extreme performance pressure, fear of failure, over-involved parenting, and rigid 'win-at-all-costs' coaching styles can lead to performance anxiety, athletic burnout, and emotional exhaustion (Pluhar et al., 2019). Furthermore, body image concerns may interact negatively with certain athletic environments, particularly in sports emphasizing aesthetics or weight categories, where performance expectations can inadvertently foster weight anxieties, restrictive eating, or compulsive exercise (Nielsen et al., 2021). Ultimately, the psychological impact of sports is determined by the interplay between the motivational climate, the social context, and the individual's characteristics.

These psychological dynamics, including the motivation to exercise and the use of coping mechanisms, are deeply connected to an individual's self-concept. In modern adolescence, this self-concept is increasingly shaped by virtual interactions, making it necessary to explore how digital spaces modulate psychological vulnerability.

2.8 Social media, body image, and eating behaviors

The ubiquitous presence of social media in adolescents' daily lives has substantially transformed the way young people experience social interaction, identity construction, and body image perception (Valkenburg & Peter, 2011). Digital platforms such as Instagram, TikTok, and Snapchat expose users to continuous social comparison opportunities and idealized representations of appearance, fitness, and lifestyle success (Fardouly & Vartanian, 2016). Because adolescence is characterized by heightened sensitivity to peer evaluation, these digital environments strongly influence self-esteem, emotional regulation, and behavioral choices (Nesi, 2020).

Adolescents frequently engage in upward social comparison against highly edited, curated, or selectively presented online portrayals. These digital interactions contribute heavily to body dissatisfaction, appearance-related anxiety, and reduced self-worth, particularly among adolescent girls (Holland & Tiggemann, 2016). Exposure to these beauty standards increases the psychological pressure to conform to socially valued body ideals, which can manifest as unhealthy eating behaviors and maladaptive exercise patterns (Perloff, 2014).

Furthermore, social media peer networks amplify these vulnerabilities through the normalization of restrictive dieting practices, "fitspiration" content, and appearance-focused trends. These media spaces selectively target thinness in females and hyper-muscularity in males (Tiggemann & Zaccardo, 2015). Adolescents exposed to constant messages emphasizing aesthetic perfection internalize these expectations, frequently

engaging in unhealthy weight-control behaviors, skipping meals, or adopting compulsive fitness regimes to match their virtual peers (Fardouly et al., 2015).

In addition to driving restrictive eating patterns, the emotional distress associated with negative social comparison can trigger opposite behavioral shifts, such as emotional eating. When experiencing feelings of inadequacy, social exclusion, or low self-esteem generated by digital feedback, adolescents often use food as a maladaptive coping mechanism to temporarily downregulate negative emotions and reduce psychological discomfort (Spoor et al., 2007).

Importantly, the psychological effects of social media are not uniform across all youth. Pre-existing individual vulnerability factors, including baseline self-esteem, emotional regulation capacities, offline social support, and genetic predispositions, influence how an adolescent interprets and responds to online content (Coyne et al., 2020). When used in balanced, supportive, and digitally literate ways, these platforms can conversely provide opportunities for positive social connection, identity exploration, and access to supportive health information (Rideout & Fox, 2018).

Consequently, social media represents a highly influential environmental factor capable of shaping adolescents' body image perceptions, eating behaviors, and exercise-related motivations. Its interaction with underlying neurobiological sensitivities, stress vulnerability, and psychosocial development highlights the necessity of adopting an integrated perspective when examining adolescent lifestyle choices.

2.9 Integrated Lifestyle Framework

The literature reviewed throughout this chapter suggests that adolescent lifestyle behaviors emerge from the continuous, bi-directional interaction between neurobiological development, psychological functioning, motivational processes, and environmental influences (Adam & Epel, 2007; Patton et al., 2016; Scaglioni et al., 2018). Eating habits, physical activity participation, stress regulation, and body image perceptions should therefore not be considered isolated phenomena, but rather interconnected dimensions shaped by multiple biopsychosocial mechanisms (Gómez-Pinilla, 2008; Lubans et al., 2022).

As established in Chapter 1, the asynchronous maturation of cognitive control and emotional processing systems increases an adolescent's baseline vulnerability to stress, impulsive behaviors, and emotional dysregulation (Casey et al., 2023; Steinberg, 2008). At the same time, psychosocial transitions such as identity formation and social

comparison strongly guide self-perception (Harter, 2012; Holland & Tiggemann, 2016). Within this integrated framework, stress operates as a central mediating factor that directly dictates both eating behaviors and physical activity patterns (Macht, 2008; Tsatsoulis & Fountoulakis, 2006). Chronic stress exposure contributes to a cascade of emotional eating, reduced autonomous motivation for exercise, sedentary lifestyles, and heightened body dissatisfaction (Adam & Epel, 2007; Biddle et al., 2019; Morin et al., 2022). Conversely, adaptive coping strategies, supportive social environments, and intrinsically motivated physical activity promote emotional resilience and psychological well-being (Cowdrey, 2025; Ntoumanis et al., 2021; Zschucke et al., 2015).

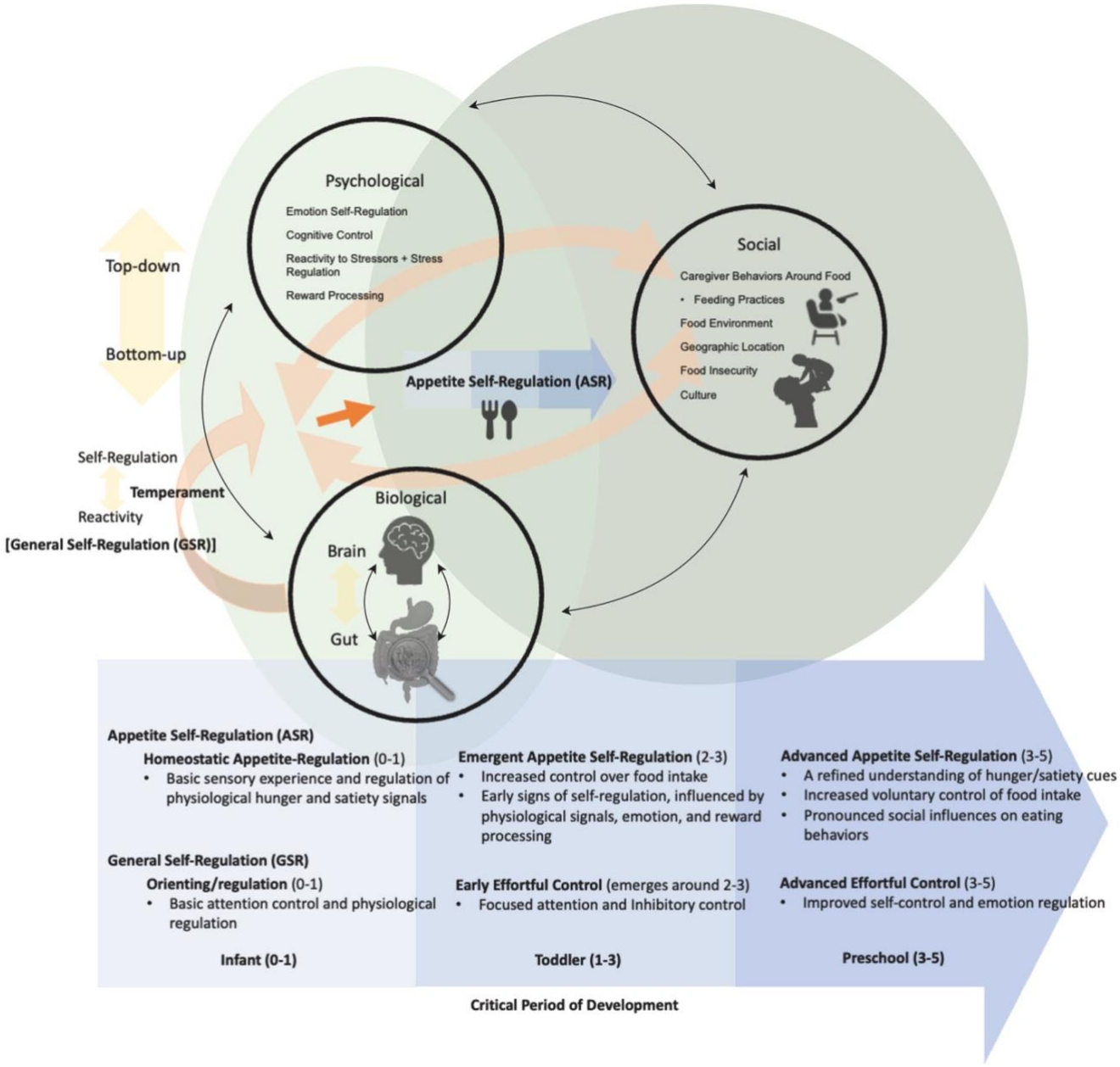

Figure 8. Integrated biopsychosocial model of stress, physical activity, and eating behavior in adolescence (Adapted from Borsini et al., 2023; Steinberg, 2008).

