

2º CICLO DE ESTUDOS
MESTRADO EM EDUCAÇÃO PARA A SAÚDE

Determinants of body image in adolescence: a multilevel approach

Beatriz de Oliveira Teixeira

M

2020

Orientadora: Prof^a Doutora Elisabete Ramos

Coorientador: Prof Doutor Milton Severo



Esta dissertação é realizada a partir do projeto *EpiTeen* e tem como base o manuscrito apresentado. Para a sua elaboração fui responsável pela análise dos dados e pela redação da sua versão inicial.

Agradecimentos

À Profª Doutora Elisabete Ramos por toda a sua ajuda e paciência e por tanto ter acrescentado ao meu trabalho, tendo-me permitido aprender e crescer enquanto profissional.

Ao Prof Doutor Milton Severo pelo apoio crucial no desenvolvimento deste trabalho e em toda a paciência.

Aos meus pais e à minha irmã, por serem o meu porto seguro, por estarem ao meu lado em todas as minhas decisões, por me terem educado com os valores certos e por me ensinarem a enfrentar as adversidades da vida.

Ao Rogério, pela paciência interminável, por todo o apoio, por estar sempre do meu lado, por me relaxar, acalmar e me “obrigar” a fazer pausas, mesmo nas alturas de maior trabalho e stress. Por ser o meu mais honesto porto de abrigo.

À Profª Doutora Cláudia Afonso pelo carinho e amizade que manteve comigo ao longo de todo o meu mestrado e pelo seu apoio constante nas mais diversas vertentes.

À Mariana e à Francisca, por estarem do meu lado desde o primeiro dia deste percurso, por terem tornado esta dissertação uma aventura sorridente, pelo apoio e pelas intermináveis chamadas que tanto me ajudaram.

Às Beas, à Maria, à Mafalda, à Ana, à Sofia, à Maria Inês, ao Fábio, ao Bruno e ao Zé pela amizade constante e por continuarem a saber o que dizer no momento certo.

“A inspiração existe, mas tem de te encontrar a trabalhar”

Pablo Picasso

Resumo

Introdução: A imagem corporal é uma imagem tridimensional, complexa e subjetiva. Trata-se de um conceito importante a ser considerado na adolescência, dada a sucessão de mudanças físicas e cognitivas características desta faixa etária, tornando a adolescência um período decisivo no desenvolvimento da imagem corporal. A insatisfação com a imagem corporal está associada a várias consequências negativas, tais como obesidade, distúrbios alimentares, sintomas depressivos, alimentação não saudável, baixa autoestima e comportamentos inseguros. As consequências identificadas têm impacto na vida e saúde do indivíduo quer a curto, médio e longo prazo podendo os seus efeitos ocorrer direta ou indiretamente ao longo de toda a vida. De forma a entender completamente o desenvolvimento da percepção da imagem corporal e a insatisfação com essa imagem, é necessário considerar características individuais, familiares e ambientais. Nos adolescentes, a escola poderá ter um contexto particularmente relevante, uma vez que este ambiente tem um forte impacto no seu desenvolvimento social e psicológico.

Objetivos: Este estudo tem como objetivo compreender o papel da escola na percepção da imagem corporal do adolescente, bem como as características da escola, da família e do indivíduo que explicam as diferenças entre escolas. O estudo pretende ainda avaliar se o efeito da escola depende do sexo e da idade dos adolescentes.

Metodologia: Este trabalho foi realizado no âmbito da coorte *EPITeen*, que incluiu adolescentes, nascidos em 1990, matriculados em escolas públicas e privadas do Porto. Os participantes foram avaliados aos 13 anos ($n=2117$) e aos 17 anos ($n=2257$). Foram usados questionários autoaplicados para recolher informação sobre as características sociodemográficas e de saúde da família e do participante, e sobre os estilos de vida dos adolescentes. O peso e a altura dos adolescentes foram medidos usando procedimentos padronizados e seguindo o mesmo protocolo em ambas as avaliações. As figuras de Stunkard foram usadas para avaliar a imagem com a qual o adolescente se identificava e qual a que gostaria de ter. Os adolescentes responderam ao Eating Disorders Inventory (EDI) e para este estudo foram utilizadas apenas 3 dimensões: insatisfação corporal, a bulimia e o impulso para emagrecer. Uma estrutura multinível foi considerada tendo em informação a nível do indivíduo, da família e da escola. Para avaliar o efeito das escolas nas variáveis relacionadas com a imagem corporal, foi utilizado o coeficiente intra-cluster (ICC). Para $ICC \geq 1\%$ considerou-se que a escola influenciou a percepção da imagem corporal do adolescente. Para medir a percentagem (%) explicada por cada um dos modelos, calculou-se a % de proporção explicada. Para entender a relação entre as variáveis de cada nível com os outcomes relacionados com a imagem corporal, foram