This model illustrates the dynamic and bidirectional relationships between psychological stressors and lifestyle behaviors. It highlights the distinction between an adaptive pathway (rooted in intrinsic motivation and resilience) and a maladaptive pathway (characterized by stress-induced inactivity and emotional eating).

The framework emphasizes how biological, psychological, and social factors converge to influence adolescent developmental trajectories.

As visually conceptualized in this model (Figure 8), motivation plays a fundamental role in shaping adolescent lifestyle trajectories (Deci & Ryan, 2000). Participation in physical activity appears significantly more stable and psychologically beneficial when driven by intrinsic motivation, enjoyment, personal competence, and social support rather than external pressure or appearance-related concerns (Eime et al., 2013; Ntoumanis et al., 2021). Similarly, healthy eating behaviors are heavily influenced by the individual's emotional regulation abilities, self-esteem, and immediate environmental context (Savage et al., 2007; Scaglioni et al., 2018; Volkow et al., 2011).

Environmental influences further complicate behavioral regulation during this stage (Bandura, 2001; WHO, 2023). Family environments, peer relationships, school demands, digital media exposure, and cultural appearance standards continuously interact with the adolescent's neurobiological sensitivity (Savage et al., 2007; Spear, 2013). In particular, social media can act as an environmental catalyst, amplifying body dissatisfaction, comparison processes, and appearance-related stress, which increases vulnerability to maladaptive eating behaviors and unhealthy exercise patterns (Holland & Tiggemann, 2016; Tiggemann & Zaccardo, 2015).

Crucially, following the pathways delineated in Figure 8, these variables rarely operate independently. Adolescents experiencing elevated stress levels may simultaneously demonstrate emotional eating behaviors, reduced motivation for physical activity, increased social comparison, and lower emotional well-being (Adam & Epel, 2007; Biddle et al., 2019; Holland & Tiggemann, 2016). Conversely, adolescents exposed to supportive environments and adaptive coping opportunities develop healthier behavioral patterns and greater resilience (Cowdrey, 2025; Eime et al., 2013; Ntoumanis et al., 2021).

Taken together, these findings highlight the necessity of adopting an integrated biopsychosocial framework when examining adolescent health behaviors (Borsini et al., 2023; Patton et al., 2016). Understanding the complex interplay between stress, neurobiological development, motivation, social influences, and lifestyle choices provides a critical foundation for both future research and the design of more effective, multidimensional public health interventions (Casey et al., 2023; O'Neil et al., 2014; Steinberg, 2008). Although existing literature has extensively explored these dimensions in isolation, the scarcity of unified theoretical models underscores the need for the integrated approach proposed in this study.

Chapter 3

Research rationale and methodology

3.1 Research rationale

The literature reviewed in the previous chapters highlights adolescence as a developmental stage characterized by profound neurobiological, psychological, and social transformations (Steinberg, 2008). During this period, ongoing maturation of emotional and cognitive regulatory systems contributes to increased vulnerability to stress, emotional dysregulation, and maladaptive coping behaviors (Casey et al., 2023). Simultaneously, adolescents become increasingly exposed to environmental pressures involving academic demands, social comparison, body image concerns, and digital media influences (Nesi, 2020). Among these maladaptive responses, alterations in eating behaviors, such as emotional eating, and sedentary lifestyles are frequently observed consequences of chronic stress (Adam & Epel, 2007). While established research suggests that regular physical activity promotes psychological well-being and resilience (Klaperski et al., 2014), studies have often investigated these variables in isolation. Crucially, a significant gap remains regarding the role of the "quality" of motivation, as conceptualized by *Self-Determination Theory* (Ryan & Deci, 2017), as a potential protective factor. Although it is widely accepted that physical activity may reduce stress, it remains unclear whether sport participation acts as an effective moderator against emotional eating, or whether the nature of one’s motivation (i.e., autonomous vs. controlled) is the primary determinant.

The present study aims to bridge this gap by examining not only the direct relationship between perceived stress and eating behaviors but also by exploring how motivational profiles and sport participation interact to influence these outcomes.

3.2 Research objectives and hypotheses

Research Aims

The present study aims to contribute to the existing literature by addressing the following objectives:

1. To examine the association between perceived stress and different dimensions of eating behaviour (emotional, restrained, and external) in adolescents.

2. To compare physically active and sedentary adolescents regarding their levels of perceived stress and motivational profiles toward physical activity.
3. To test the moderating role of physical activity participation in the relationship between perceived stress and emotional eating.
4. To investigate the predictive role of autonomous motivation (RAI) on emotional eating, while controlling for perceived stress and sport participation.

Hypotheses

Based on previous literature, the following hypotheses were formulated:

H1: Perceived stress will be positively associated with maladaptive eating behaviours, particularly emotional eating. This expectation is supported by evidence showing that stress activates neuroendocrine responses (e.g., HPA axis activation) that increase preference for high-calorie palatable foods and promote emotional eating as a coping strategy (Adam & Epel, 2007; Torres & Nowson, 2007).

H2: Physically active adolescents will report lower levels of perceived stress and higher levels of autonomous motivation compared to sedentary peers. This hypothesis is based on evidence suggesting that physical activity reduces physiological stress reactivity and is associated with more adaptive motivational profiles, particularly when behaviours are self-determined (Gerber & Pühse, 2009; Deci & Ryan, 2000).

H3: Physical activity will moderate the relationship between perceived stress and emotional eating, such that higher levels of physical activity will weaken the positive association between stress and emotional eating. This is supported by studies indicating that physical activity enhances emotion regulation and acts as a buffer against stress-related maladaptive coping behaviours (Rebar et al., 2015).

H4: Autonomous motivation toward physical activity will be negatively associated with emotional eating, beyond the effects of perceived stress and physical activity participation. According to Self-Determination Theory, autonomous motivation is linked to better emotional regulation and healthier behavioural patterns, reducing the likelihood of using food as an emotional coping mechanism (Deci & Ryan, 2000).

3.3 Research Design

The present study employed a quantitative cross-sectional design to examine the associations among perceived stress, physical activity, motivational regulation, and eating behaviours in adolescents.

Data collection was conducted through a structured questionnaire comprising validated psychometric instruments and sociodemographic questions. This approach allowed the assessment of psychological constructs (stress and motivation) and behavioural patterns (physical activity and eating behaviours) within a natural school context.

The study was developed within a biopsychosocial framework, which considers health behaviours as the result of the interaction between psychological processes, behavioural patterns, and environmental influences (Engel, 1977; Steinberg, 2008).

3.4 Participants and Sampling Procedure

The study employed a convenience sampling strategy to recruit participants from two secondary schools: Istituto Superiore "Grazio Cossali" (Orzinuovi, BS) and Liceo Scientifico "Enrico Medi" (Villafranca, VR). A total of 200 students participated in the study.

To be eligible for inclusion, participants were required to be between 14 and 19 years of age and currently enrolled in their respective secondary schools during the data collection period. Participation was strictly voluntary, and all individuals were provided with detailed information regarding the study objectives, confidentiality protocols, and ethical considerations prior to data collection. In compliance with ethical guidelines, parental informed consent and individual participant assent were obtained for all minors prior to the administration of the questionnaires.

To ensure the reliability and accuracy of the results, data cleaning procedures were applied; consequently, questionnaires that were incomplete or contained excessive missing data were excluded from the final analysis.

3.5 Measures and instruments

Data collection was conducted using a structured questionnaire composed of several sections aimed at assessing perceived stress, eating behaviors, motivation toward physical activity, and lifestyle characteristics.

3.5.1 Sociodemographic and lifestyle questionnaire

Participants were asked to provide demographic information including age, gender, educational level, and sport participation status. Additional questions assessed frequency of physical activity, type of sport practiced, social media use, and general lifestyle habits.

3.5.2 Perceived Stress Scale (PSS-4)

Perceived stress was assessed using the Perceived Stress Scale – 4 item version (PSS-4), a widely used instrument designed to evaluate the degree to which individuals perceive situations in their lives as stressful. The scale measures subjective perceptions of unpredictability, lack of control, and emotional overload experienced during the previous month (Cohen et al., 1983).

3.5.3 Behavioral Regulation in Exercise Questionnaire (BREQ-2)

Motivation toward physical activity was evaluated using the Behavioral Regulation in Exercise Questionnaire – 2 (BREQ-2). This instrument assesses different forms of motivational regulation according to Self-Determination Theory, ranging from intrinsic motivation to external regulation and amotivation (Markland & Tobin, 2004; Ryan & Deci, 2017).

3.5.4 Dutch Eating Behavior Questionnaire (DEBQ)

Eating behaviors were assessed using the Dutch Eating Behavior Questionnaire (DEBQ), which measures emotional eating, external eating, and restrained eating patterns. The instrument was selected because it allows the assessment of different maladaptive eating tendencies commonly associated with stress and emotional regulation difficulties (Van Strien et al., 1986).

3.5.5 Eating Attitudes Test (EAT-26)

The Eating Attitudes Test (EAT-26) was included to evaluate dysfunctional attitudes and behaviors related to eating and body image. The questionnaire is commonly used as a screening instrument for disordered eating risk (Garner et al., 1982).

3.5.6 Body image and social media section

To investigate the complex interplay between social media exposure, body image perception, and eating behaviors, a specific assessment section was integrated into the questionnaire. While standardized instruments exist for individual constructs, the rapidly evolving nature of digital interactions necessitated the development of an ad-hoc instrument based on the theoretical framework for social media use and eating behaviors established by the National Institutes of Health (NIH).

3.6 Data collection procedure

Data collection was conducted within participating schools during regular school hours. Following approval from school administrators and teachers, participants received information regarding the purpose of the study and instructions for questionnaire completion.

Questionnaires were administered anonymously in order to promote honest responses and reduce social desirability bias. Participants were informed that they could withdraw from the study at any time without consequences.

The completion time for the questionnaire was approximately 30- 40 minutes. All collected data were stored securely and processed according to ethical and confidentiality standards.

3.7 Data Analysis Plan

Statistical analyses were performed using JASP (Version 0.18.3). Prior to the primary analyses, a rigorous data cleaning procedure was implemented. Raw data were exported from Excel, where they had been organized by questionnaire section. Items on the PSS-4 requiring reverse scoring were recoded accordingly. The internal consistency of all psychometric scales and subscales (PSS-4, BREQ-2, DEBQ, and EAT-26) was assessed using Cronbach's alpha (α) and McDonald's omega (ω). Values of $\alpha \geq .70$ were considered indicative of acceptable reliability, although slightly lower values were considered acceptable for brief or exploratory measures (Nunnally & Bernstein, 1994).

The analytical plan was implemented in consecutive phases:

1. Preliminary and descriptive analyses. Descriptive statistics were calculated to summarize participants' demographic characteristics (e.g., age, gender, and sport participation status) and the main study variables. Means (M), standard deviations (SD), frequencies, and percentages were computed. The normality of variable distributions was assessed through the Shapiro–Wilk test and visual inspection of distribution plots.
2. Bivariate analyses (H1 and H2). To examine Hypothesis 1, Spearman's rank-order correlation coefficients (ρ) were computed to assess the associations between perceived stress and eating behaviour dimensions (emotional eating, restrained eating, and external eating), as normality assumptions were not fully satisfied. To test Hypothesis 2, independent samples *t*-tests were conducted to compare physically active and sedentary adolescents in terms of perceived stress, eating behaviours, and motivational profiles. Cohen's *d* was calculated to estimate effect sizes.
3. Moderation analysis (H3). To evaluate whether participation in physical activity moderated the relationship between perceived stress and emotional eating, a moderation analysis based on Ordinary Least Squares (OLS) regression was performed. Perceived stress was entered as the independent variable (X), sport participation (coded as 0 = sedentary, 1 = active) as the moderator (W), and emotional eating as the dependent variable (Y). An interaction term between perceived stress and sport participation was included to assess the moderating effect.
4. Multiple regression analysis (H4). To test Hypothesis 4, a multiple linear regression analysis was conducted with emotional eating as the dependent variable and perceived stress, sport participation, and autonomous motivation (Relative Autonomy Index; RAI) entered as predictors. This analysis allowed the assessment of the unique contribution of autonomous motivation to emotional eating while controlling for the effects of stress and sport participation.

For all statistical analyses, the significance level was set *a priori* at $p < .05$. Variables included in the regression models were selected on the basis of theoretical relevance and previous empirical findings.

Chapter 4

4.1 Sample Characteristics

A total of 200 adolescents participated in the study. The mean age of the participants was 16.40 years (*SD = 1.31*). The sample included both students who regularly practiced sports and students who did not engage in regular physical activity. Specifically, 139 participants (69.5%) reported practicing sports, whereas 61 participants (30.5%) reported not engaging in regular sports activities.

The relatively high proportion of physically active adolescents allowed meaningful comparisons between active and sedentary participants. All statistical analyses were performed using JASP (JASP Team, 2024).

4.2 Descriptive Statistics

Descriptive statistics for the main study variables are presented in Table 1. Participants reported moderate levels of perceived stress. Regarding eating behaviors, the sample displayed relatively low levels of emotional, restrained, and external eating. Finally, moderate levels of autonomous motivation toward physical activity were observed.

Table 1

Descriptive Statistics for the Main Study Variables (N = 200)

Variable	M	SD
Perceived Stress (PSS-4)	2.05	0.81
Emotional Eating (DEBQ)	1.45	1.05
External Eating (DEBQ)	2.20	0.93
Restrained Eating (DEBQ)	1.38	0.90
Relative Autonomy Index (RAI)	0.72	1.10

Note. Values represent Mean (M) and Standard Deviation (SD).

4.3 Reliability Analysis

Prior to conducting the main statistical analyses, the internal consistency of all psychometric instruments was assessed using Cronbach's alpha and McDonald's omega coefficients. Overall, most scales demonstrated acceptable to excellent reliability, supporting the use of composite scores in subsequent analyses.

Table 2

Reliability coefficients of the study scales

Scale	Cronbach's α	McDonald's ω
Stress	.657	.684
Amotivation	.789	.797
External regulation	.534	.534
Introjected regulation	.440	.557
Identified and intrinsic	.908	.914
Emotional eating	.903	.904
Restrained eating	.745	.748
External eating	.815	.824
EAT-26	.872	.873

Note. Values represent internal consistency estimates.

Although the internal consistency of the stress scale and some motivational subscales was below the conventional threshold of *.70*, these values are consistent with previous research using brief scales and were considered acceptable for exploratory purposes.