calculados os respectivos coeficientes de regressão (β) e os resultados foram considerados significativos quando o intervalo de confiança (IC) não continha o valor zero.

Resultados: A variabilidade entre escolas aumenta com a idade em ambos os sexos, em relação à insatisfação corporal (1,79% a 2,16% nas raparigas e 1,36% a 1,67% nos rapazes) e em relação à imagem desejada (2,83% a 2,99% nas raparigas e 0,87% e 1,22% nos rapazes). Por outro lado, nas raparigas, a variabilidade explicada pela escola diminui com a idade relativamente ao impulso pela magreza (2,67% a 0,99%) e à bulimia (2,52% a 1,17%). Contudo, a variabilidade explicada pela escola ao longo do tempo aumenta nos rapazes no que diz respeito à bulimia (1,57% a 3,05%). Existem características individuais (consumo de produtos *light*, ingestão de fritos, índice de massa corporal (IMC), sintomas depressivos, consumo de tabaco e álcool), familiares (nível de educação, IMC e mãe fumadora) e da escola (tipo de escola, média de escolaridade dos pais e média de IMC, sintomas depressivos e EDI total dos adolescentes) que influenciam o efeito da escola nas variáveis relacionadas com a imagem corporal.

Conclusão: A escola influencia a perceção da imagem corporal na adolescência. Este efeito é maior nas raparigas do que nos rapazes e aumenta com a idade nos rapazes. No entanto, nas raparigas, este efeito não é homogêneo em relação à idade: aumenta com a idade para a imagem desejada e insatisfação corporal e diminui com a idade para a bulimia e o impulso para emagrecer. Entende-se como fundamental trabalhar na escola os fatores individuais, familiares e escolares mencionados, por forma a contribuir para a aquisição de um conjunto de fatores protetores que promovam a satisfação corporal na adolescência através da promoção da educação para a saúde relativamente à perceção da imagem corporal nesta faixa etária.

Palavras-Chave: Imagem Corporal, Adolescência, Escola, Abordagem multinível

Abstract

Introduction: Body image is a three-dimensional image, complex and subjective. It is an important concept to be considered in adolescence, given the succession of physical and cognitive changes typical of this age group, making adolescence a decisive period in the development of body image. Dissatisfaction with body image is associated with several negative consequences, such as obesity, eating disorders, depressive symptoms, unhealthy eating, low self-esteem and unsafe changes. The identified consequences have impact on the individual's life and health, in a short, medium and long term way, and their effects may occur directly or indirectly throughout their lives. In order to fully understand the development of body image perception and dissatisfaction with that image, it is necessary to consider individual, family and environmental characteristics. In adolescents, school can be a particularly relevant context, since this environment has a strong impact on the social and psychological development of adolescents.

Aims: This study aims to understand the role of the school on the adolescent's body image perception as well as to comprehend the school, family and individual characteristics that explain the differences between schools. The study also aims to assess whether the school effect depends on adolescents' sex and age.

Methodology: This work was carried out within the EPITeen cohort, which included adolescents, born in 1990, enrolled in public and private schools in Porto. Participants were assessed at 13 years old ($n=2117$) and at 17 years old ($n=2257$). Self-administered questionnaires were used to collect information on the sociodemographic and health characteristics of the family and the participant, and on the adolescents' lifestyles. The adolescents' weight and height were measured using standardized procedures and followed the same protocol in both assessments. Stunkard's figures were used to assess the image with which adolescent identified and which he would like to have. Adolescents responded to the Eating Disorders Inventory (EDI) and for this study only 3 dimensions were used: body dissatisfaction, bulimia and impulse to thinness. A multilevel structure was considered taking into account individual, family and school information. To assess the effect of schools on body image related measures, the intra-cluster coefficient (ICC) was used. For $ICC \geq 1\%$ it was considered that school influenced the adolescent's body image perception. To measure the percentage (%) explained by each of the models, the % of explained proportion was calculated. To understand the relationship between the variables at each level and the body image related measures, the respective regression coefficients (β) were calculated and the results were considered significant when the confidence interval (CI) did not contain a zero value.

Results: The variability by school increases with age in both sexes for body dissatisfaction (1.79% to 2.16% for girls and 1.36% to 1.67% for boys) and for desired image (2.83% to 2.99% for girls and 0.87% and 1.22% for boys). Instead, in girls, the variability explained by school decreases with age for impulse to thinness (2.67% to 0.99%) and for bulimia (2.52% to 1.17%). However, the variability explained by school over time increases in boys for bulimia (1.57% to 3,05%). There are individual (light products consumption, fried foods intake, Body Mass Index (BMI), depressive symptoms, tobacco and alcohol consumption), familiar (education level, BMI and smoking mother) and school characteristics (school type, average of parents' education and average of adolescent' BMI, depressive symptoms and total EDI) that influence school effect on body image related measures.

Conclusion: School influences body image perception in adolescence. This effect is greater for girls than for boys and increase with age in boys. Although, in girls, this effect is not homogeneous considering age: increases for desired image and body dissatisfaction and decreases for bulimia and impulse to thinness. Working at school on the individual, family and school factors mentioned is fundamental to contribute to the acquisition of a set of protective factors that promote body satisfaction in adolescence through the promotion of health education regarding the perception of body image in this age group.

Keywords: Body image, Adolescence, School, Multinivel approach

Acronyms List

BDI-II: Beck Depression Inventory II

BMI: Body Mass Index

cm: centimeters

CI: Confidence Interval

EDI: Eating Disorders Inventory

EPITeen: Epidemiological Investigation of Adolescent Health in Porto

ICC: Intra-Cluster Coefficient

IUGR: Intrauterine Growth Restriction

kg: kilograms

MAR: Missing at Random

SPSS: Software Package for Social Sciences

WHO: World Health Organization

Tables Index

Table A – Description of the items included in each of the 3 subscales used.....	15
Table 1 – Body image related measures of the sampled participants, by age and sex.....	48
Table 2 - Variability [measured by Intra-cluster coefficient (ICC)] of the body image related measures explained by school, by sex and age.....	49
Table 3 – The role of individual and family characteristics on body image related measures at 13 years old by sex.....	50
Table 4 – The role of individual and family characteristics on body image related measures at 17 years old by sex.....	52
Table 5 – The role of school and school characteristics on body image related measures that have impact on school at 13 years old by sex.....	54
Table 6 – The role of school and school characteristics on body image related measures that have impact on school at 17 years old by sex.....	56
Table 7 – The role of individual, family and school characteristics that were previously related to body image related measures at 13 and 17 years old, whenever the % explained variance for individual characteristics was below 85%.....	59
Supplementary Table 1 – Characteristics of the sampled participants by age and sex.....	61
Supplementary Table 2 - Characteristics of the participants at 17y who participated at both ages.....	64

Contents

Agradecimientos	i
Resumo	ii
Abstract	iv
Acronyms List.....	vi
Tables Index.....	vii
1. Introduction	1
2. Objectives.....	10
3. Contextualization and Study Sample	12
4. References	18
5. Manuscript	26

1. Introduction

During adolescence, the fast-morphological changes, such as the increased of fat deposition, especially in girls, and of lean mass in boys, the growth spike in height in both sexes (1) and the delay in the physical development of boys compared to girls of the same age (2), can directly influence subject's mental image beyond that contradict the sociocultural idealization of beauty established by society. It seems that, regardless of the body aspect presented, adolescents are vulnerable to the body ideal internalization in the current culture (3), that spreads the message that achieving the ideal body is the key to a happy and a successful life (4). The unrealistic ideals created by society, namely the search for the perfect physical image, with, at the same time, the existence of the body composition typical changes have greatly contributed to diminishing self-esteem at this stage of life (2, 5). As a result, in the recent decades, the topic of body image has increased importance among adolescents (3).