4.4 Hypothesis 1: associations between perceived stress and eating behaviours

To examine the relationship between perceived stress and eating behaviours, Spearman's rank-order correlations were conducted (Table 3). Perceived stress was positively associated with emotional eating (ρ=.17,p=.018), suggesting that adolescents with higher stress levels report more frequent emotional eating. No significant associations were found between perceived stress and the other eating dimensions. Furthermore, significant positive correlations emerged between all eating behaviour subscales. These findings provide partial support for Hypothesis 1.

Table 3

Spearman's rank-order correlations between study variables

Variable	1	2	3	4
1. Perceived stress	—			
2. Emotional eating	.17*	—		
3. Restrained eating	.05	.28**	—	
4. External eating	.08	.48**	.32**	—

Note. Values represent Spearman's ρ coefficients. *$p < .05$, $p < .001$.

4.5 Hypothesis 2: differences between physically active and sedentary adolescents

Independent samples t-tests were conducted to compare physically active and sedentary adolescents (Table 4). Physically active adolescents reported significantly lower levels of perceived stress compared to their sedentary counterparts. Furthermore, active participants demonstrated a significantly higher Relative Autonomy Index (RAI). Conversely, no statistically significant differences emerged between the two groups regarding emotional, restrained, or external eating behaviors.

Table 4

Comparison of stress, motivation, and emotional eating between active and sedentary adolescents

Variable	Active(= 139)	Sedentary (= 61)	t	p	d
Perceived Stress	1.95 (0.73)	2.25 (0.92)	2.46	.015	0.38
RAI (Motivation)	1.25 (0.85)	-0.65 (0.95)	-13.91	< .001	2.08
Emotional Eating	1.42 (1.02)	1.51 (1.11)	0.53	.594	0.08

Note. Values are reported as Mean (SD).

4.6 Hypothesis 3: moderating role of physical activity

A moderation analysis was conducted to determine if physical activity buffered the relationship between perceived stress and emotional eating (Table 5). The overall regression model was not statistically significant (F(3,195) =2.13, p=.097,R2=.032). While sport participation was a significant predictor of emotional eating, the interaction term between perceived stress and sport participation failed to reach statistical significance (B=0.328, p=.085). Consequently, Hypothesis 3 was not supported, suggesting that sport participation alone is insufficient to buffer the impact of stress on emotional eating.

Table 5 presents the regression coefficients for the moderation model.

Table 5

Summary of moderation analysis predicting emotional eating

Predictor	B	SE	β	t	p
Intercept	1.738	354	—	4.913	< .001
Perceived Stress	-67	145	-51	-460	.646
Sport Participation	-860	435	—	-1.978	.049

Stress × Sport Participation	328	189	340	1.732	.085

Note. N = 199. Emotional eating was entered as the dependent variable. Sport participation was coded as 0 = sedentary and 1 = active. The interaction term (Perceived Stress × Sport Participation) was not statistically significant, indicating that physical activity did not moderate the relationship between perceived stress and emotional eating. *R^2 = .032*, Adjusted *R^2 = .017, F(3, 195) = 2.13, p = .097*.

4.7 Hypothesis 4: autonomous motivation as a predictor of emotional eating

To investigate whether autonomous motivation predicted emotional eating beyond stress and sport participation, a multiple linear regression was performed (Table 6). The model was statistically significant (F(3,190)=3.46,p=.018,R2=.052). Autonomous motivation emerged as the only significant predictor of emotional eating (β=−0.269,p=.008), indicating that higher autonomous motivation is associated with lower emotional eating. Neither perceived stress nor sport participation remained significant predictors in this model, supporting Hypothesis 4.

Table 6

Summary of multiple regression analysis predicting emotional eating

Predictor	**B**	**SE**	**β**	**t**	**p**
Constant	1.198	253	—	4.743	< .001
Perceived Stress	135	93	104	1.447	.150
RAI	-95	36	-269	-2.677	.008
Sport Participation	301	234	130	1.287	.200

Note. N = 194. R^2 = .052; Adjusted *R^2 = .037.*

4.8 Exploratory analysis: gender differences in eating behaviours

An independent samples t-test was conducted to explore gender differences in eating behaviours (Table 7). A statistically significant difference was observed in emotional

eating, with female adolescents reporting higher scores than their male counterparts (t=−2.33, p=.021). No significant gender differences emerged for perceived stress or restrained eating.

Table 7

Gender differences in emotional eating

Variable	Male (= 98)	Female (= 102)	t	p
Emotional Eating	1.28 (0.88)	1.62 (1.16)	2.33	.021

Note. Values represent Mean (SD). N = 200.

4.9 Summary of findings

Overall, the findings provided partial support for Hypothesis 1, full support for Hypothesis 2, no support for Hypothesis 3, and support for Hypothesis 4.

Perceived stress was positively associated with emotional eating, whereas no significant associations were found with restrained or external eating. Regarding group differences, physically active adolescents reported lower levels of perceived stress and significantly higher levels of autonomous motivation compared to their sedentary peers. However, the moderation analysis revealed that sport participation did not significantly buffer the relationship between perceived stress and emotional eating.

Finally, autonomous motivation emerged as a significant negative predictor of emotional eating. This suggests that the quality of motivation toward physical activity, rather than participation alone, may represent an important protective factor against maladaptive eating behaviours in adolescence.

Chapter 5

Discussion

5.1 Overview of the study

The present study aimed to investigate the complex interplay between perceived stress, eating behaviours, physical activity, and motivational profiles among adolescents. By examining these variables, this research sought to clarify whether physical activity and motivational quality could serve as protective factors against stress-induced maladaptive eating. The rationale for this investigation stems from the need to understand how lifestyle choices and psychological processes interact during a developmental stage characterized by high vulnerability to both stress and body image concerns.

Results showed that perceived stress was positively associated with emotional eating. Furthermore, physically active adolescents reported lower stress levels and more autonomous motivational profiles than their sedentary peers. While physical activity did not moderate the relationship between stress and emotional eating, autonomous motivation emerged as a significant predictor, remaining significant even after controlling for stress and sport participation.

5.2 Perceived stress and eating behaviours

The first hypothesis proposed that higher levels of perceived stress would be associated with maladaptive eating behaviors, particularly emotional eating. The results partially supported this hypothesis. Specifically, perceived stress was positively associated with emotional eating, whereas no significant relationships emerged between stress and restrained or external eating.

These findings are consistent with previous literature suggesting that stress may promote emotional eating behaviors as a maladaptive coping strategy (Adam & Epel, 2007). Adolescents experiencing higher levels of stress may use food, especially highly palatable foods, as a means of regulating negative emotions and alleviating psychological discomfort. (Adam & Epel, 2007; Torres & Nowson, 2007). From a neurobiological perspective, chronic stress may alter the functioning of the hypothalamic–pituitary–adrenal (HPA) axis and increase the consumption of energy-dense foods through cortisol-mediated mechanisms (Torres & Nowson, 2007).

The absence of significant associations between stress and restrained or external eating may indicate that these eating patterns are influenced by factors other than perceived stress, such as sociocultural pressures, body image concerns, environmental food cues, or individual personality traits. Previous studies have similarly reported that emotional eating represents the eating behaviour most consistently associated with psychological distress during adolescence (Michels et al., 2012).
Furthermore, the exploratory analyses revealed that female adolescents reported significantly higher levels of emotional eating than males. This finding is consistent with previous research demonstrating greater vulnerability among females to stress-related eating and emotional dysregulation (Van Strien et al., 2013). These gender differences are likely influenced by a complex interplay of social and cultural factors, including heightened body image concerns and the internalization of appearance ideals. These factors remain significant predictors of maladaptive eating behaviours even when controlling for perceived stress and individual differences in stress response (Holland & Tiggemann, 2016; Tiggemann & Zaccardo, 2015).