According to Ellen Fitzsimmons-Craft *et al*, "body dissatisfaction refers to the negative subjective evaluation of one's physical body, such as one's weight and shape" (6). Besides it is well known that body dissatisfaction comes with several negative consequences in adolescence such as obesity, eating disorders, depressive symptoms, low self-esteem and unsafe behaviors, such as smoking and alcohol (7-10).

Differently, body satisfaction, is related to health and subjective well-being during adolescence (11). According to the World Health Organization (WHO), being healthy is defined as a "state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (12). Besides, the subjective well-being refers to "how people experience and evaluate their lives and specific domains and activities in their lives" (13).

Schools and governments are progressively recognizing that body image during adolescence is a public health issue that requires school's attention (14). Body image dissatisfaction can thus be an important stressor factor during this stage of life and it is crucial to understand which are the factors related to this issue in adolescence and to investigate its effects on the overall well-being of this population group in order to better define how to improve adolescents' body image and contribute to a better health.

Body Image Concept and Development

Body image is a three-dimensional image of the body of each individual created in his mind (15) and, therefore, subjective and subject to change. Body image embeds four components: the perceptual component, related to the physical characteristics perceived by the person; the affective component, which concerns the individual's feelings about his appearance and his body; the cognitive component, which is related to each person's beliefs/thoughts about their body aspect, and the behavioral component, which corresponds to the individual's behaviors about their appearance (16).

The way people look at their physical body in the last decades is constantly changing. In the 60s and 70s, the individual claimed his right to the free use of his body, after the existing social taboos. In the 80's and 90's, the individual became conscious that the body is the visible face of himself, identifying him socially. From this data, more and more people invest in their body, in the hope of increasing its power of social stimulation (17). In fact, the study of body image has become popular especially since the 80's (3).

In girls, the ideal of physical beauty is, in Western societies, verified by the passage from a beauty standard of a voluptuous woman with some fat and large breasts to the Victoria's Secret underwear standard models - tall and thin women with slim waists. As for men, a V-shaped mesomorphic body, a slim waist, broad shoulders and the usual defined abdominals has been valued (16). Short stature and excessive weight are seen as one of the causes of body dissatisfaction, traditionally in women, but since the 1970s, also for an increasing number of men (17). Nowadays, the pressure exerted by society in relation to the search for the perfect body, have been increased not only in women but also in men (18).

In our society, media applies a cultural pressure in relation to the body image theme and, just like the "perfect image" definition, the media influence on this topic has also occurred in different ways over the decades. Initially, social media exercised their power through face-to-face communication and traditional media, such as television and magazines (19, 20). Over the years, teenagers have become the main target of the media influence by the others social networks, posting pictures of themselves, seeing photos of others, and spent most of their time seeing and replying to comments written on their profile page (21). Adolescents report, moreover, that they feel pressure to "look perfect" on social media and carefully choose which photos to publish (22). Males reported pressure to increase their muscles or weight, while females specified pressure from the media to lose weight (23). Besides, in this age group, young people tend to compare themselves with the ideals constantly observed on media (20). Despite the clear knowledge of the media impact on

the current pressure on society regarding body image, it is important to consider that advantageous social environment factors can attenuate the relationship between the media and body dissatisfaction, promoting a higher self-esteem and better family relationships (5, 20). The impact of social media on body image outcomes is most detrimental, but is dependent on the context, peers and family (24).

The complexity of the body image perception can be understood through three major theories - the perceptual, the developmental and the sociocultural theories. The perceptual theories, as its name implies, address the perceptual component of body image, that is, the accuracy of one's perception of one's own body size. The subjective developmental theories focus on the importance of childhood and adolescence in the development of body image disorders such as the theory of negative verbal commentary and teasing has gained importance over time regarding body image perception. Finally, the sociocultural theories argue that body image disturbances are mainly due to sociocultural factors. Regarding these theories stands out the theory of sociocultural ideals, the feminist and socialization theories, the gender roles and the mass media. In a society where "what is beautiful is good" thinness has almost become a synonymous of beauty, and obesity has been increasingly denigrated (25).