5.3 Physical activity, stress, and motivational profiles

The second hypothesis predicted that physically active adolescents would report lower levels of perceived stress and higher levels of autonomous motivation compared with sedentary adolescents. The findings fully supported this hypothesis.
Physically active participants reported significantly lower levels of stress than sedentary adolescents. This result is in line with previous evidence demonstrating the beneficial effects of regular physical activity on psychological well-being and stress regulation (Biddle et al., 2019; Zschucke et al., 2015). Physical activity may reduce stress through multiple physiological and psychological mechanisms, including improved mood, enhanced self-esteem, reduced physiological reactivity to stressors, and increased resilience (Klaperski et al., 2014; Zschucke et al., 2015; Biddle et al., 2019).
In addition, physically active adolescents displayed more self-determined motivational profiles, characterized by higher levels of identified and intrinsic motivation and lower levels of amotivation. These findings are consistent with Self-Determination Theory (Ryan & Deci, 2017), which posits that autonomous forms of motivation promote sustained engagement in health-related behaviours and foster psychological well-being.
Interestingly, no significant differences emerged between active and sedentary adolescents regarding emotional eating. This result suggests that participation in sport

alone may not be sufficient to influence eating behaviours directly. Other psychological variables, such as emotional regulation skills, coping strategies, and motivational quality, may play a more relevant role.

5.4 The moderating role of physical activity

The third hypothesis proposed that physical activity participation would moderate the relationship between perceived stress and emotional eating by attenuating the impact of stress on eating behaviours. However, this hypothesis was not supported.

The moderation analysis revealed that sport participation did not significantly alter the association between perceived stress and emotional eating. Although physically active adolescents reported lower overall stress levels, participation in sport did not appear to buffer the effects of stress on emotional eating behaviours.

Several explanations may account for this finding. First, physical activity was assessed dichotomously (active vs. sedentary), without considering exercise intensity, duration, frequency, or quality. Consequently, important variations in physical activity engagement may not have been captured. Previous studies suggest that the psychological benefits of physical activity may depend not only on participation itself but also on the characteristics of the activity performed (Klaperski et al., 2014).

Second, emotional eating is a complex phenomenon influenced by multiple psychological and environmental factors (Michels et al., 2012; Van Strien et al., 2013). Stress-related eating behaviours may depend more strongly on emotional regulation abilities, coping styles, body dissatisfaction, and social influences than on physical activity participation alone.

Finally, it is possible that the protective effects of physical activity against emotional eating are indirect and mediated by other variables, such as self-esteem, resilience, or motivational processes.

5.5 Autonomous motivation and emotional eating

The fourth hypothesis proposed that autonomous motivation toward physical activity would predict emotional eating beyond the effects of perceived stress and sport participation. This hypothesis was supported.

Autonomous motivation emerged as the only significant predictor of emotional eating in the regression model. Specifically, adolescents reporting higher levels of autonomous motivation exhibited lower levels of emotional eating, even after controlling for stress

and sport participation.
This finding highlights the importance of motivational quality rather than mere behavioural participation. According to Self-Determination Theory, individuals who engage in physical activity for autonomous reasons, such as enjoyment, personal values, or intrinsic satisfaction, tend to experience greater psychological well-being and more adaptive emotional regulation strategies (Ryan & Deci, 2017).
Conversely, adolescents characterized by lower autonomous motivation may be more vulnerable to emotional distress and maladaptive coping behaviours, including emotional eating. These results suggest that interventions aimed at promoting autonomous motivation could contribute not only to increased physical activity participation but also to healthier eating behaviours and improved emotional well-being (Ryan & Deci, 2017; Ntoumanis et al., 2021).

5.6 Practical implications

The findings of the present study have several practical implications for health promotion programs targeting adolescents.
First, school-based interventions should incorporate stress management and emotional regulation strategies in order to prevent maladaptive eating behaviours. Programs promoting mindfulness, coping skills, and psychological resilience may be particularly beneficial (Biddle et al., 2019; Zschucke et al., 2015).
Second, interventions should encourage not only participation in physical activity but also the development of autonomous forms of motivation. Educational environments that support adolescents' autonomy, competence, and relatedness may foster long-term engagement in healthy lifestyles (Ryan & Deci, 2017).
Finally, special attention should be devoted to female adolescents, who appear to be more vulnerable to emotional eating behaviours and may benefit from targeted prevention programs addressing body image concerns and emotional coping.

5.7 Limitations and future directions

Several limitations should be considered when interpreting the findings.
First, the cross-sectional design precludes causal inferences regarding the relationships among stress, motivation, physical activity, and eating behaviours. Longitudinal studies are needed to clarify the directionality of these associations.
Second, all variables were assessed through self-report questionnaires, which may be

affected by recall bias and social desirability bias.

Third, the use of a convenience sample limits the generalizability of the findings to the broader adolescent population.

Additionally, physical activity was measured as a dichotomous variable (active vs. sedentary), preventing a more detailed examination of exercise frequency, intensity, and duration.

Future research should employ longitudinal designs, objective measures of physical activity, and larger, more representative samples. Moreover, future studies should investigate potential mediators and moderators, including emotional regulation, body image, resilience, and social media use.

Chapter 6

CONCLUSIONS

The present study investigated the relationships among perceived stress, physical activity participation, exercise motivation, and eating behaviours in adolescents. Overall, the findings indicate that perceived stress is positively associated with emotional eating, supporting the view that emotional eating may represent a maladaptive coping strategy during adolescence (Adam & Epel, 2007; Michels et al., 2012). Female adolescents appeared particularly vulnerable to emotional eating behaviours, highlighting the importance of considering gender differences in prevention and intervention programs.

The study further demonstrated that physically active adolescents reported lower levels of stress and more autonomous motivational profiles than sedentary adolescents, confirming the beneficial role of physical activity in adolescent psychological well-being (Biddle et al., 2019; Zschucke et al., 2015).

However, physical activity participation did not moderate the relationship between stress and emotional eating, suggesting that merely engaging in sport may not be sufficient to protect adolescents from stress-related eating behaviours. Importantly, autonomous motivation toward physical activity emerged as a significant negative predictor of emotional eating even when controlling for the effects of perceived stress and sport participation. This finding emphasizes that the quality of motivation is more relevant than physical activity participation itself in promoting adaptive behavioural outcomes. This finding emphasizes that the quality of motivation may be more relevant than physical activity participation itself in promoting adaptive behavioural and emotional outcomes.Taken together, these results support a biopsychosocial perspective on adolescent health, highlighting the complex interactions among psychological factors, lifestyle behaviours, and motivational processes. From a practical perspective, interventions aimed at promoting adolescent well-being should address stress management, emotional regulation, and the development of autonomous motivation toward healthy behaviours. School settings may represent an ideal context for implementing integrated prevention programs that simultaneously target physical activity, psychological well-being, and healthy eating behaviours.

In conclusion, fostering autonomous motivation and supporting adolescents in developing adaptive coping strategies may contribute substantially to promoting

healthier lifestyles and preventing maladaptive eating behaviours during this critical developmental stage.

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Annexes

APPENDICES

Appendix A – Questionnaire

TITOLO QUESTIONARIO:

(EN)"A comprehensive analysis of eating patterns, physical activity, stress, body image perception and social media use related to eating habits in Italian high school students"

(IT) "Un'analisi completa delle abitudini alimentari, dell'attività fisica, dello stress, della percezione dell'immagine corporea e dell'uso dei social media correlato alle abitudini alimentari negli studenti delle scuole superiori italiane".

Gentili studenti e studentesse,

Questo questionario, della durata di circa 25/30 minuti, sarà utilizzato come base per due tesi di laurea magistrali in Food and Health dell'Università di Padova.

Non ci sono risposte giuste o sbagliate: è fondamentale che rispondiate onestamente e chiaramente a tutte le domande su abitudini alimentari, sport, stress, immagine corporea e social media, per ottenere dati utili e realistici sul vostro benessere quotidiano.

Grazie per il tuo prezioso contributo!