Sociocultural theories largely explain body image disorders for a large group of people since it is a mass influencing factor. In addition, the growing impact of online media and the increase of obesity stigmatization (26, 27) have contributed to strengthening this theory. Despite this, developmental theories and perceptual theories cannot be ignored because they explain people's vulnerability or resilience to developing or maintaining the disorders of body image (25). After all, according to Schilder, "our own body image is not possible without the body image of others" (15). Indeed, already in 1996, it was found that social discrimination during the individual's developmental phase is positively related to body dissatisfaction, with cumulative effects throughout life (28). Besides, it is known that a higher self-esteem and a better health perception, is related to body satisfaction and, therefore, to the way each one sees his own body size (17). These three theories are easily associated to body dissatisfaction, discrimination, social isolation and even possibly risky behaviors such as eating disorders. Therefore, it is clear that these major theories include the relationship with factors that cover not only the individual level but also the family and the environment (friends, school and media) levels.

Adolescence and Body Image

Adolescence is a period between 10 and 19 years old (29). This stage is revealed as one of the most critical for individual's development due to the typical physical, psychological and social instabilities that result from it. It is in adolescence that body self-assessments begin to be clear and implicit (1, 25).

The typical puberty morphological changes directly influence body image perception (1), making this phase an important historical point in the development of body image perception itself. The physical changes that occurred in adolescence are very quickly and, especially in women, often go against what they want. Indeed, in both sexes, the sex hormones secreted affect body tissues, causing marked changes in body composition. Besides, in boys, the typical growth delay in relation to girls also generates body dissatisfaction (2). It is normal to understand that because these changes occur fast, it is difficult for adolescents to learn how to accept them at the same time that changes happen, which contributes to increase the non-recognition of their body and, as such, lead to body dissatisfaction. It is important to note that young teenagers initially experience major physical changes while, with the increase of age, these young people are more concerned with independence and the entry into the adult world, with almost all physical changes occurred (30, 31). Psychologically, self-esteem typically decreases during adolescence, probably also linked to all the unwanted physical changes occurred, contributing to a poor mental health. Moreover, body image dissatisfaction lowers self-esteem by making adolescents more vulnerable (32, 33). In turn, this low self-esteem and body image dissatisfaction is associated with feelings of sadness and can increase the tendency towards depression and suicidal ideals (8, 34). In addition, body dissatisfaction in adolescence is also related to peer stress and family pressure (10, 35). Already socially, the teenager feels the need to be accepted into the group of friends by having close relationships with peers and chasing a physically attractive body (23, 36). Therefore, there is a perceived need to promote self-esteem and acceptance of the physically body in this age group.

According to WHO, more than one in four adolescents (27%) perceived themselves as being too fat (27). Previous studies indicate that the prevalence of body image dissatisfaction covers a wide range, being always of a considerable value (37, 38). For example, in Tunisia, a study of adolescents showed a prevalence of 42.4% of this issue (39) and, in Brazil, a study of 1058 adolescents indicated that 75.2% had body dissatisfaction (40).

It is also important to note that, in general, girls have higher levels of body dissatisfaction than boys (27, 41-43). The same is also reported in Portugal in a study done in Porto city (44). It is possible that the greater prevalence of this body image issue in girls, compared to boys, is due to their rapid increase in weight (especially fat), during puberty (45), make them more vulnerable to the existing social pressure. Besides, as boys grow, their muscle mass increases, automatically resembling the look of an adult men. For this reason, possibly, society applies less social pressure to them and therefore they are happier with the appearance of their body (46). According to the literature, boys are more likely to underestimate their weight while girls are more likely to overestimate their weight (47). In line with this thought, previous studies state that boys report more use of strategies to increase muscle mass while girls search for a thinner body (23). It is also noted that, in the recent decades, there has been an increase among males in the prevalence of eating disorders (48), which are often related to body dissatisfaction.

Body image dissatisfaction begins to be relevant since the age of 12 (3), despite starting to be a present issue from 5 years of age (43). According to WHO, older adolescents are more likely to perceived themselves as too fat in relation to the younger ones (27). A recent systematic review about this theme is in line with this finding, stating that body dissatisfaction increases with age (43), probably due to the social pressure and the concern about body image that tends to growth in this stage of life (43, 49). With age, it is interesting to know that body image perception is constantly being changed by each individual (15) and that body dissatisfaction has a tendency to increase in girls and decrease in boys (50, 51).

Determinants of Body Dissatisfaction

Social pressure is particularly felt in adolescence, and it is normal, at this stage, that young people want to fully adjust to those around them (46). Moreover, friendship is an important type of peer relationship that should be considered. This relationship considerably influences adolescent's self-esteem and healthy development, especially in the younger ones. Young people care a lot about how their friends look at them and how they evaluate their body and tend to behave in ways that allows them to be integrated into the peer group (6). In addition, according to WHO, more than half of boys and about two thirds of girls report high support from friends in their lives (27).

It is also customary for adolescents to compare themselves to their ideals on television, social networks and magazines, making media with a great impact on body image perception, especially on young people. Furthermore, teenagers use electronic media to communicate almost all day, making social media with a huge impact on this issue (52, 53). It should also be noted that, in nowadays, with the prevalence of obese children increasing (27), the discrepancy between these ideals and reality is extending (46).

The perception of body image is also influenced by family members. The family characteristics in which adolescents are inserted are related to their body satisfaction and social well-being (27). In fact, parents act, even if often in an unconscious way, as models of reference to their children regarding the following lifestyle habits and the cultural values to defend (2, 54). Indeed, it is very common to find adolescents and their parents sharing the same fundamental values (2). Besides, according to the literature, parental knowledge of children's activities is negatively associated with problems in adolescents. Furthermore, parental influence is an essential issue in the degree of social media use for restriction or modeling this use on adolescents (46, 52). Regarding specifically body image perception, investigation claims that having at least one obese parent increase the desire of losing weight (39). Moreover, a previous study states that adolescents who experienced better relationships with parents are less dissatisfied with their bodies (20), making easy to understand the need to promote self-esteem combined with positive comments from parents towards their children.

On the other hand, it is essential to understand how school characteristics shape the perception of adolescents' body image. It is in school that adolescents spend most of their time and where exists their main peer relationships that are essential in building body image perception, which makes school one of the main means of socialization in adolescence (55).

Additionally, this place has a fundamental role both in formal education (acquisition of curricular subjects) and informal education (construction of social values and learning about the acceptance of the other and their differences). The Health Education Reference (56), in force at the moment in Portugal, is a flexible and voluntary educational tool, possible to be adapted according to the realities of each educational context, from pre-school to secondary education. However, depending on the objectives defined in the field of health education in each school, teachers choose what content to address, as well as the moments and methods to do so. The Basic Law of the Educational System (57) addresses the need for health education from pre-school to secondary education. However, a noteworthy aspect is that the question of "How to approach the theme?" is never addressed in any legislation/reference. Teachers are therefore unable to feel comfortable talking about

certain topics. Besides, there is the risk, for example, that a child, by changing schools during obligatory schooling, may never hear about some of the five topics considered as priorities in this referential. The Mental Health theme, one of these five topics, has the sub-theme of the individual identity, where the theme of body image perception is relevant (56).

School is seen as a reference place when implementing health education, a process, according to WHO, of empowering people to increase knowledge about their health and improvement (58). Firstly, because it is the easiest way to reach a larger number of children in our country, due to the compulsory education exposed in the Basic Law of the Educational System (57). In addition, scientific evidence shows that children and young people do not yet have their life behaviors fixed and it is in this stage of life that these “roots” are built. At this stage, adolescents are also much more receptive to change and learning new life habits (55). Indeed, according to the literature, students adjust to school in relation to their entire social process (59). Thus, school can condition the student's perception of their body image and consequently contribute to more or less healthy young people regarding this issue.

In line with this thought, Portugal currently has Health Promoting Schools, in which their main objective is to contribute to the development of the students and community's health. As such, these schools must promote health education across different sectors; invite health and education professionals, students, parents, and local community leaders to work together; provide a healthy and sustainable environment, develop educational health promotion projects and implement policies and practices that promote health (60). Previous studies claim that schools with multidisciplinary teams and with health education programs focused on physical appearance reflection, in a continuously way, for the whole school community, and not only for risk groups, are associated with adolescents with higher body satisfaction (61-63).