CONTATTI:

Giulia Bonetti: giulia.bonetti.2@studenti.unipd.it

Delia Bonato: delia.bonato@studenti.unipd.it

DATI DEMOGRAFICI

Compila le seguenti domande:

1. Età (anni interi): _____
2. Classe frequentata e tipo di istituto (es.1a liceo scientifico):_____
3. Genere:

   □M □F □ non binario □preferisco non dire □altro:_____

4. Eventuali condizioni mediche rilevanti per l'alimentazione (Es. celiachia, intolleranza al lattosio, allergia alle noci, IBS, diabete, nessuna, etc.):_____
5. Fai uso frequente (almeno 4 volte a settimana) di farmaci?

   □ No
   □ Sì
   Se sì, specifica quali: _____

ABITUDINI ALIMENTARI

Indica la risposta che meglio rappresenta le tue abitudini nelle ultime 4 settimane:

Segui un regime di dieta specifico?

□ Onnivora (sia prodotti di origine animale che prodotti di origine vegetale)

□Flexitariana (per lo più prodotti vegetali con consumo occasionale di carne e altri prodotti animali)

□Vegetariana (consumo di prodotti vegetali e derivati animali, come latte e uova, ma esclude carne e pesce)

□Vegana (consumo di prodotti vegetali escludendo tutti i prodotti animali e derivati)

□Altro:_____

6. Quante mattine a settimana fai colazione?

   □mai
   □1–2 volte a settimana
   □3–4 volte a settimana
   □5–7 volte a settimana

7. Di solito cosa mangi/bevi a colazione?
   - □ Brioche e cappuccino
   - □ Latte/yogurt e biscotti
   - □ Latte/yogurt e cereali
   - □ Fette biscottate e marmellata
   - □ Pane, burro e marmellata
   - □ Porridge
   - □ Toast salato
   - □ Altro:_____
8. Quante volte alla settimana salti il pranzo?
   - □ mai
   - □ 1–2 volte a settimana
   - □ 3–4 volte a settimana
   - □ ≥5 volte a settimana
9. Quante volte alla settimana salti la cena?
   - □ mai
   - □ 1–2 volte a settimana
   - □ 3–4 volte a settimana
   - □ ≥5 volte a settimana
10. Quante volte al giorno fai uno spuntino tra un pasto e l'altro?
    - □ mai
    - □ 1
    - □ 2
    - □ ≥3
11. Di solito cosa scegli per lo spuntino? (scegli massimo 3 opzioni tra quelle che consumi più frequentemente)
    - □ Merendine confezionate (es. plumcake, brioche, crostatine, etc.)
    - □ Pane e Nutella/marmellata
    - □ Biscotti
    - □ Cioccolato o barrette di cioccolato
    - □ Crackers o simili (grissini, schiacciatine, croccantelle, etc.)
    - □ Frutta fresca
    - □ Yogurt
    - □ Caffè

□ Pane e formaggi/affettati

12. Con quale frequenza settimanale consumi questi alimenti? (porzioni a settimana PS)

Alimento	**Mai**	**1/2PS**	**2/3PS**	**4/5PS**	**>5PS**
Frutta	□	□	□	□	□
Verdura	□	□	□	□	□
Cereali integrali	□	□	□	□	□
Olio EVO	□	□	□	□	□
Cereali raffinati	□	□	□	□	□
Latte e derivati	□	□	□	□	□
Frutta secca	□	□	□	□	□
Pesce	□	□	□	□	□
Legumi	□	□	□	□	□
Carne	□	□	□	□	□
Uova	□	□	□	□	□
Bevande zuccherate	□	□	□	□	□
Fast food	□	□	□	□	□
Dolci/merendine	□	□	□	□	□

13. Con chi mangi di solito il pranzo?
    - □ famiglia
    - □ amici
    - □ da solo
    - □ altro:_____
14. Con chi mangi di solito la cena?
    - □ famiglia
    - □ amici

□ da solo

□ altro:_____

15. Quanto spesso mangi davanti a TV, PC o smartphone

□ mai

□ raramente

□ qualche volta

□ spesso

□ sempre

16. Durante un giorno di scuola, quante volte usi il distributore di snack o vai al bar per comprare uno spuntino o una bevanda?

□ mai

□ 1 volta

□ 2 volte

□ 3+ volte

17. Quando usi il distributore o vai al servizio bar, cosa compri più spesso? (scegli massimo 3 opzioni tra quelle che consumi più frequentemente)

□ Merendine dolci (es. plumcake, brioche, crostatine)

□ Biscotti e barrette

□ Cioccolato (tavolette/barrette)

□ Caramelle

□ Patatine

□ Crackers, grissini, snack salati

□ Acqua (naturale/frizzante)

□ Bibite zuccherate (cola, aranciata, tè freddo)

□ Succhi di frutta

□ Energy drink

□ Caffè/cappuccino/cioccolata calda

□ Pizza al taglio/pizzette

□ Panini farciti (prosciutto, salame, tonno)

□ Cornetti/brioche (vuoti, farciti)

□ Torte (ciambellone, crostate)

□ Altro:_____

18. Pensi che il servizio bar/distributore fornisca abbastanza alternative per una merenda sana?

□ per niente
□ poco
□ abbastanza
□ molto
se per niente\poco cosa dovrebbero aggiungere? _____

ATTIVITÀ SPORTIVA

Le seguenti domande riguardano la tua attività sportiva attuale.

19. Attualmente pratichi sport in modo regolare? Per “regolare” si intende svolgere attività fisica almeno una volta a settimana negli ultimi 3 mesi, indipendentemente dal fatto che l’attività sia organizzata (palestra, sport di squadra) o autonoma (allenamento a casa, corsa, esercizi individuali).

    □ No
    □ Sì, 1 sport
    □ Sì, più di uno

    Se sì, quante volte a settimana ti alleni?
    □ 1
    □ 2
    □ 3
    □ 4
    □ 5 o più

20. Che tipo di sport pratichi principalmente?
    □ Sport di squadra (es. calcio, basket, pallavolo)
    □ Sport individuale (es. atletica, nuoto, tennis)
    □ Sport di forza/estetici (palestra, bodybuilding, crossfit)
    □ Sport artistici/estetici (danza, ginnastica)
    □ Altro: _____

21. Quanto dura in media un allenamento?
    □ < 60 min
    □ 60–90 min
    □ > 90 min

22. Da quanti anni pratichi questo sport?
    □ < 1 anno
    □ 1–2 anni

□ 3–5 anni
□ > 5 anni

MOTIVAZIONI NELL'ESERCIZIO FISICO (BREQ-2)

Istruzioni:

Indica quanto ciascuna affermazione descrive il motivo per cui fai attività fisica.

Scala di risposta : 0=Mai, 1=Quasi Mai, 2=A volte, 3=Spesso, 4=Molto spesso

	Affermazione	**0**	**1**	**2**	**3**	**4**
23	Non vedo perché dovrei fare attività fisica.	□	□	□	□	□
24	Non capisco il motivo per cui dovrei fare esercizio.	□	□	□	□	□
25	Svolgere attività fisica non è importante per me.	□	□	□	□	□
26	Faccio esercizio perché gli altri mi dicono che dovrei farlo.	□	□	□	□	□
27	Mi alleno per evitare critiche o disapprovazione altrui.	□	□	□	□	□
28	Svolgo attività fisica perché amici/famiglia mi incoraggiano a farlo.	□	□	□	□	□
29	Mi sento in colpa se non faccio esercizio.	□	□	□	□	□

30	Mi sento nervoso/a o irrequieto/a se salto un allenamento.	□ □ □ □ □
31	Mi sento un fallimento quando non faccio attività fisica da un po'.	□ □ □ □ □
32	Ritengo che fare attività fisica sia davvero importante per me.	□ □ □ □ □
33	È importante per me fare lo sforzo di svolgere esercizio regolarmente.	□ □ □ □ □
34	Credo che l'attività fisica aiuti a raggiungere i miei obiettivi personali.	□ □ □ □ □
35	Faccio esercizio perché è divertente.	□ □ □ □ □
36	Mi piace far attività fisica.	□ □ □ □ □
37	Ottengo piacere nel partecipare alle mie sessioni di allenamento.	□ □ □ □ □

STRESS PERCEPITO (PSS-4)

Istruzioni:

Nelle **ultime 4 settimane**, quanto spesso ti sei sentito/a nel modo descritto?

Scala di risposta : 0=Mai, 1=Quasi Mai, 2=A volte, 3=Spesso, 4=Molto spesso

Affermazione	**0**	**1**	**2**	**3**	**4**

38	Sentire che non eri in grado di controllare le cose importanti della tua vita?	☐	☐	☐	☐	☐
39	Sentirti fiducioso/a nella tua capacità di gestire i tuoi problemi personali?	☐	☐	☐	☐	☐
40	Sentire che le cose stavano andando come volevi?	☐	☐	☐	☐	☐
41	Sentire che le difficoltà si accumulavano così tanto da non poterle superare?	☐	☐	☐	☐	☐

COMPORTAMENTO ALIMENTARE (DEBQ)

Istruzioni:
Indica con quale frequenza ti capita quanto descritto.

Scala di risposta: 0=Mai, 1=Raramente, 2=A volte, 3=Spesso, 4=Sempre)

	Affermazione	**0**	**1**	**2**	**3**	**4**
42	Hai voglia di mangiare quando le cose vanno male?	☐	☐	☐	☐	☐
43	Hai voglia di mangiare quando sei emotivamente scosso/a?	☐	☐	☐	☐	☐
44	Hai voglia di mangiare quando sei depresso/a o scoraggiato/a?	☐	☐	☐	☐	☐
45	Hai voglia di mangiare quando sta per succedere qualcosa di spiacevole?	☐	☐	☐	☐	☐

46	Hai voglia di mangiare quando ti senti solo/a?	☐ ☐ ☐ ☐ ☐
47	Hai voglia di mangiare quando sei irritato/a?	☐ ☐ ☐ ☐ ☐
48	Mangi meno per evitare di aumentare di peso o diventare più pesante?	☐ ☐ ☐ ☐ ☐
49	Mangi cibi che fanno dimagrire?	☐ ☐ ☐ ☐ ☐
50	Mangi meno di quanto vorresti?	☐ ☐ ☐ ☐ ☐
51	Controlli esattamente ciò che mangi?	☐ ☐ ☐ ☐ ☐
52	Mangi meno dopo aver mangiato troppo?	☐ ☐ ☐ ☐ ☐
53	Hai voglia di mangiare quando vedi altri mangiare?	☐ ☐ ☐ ☐ ☐
54	Mangi di più quando vedi altri mangiare?	☐ ☐ ☐ ☐ ☐
55	Hai voglia di comprare qualcosa quando passi davanti a una panetteria/pasticceria?	☐ ☐ ☐ ☐ ☐
56	Hai voglia di mangiare quando vedi o senti l'odore del cibo?	☐ ☐ ☐ ☐ ☐

57	Mangi di più se il cibo ha un buon sapore?	□ □ □ □ □

58. Hai mai smesso o ridotto drasticamente uno sport che praticavi?
□ No
□ Sì

Se sì, indica i motivi principali:
□ Mancanza di tempo / Studio
□ Stress eccessivo legato alla competizione
□ Pressione eccessiva (allenatori/genitori)
□ Problemi legati all'immagine corporea o al peso
□ Altro: _____

BODY DYSMORPHIA

Rispondi in base a come ti sei sentito/a riguardo al tuo aspetto fisico nell'ultimo mese.

59. Ti preoccupi del tuo aspetto fisico?

□ No
□ Sì
Se sì, elenca aree: _____

60. Pensi spesso al tuo aspetto e vorresti pensarci meno?

□ No
□ Sì

61. La tua preoccupazione principale è non essere abbastanza magro o ingrassare?

□ No
□ Sì

62. Ti disturba molto la percezione di non essere abbastanza?

□ No
□ Sì

63. La percezione di non essere abbastanza ha interferito con amici/relazioni?

□ No
□ Sì

Se si descrivi brevemente:_____

64. Ha causato problemi a scuola/lavoro?

□ No
□ Si

Se si descrivi brevemente:_____

65. Eviti di fare cose perché credi che dipendano dal tuo aspetto?

□ No
□ Si

Se si descrivi brevemente:_____

ATTEGGIAMENTI ALIMENTARI (EAT-26)

Istruzioni:

Indica quanto le affermazioni che seguono descrivono il tuo comportamento alimentare negli ultimi 6 mesi scegliendo l'opzione che meglio rispecchia la tua situazione

(Scala di risposta: 0=Mai, 1=Raramente, 2=A volte, 3=Spesso, 4=Normalmente, 5=Sempre)

	Affermazione	**0**	**1**	**2**	**3**	**4**	**5**
66	Sono terrorizzato/a di essere in sovrappeso	□	□	□	□	□	□
67	Quando ho fame evito di mangiare	□	□	□	□	□	□

68	Penso al cibo con preoccupazione	□	□	□	□	□	□
69	Mi è capitato di mangiare con enorme voracità sentendomi incapace di smettere	□	□	□	□	□	□
70	Ho l'abitudine di sminuzzare il cibo	□	□	□	□	□	□
71	Faccio molta attenzione al potere calorico degli alimenti che mangio	□	□	□	□	□	□
72	Evito in particolare gli alimenti con un alto contenuto di carboidrati (ad esempio, pane, riso, patate, ecc)	□	□	□	□	□	□
73	Sento gli altri che vorrebbero che mangiassi di più	□	□	□	□	□	□
74	Vomito dopo aver mangiato	□	□	□	□	□	□
75	Mi sento molto in colpa dopo aver mangiato	□	□	□	□	□	□
76	Mi tormenta il desiderio di essere più sottile	□	□	□	□	□	□
77	Mi sottopongo a esercizi fisici intensi per bruciare calorie	□	□	□	□	□	□
78	Altri pensano che io sia troppo magro/a	□	□	□	□	□	□
79	Mi preoccupa l'idea di avere del grasso sul mio corpo	□	□	□	□	□	□

80	Impiego più tempo degli altri per mangiare	□ □ □ □ □ □
81	Evito di mangiare cibi dolci	□ □ □ □ □ □
82	Mangio cibi dietetici	□ □ □ □ □ □
83	Sento che il cibo controlla la mia vita	□ □ □ □ □ □
84	Mi piace mostrare un grande autocontrollo verso il cibo e dominare la fame	□ □ □ □ □ □
85	Sento che gli altri fanno pressioni su di me perché io mangi	□ □ □ □ □ □
86	Dedico al cibo troppo tempo e troppi pensieri	□ □ □ □ □ □
87	Mi dispero se mangio dei dolci	□ □ □ □ □ □
88	Mi impegno in programmi di dieta	□ □ □ □ □ □
89	Mi piace che il mio stomaco sia vuoto	□ □ □ □ □ □
90	Ho l'impulso di vomitare dopo mangiato	□ □ □ □ □ □
91	Mi piace provare nuovi cibi elaborati	□ □ □ □ □ □

IMPATTO DEI SOCIAL MEDIA SULLE ABITUDINI ALIMENTARI

Istruzioni:

Rispondi in base all'uso che hai fatto dei social media nell'ultimo mese

ABITUDINI ALIMENTARI

(Scala di risposta: 0=Mai, 1=Raramente, 2=A volte, 3=Di solito, 4=Sempre)