In this way, it is easy to understand that school is seen as a reference place when implementing health education for the primary prevention of body dissatisfaction (55). It is, therefore, the ideal place to hold young people responsible for their health, and to prepare them, to be able to adopt a healthier lifestyle than the current generations and to be able to take care of their health and of others, specifically regarding body image subject, by learning to accept their body and the difference between bodies and by promoting the non-stigmatization of the perfect image. Therefore, it is crucial to study the school role regarding young people's body image perception once body satisfaction is determinant to wellbeing in adolescence (11).

Consequences of Body Dissatisfaction

Moreover, it is noteworthy that most adults with body dissatisfaction began this feeling in childhood/adolescence - a developmental phase in which the search for the ideal of beauty is considered the main cause of social tension (25). Therefore, it is noticeable that the distortion of body image in pediatric age has a continuously negative impact throughout the individual rest of life.

Body dissatisfaction plays an important role in mental health during adolescence, since it is positively associated with low self-esteem, depressive symptoms and even suicidal ideas (8, 17, 34) and, consequently, not linked to adolescent's mental well-being. It is necessary to note that these effects can have an impact not only at this stage of life, but also throughout life, negatively affecting individual' growth and development (46), including the establishment of relationships and even the professional success. In fact, body dissatisfaction has already been related to a poor academic achievement in girls, as it leads to a decrease in confidence and, therefore, in school performance (64).

Body image dissatisfaction is an issue that particularly affects adolescent health, as it is often associated with obesity, eating disorders and unhealthy eating such as low consumption of fruits and skipping breakfast. In addition, body dissatisfaction is also related, in this age group, with insufficient physical activity, more time spent playing computer games and unsafe behaviors, such as smoking and alcohol (7, 9, 37, 39, 65).

Finally, it can be said that body image dissatisfaction is negatively associated with the acquisition of health-related behaviors and, consequently, with the lack of health and well-being in general. In fact, an association was found between body dissatisfaction and a poor self-rated health (66). It is essential to understand how to reduce body dissatisfaction in adolescents in order to decrease the existence of the causes that are related to a negative body image perception not only in adolescence but throughout life.

2. Objectives

Based on the EPITeen cohort, the objectives of this research work are:

- Understand the role of the environment, namely the school, in the perception of adolescents' body image.

- Understand which school, family, and individual characteristics explains differences between schools regarding body image perceptions, and, to evaluate which characteristics, at each level, contribute the most to the differences.

- Find out if these effects depend on adolescent's gender and age.

3. Contextualization and Study Sample

This work is part of the *EPITeen* (Epidemiological Investigation of Adolescent Health in Porto) cohort study. The main objective of this project is to study the growth, development and health from adolescence to adulthood in order to provide information for an understanding of development and how life-long characteristics affect health.

This study began in 2003, and included adolescents born in 1990, enrolled in schools in the city of Porto. The "Direcção Regional de Educação do Norte" is the official entity that provides general guidelines and regional policies for all schools in Porto, and it approved the study and gave permission to contact schools. Each school board made the final decision regarding the permission for direct contact with students required for the study.

In the 2003/2004 school year, of the 2788 students born in 1990 and enrolled in Porto' school, 2159 adolescents participated, of which 1716 (79.5%) were evaluated again at 17 years of age. In the 2007/2008 school year, at age 17, 783 adolescents were evaluated for the first time as they moved to the schools' catchment area.

The Ethics Committee of the Hospital de São João approved both cohort evaluations. Procedures and policies have been developed to ensure data confidentiality and protection, including separate recording of data necessary to identify study respondents. In both evaluations, written informed consent was obtained from adolescents and their parents or legal guardians. Parents and adolescents received a written explanation of the purpose and design of the study. In addition, at least one meeting was planned in all schools, according to parental convenience, to describe the study procedures and to overcome any possible concerns of families regarding adolescent participation.