	Affermazione	**0**	**1**	**2**	**3**	**4**
92	Consumo quotidianamente i pasti principali (colazione, pranzo, cena)	☐	☐	☐	☐	☐
93	Seguo piani alimentari salutari trovati sui social media. (Una dieta salutare implica uno stile di vita equilibrato e ricco di nutrienti, con un apporto calorico adeguato ai bisogni individuali e alle attività quotidiane)	☐	☐	☐	☐	☐
94	Vado a mangiare in ristoranti salutari (che offrono opzioni a basso contenuto di calorie, grassi e zuccheri) pubblicizzati o consigliati sui social media.	☐	☐	☐	☐	☐
95	Soddisfo i miei fabbisogni nutrizionali giornalieri usando app di nutrizione (es. MyFitnessPal, Water Reminder, ecc.)	☐	☐	☐	☐	☐
96	Preparo nuove ricette salutari che trovo sui social media	☐	☐	☐	☐	☐

ATTEGGIAMENTO E NORME PERCEPITE

(Scala di risposta: 0=Per niente d'accordo, 1=Disaccordo, 2=Neutrale, 3=D'accordo, 4=Fortemente d'accordo)

	Affermazione	**0**	**1**	**2**	**3**	**4**
97	Credo che i social media abbiano sottolineato l'importanza del consumo regolare dei pasti	□	□	□	□	□
98	Ritengo che i social media possano aiutarmi a preparare a casa ricette di cibi salutari	□	□	□	□	□
99	Mi piace esplorare ristoranti che offrono opzioni salutari (a basso contenuto di calorie, grassi e zuccheri) visti sui social media	□	□	□	□	□
100	Credo che i social media abbiano contribuito a rendermi consapevole dell'importanza di soddisfare i miei fabbisogni nutrizionali giornalieri	□	□	□	□	□
101	I social media hanno influenzato positivamente le mie abitudini alimentari	□	□	□	□	□
102	Ritieni che seguire persone della tua cerchia sociale sui social media incoraggi il consumo regolare dei pasti attraverso i loro post	□	□	□	□	□
103	Ritieni che seguire persone della tua cerchia sociale sui social media influenzi negativamente la percezione del tuo peso	□	□	□	□	□

104	Ritieni che seguire persone della tua cerchia sociale sui social media migliori il tuo apporto quotidiano di nutrienti (es. tramite app come MyFitnessPal, Water Reminder, ecc.)	□ □ □ □ □
105	Ritieni che le opinioni degli influencer sui social media abbiano influenzato la tua decisione di scegliere piatti salutari (a basso contenuto di calorie, grassi saturi e zuccheri) al ristorante	□ □ □ □ □
106	Ritieni che seguire persone della tua cerchia sociale sui social media aiuti a preparare a casa ricette salutari (a basso contenuto di calorie, grassi saturi e zuccheri)	□ □ □ □ □
107	Ritieni che seguire persone della tua cerchia sociale sui social media aiuti a mantenere una dieta salutare	□ □ □ □ □

CAPACITÀ DI AZIONE PERSONALE

(Scala di risposta: 0=Per niente sicuro, 1=Poco sicuro, 2=Non lo so, 3=Sicuro, 4=Molto sicuro)

	Affermazione	**0**	**1**	**2**	**3**	**4**
108	Quanto ti senti sicuro che i social media ti aiuteranno a consumare una quantità adeguata di nutrienti? (es. tramite app come Yazio o myFitnessPal, ecc.)	□	□	□	□	□
109	Quanto ti senti sicuro che i social media ti aiuteranno a preparare pasti salutari a casa	□	□	□	□	□

110	Quanto ti senti sicuro che i social media ti aiuteranno a mantenere un consumo regolare dei pasti principali?	□ □ □ □ □
111	Quanto ti senti sicuro che la tua decisione di mangiare in un ristorante salutare sia influenzata dai post sui social media?	□ □ □ □ □
112	Quanto ti senti sicuro che la tua decisione di consumare cibi salutari sia influenzata dalle informazioni e dai consigli sui social media?	□ □ □ □ □

INTENZIONE E SALIENZA

(Scala di risposta: 0=Per niente d'accordo, 1=Disaccordo, 2=Neutrale, 3=D'accordo, 4=Fortemente d'accordo)

	Affermazione	**0**	**1**	**2**	**3**	**4**
113	Voglio usare i social media per cercare ricette di cibi salutari da preparare.	□	□	□	□	□
114	Voglio usare i social media per adottare una dieta salutare.	□	□	□	□	□
115	Voglio usare i social media per migliorare il mio consumo regolare dei pasti principali	□	□	□	□	□

116	Voglio esplorare nuovi ristoranti e cibi salutari presentati sui social media	☐	☐	☐	☐	☐
117	Voglio usare applicazioni sui social media per ricordarmi di soddisfare i miei fabbisogni nutrizionali (es. app come MyFitnessPal, Water Reminder, ecc.)	☐	☐	☐	☐	☐
118	Credo che sia importante fare colazione ogni giorno a causa di ciò che vedo e leggo sui social media	☐	☐	☐	☐	☐
119	Credo che l'esposizione continua a contenuti relativi alle diete sui social media influenzi le mie scelte alimentari	☐	☐	☐	☐	☐
120	Vedere idee e ricette per pasti salutari fatti in casa sulle piattaforme social mi incoraggia a dare priorità alla cucina domestica	☐	☐	☐	☐	☐
121	Quando uso applicazioni di social media, divento più consapevole dell'importanza di incontrare il mio fabbisogno calorico giornaliero	☐	☐	☐	☐	☐

COMPETENZE E CONOSCENZE

Affermazione	**Sì**	**No**	**Non ne sono sicura**

122	Ho le competenze necessarie per preparare pasti salutari a casa sulla base di ciò che ho imparato dai social media	☐	☐	☐
123	Ho le competenze necessarie per seguire una dieta salutare sulla base delle raccomandazioni presenti sui social media.	☐	☐	☐
124	Ho le competenze necessarie per cercare nuovi ristoranti salutari e provarli sulla base dei post sui social media.	☐	☐	☐
125	Ho le competenze necessarie per trovare e provare app di alimentazione e nutrizione per garantire un'alimentazione adeguata.	☐	☐	☐
126	È importante consumare una varietà di alimenti ricchi di nutrienti per garantire un adeguato apporto di nutrienti durante la giornata?	☐	☐	☐
127	Consideri le verdure grigliate al forno con un cucchiaino (5 ml) di olio d'oliva una ricetta salutare?	☐	☐	☐
128	È importante conoscere il contenuto calorico dei piatti prima di ordinarli dal menù al ristorante?	☐	☐	☐
129	So che consumare regolarmente i pasti principali è benefico per la mia salute	☐	☐	☐

DESCRIZIONE DELLA RICERCA E BIBLIOGRAFIA

Il presente studio integra due progetti di ricerca magistrale focalizzati sul benessere degli adolescenti e dei giovani adulti:

Tesi 1: Valuta le abitudini alimentari e rileva eventuali segnali di disturbi dell'alimentazione (DCA) e dismorfia corporea negli adolescenti, analizzando il ruolo delle influenze dei social media sui comportamenti alimentari.

Tesi 2: Analizza la correlazione tra lo stress percepito e le abitudini alimentari, valutando come l'attività sportiva possa fungere da fattore protettivo o, in certi casi, di pressione psicologica.

Comprendere questi legami è cruciale per sviluppare programmi di educazione alimentare e psicologica nelle scuole, prevenire disturbi del comportamento alimentare e promuovere un uso consapevole delle piattaforme digitali.

Titoli delle tesi:

Tesi 1

EN: "*Eating disorders and body image concerns: an overview and questionnaire-based analysis among Italian high school students"*

IT: *"Disturbi alimentari e preoccupazioni sull'immagine corporea: una panoramica e analisi basata su questionari tra gli studenti delle scuole superiori italiane"*

Tesi 2

EN: "*Physical Activity, Stress Management, and Eating Habits: A Correlational Analysis Among Italian High School Students"*

IT: "*Attività fisica, gestione dello stress e abitudini alimentari: un'analisi correlazionale tra gli studenti delle scuole superiori italiane"*

Grazie per il tuo prezioso contributo alla ricerca scientifica!

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