The project did not collect information that makes it possible to characterize schools and, therefore, in order to respond to the objectives of this study, schools, whether at 13 or 17 years old, were characterized based on the characteristics of the adolescents who integrated *EPITeen* in each school. In order to have a minimum number of students per school, all schools that had less than 4 students of each sex were excluded. Therefore, at 13 years-old, 5 schools were excluded and 41 schools were included in this study (26 public and 15 private). At 17 years old, 24 schools were excluded and 32 were included in this study (20 public, 10 private and 2 vocational school). It is important to consider that, at 17, adolescents who did not attend any school were also considered. For this purpose and for statistical resolutions, not attending school was considered as a single school. This option was not valid at the age of 13, when everyone had compulsory education.

At 13 years-old, from 2159 participants, 42 were not considered for this study because they were in schools with less than 4 girls and/or 4 boys, making a total of 2117 adolescents.

For the 17-year-old sample, 2257 adolescents were evaluated, but 242 were eliminated because they were in schools with less than 4 girls and/or 4 boys.

Data Collection Procedures

Data was collected through two self-reported questionnaires; one answered at home with help of the parents/guardians and another at school at the same time of the field team visit. The first questionnaire included information of the adolescents and family' characteristics specifically demographic, social, and behavioral. In the school questionnaire adolescents replied about information on physical activity, smoking, alcohol intake, depressive symptoms, eating disorders and to the *Stunkard* silhouette scale.

All anthropometric measurements were obtained by a trained team, at school. Participants were standing, in light indoor clothes and no shoes, according to the international guidelines (67).

Body image related measurements

Eating disorders were assessed using the Eating Disorders Inventory (EDI) (68) that was previously validated in the Portuguese population (69). This is a 64-question scale that measures a variety of attitudes, feelings, and behaviors and the answers are given within a linkert-type scale with 6 response possibilities ranging from ever to never. The grouping between items allows to identify eight subscales that measure psychological and behavioral characters but, for this study, only three of those subscales were considered: Drive for Thinness, Bulimia and Body Dissatisfaction (Table A). The psychometric characteristics of the Portuguese version of EDI were evaluated at 13-years-old (70, 71). This version has presented good psychometric characteristics in the evaluation of the eating behavior disorders symptoms, particularly in the subscales Drive for Thinness, Bulimia and Body Dissatisfaction - the subscales used in this dissertation.

Table A – Description of the items included in each of the 3 subscales used.

<i>Drive For Thinness subscale</i>	
Item 1	Eat sweets and carbohydrates without feeling nervous.
Item 7	I think I need to start a diet.
Item 11	I feel extremely guilty after overeating.
Item 16	I am terrified of the idea of gaining weight.
Item 25	I exaggerate the importance of weight.
Item 32	I am concerned with the desire to be thin.
Item 49	if I increase 1 kg, I worry about continuing to gain weight.
<i>Bulimia subscale</i>	
Item 4	I eat when I'm bored (worried).
Item 5	I stuff myself with food.
Item 28	When I lose control eating, I feel I can't stop.
Item 38	I think about stuffing myself with food.
Item 46	I eat moderately in front of others and gorge myself when they leave.
Item 53	I've thought about trying to throw up to lose weight.
Item 61	I eat or drink on the sly.
<i>Body Dissatisfaction subscale</i>	
Item 2	I think my stomach is too big.
Item 9	I think my thighs are too fat.
Item 12	I think my stomach has the right size.
Item 19	I like the shape of my body.
Item 31	I like the shape of my buttocks.
Item 45	I think my hips are too wide.
Item 55	I think my thighs have the right size.
Item 59	I think my buttocks are too big.
Item 62	I think my hips have the right size.

Body image perception was evaluated through the silhouette scale made by *Stunkard et al* (72), which consists of a set of drawings of human silhouette figures of both sexes with nine variations in ascending order of body size. These figures are presented in figure 1, in which number one represents extreme thinness and number 9 morbid obesity. In this way, each adolescent indicated not only the number of the figure which liked to look like (ideal/desired image) but also the number that most identified with (perceived image). For this study, participants were asked to select the self-perceived image and the desired image.



Figure 1 – Adaptation of the Stunkard Images (72) used in the self-application questionnaire of the *EPITeen* project

Figure 2 depict the description of the data regarding the Stunkard's images at 13 and 17 years-old. At both ages the selection of self-perceived image ranges from all possible values (from 1 to 9), with the figure 4 being the most frequently selected. Regarding desired image, the extremely low values were selected but none of the extremely high and, in general, males selected figures that represent larger corpulence.

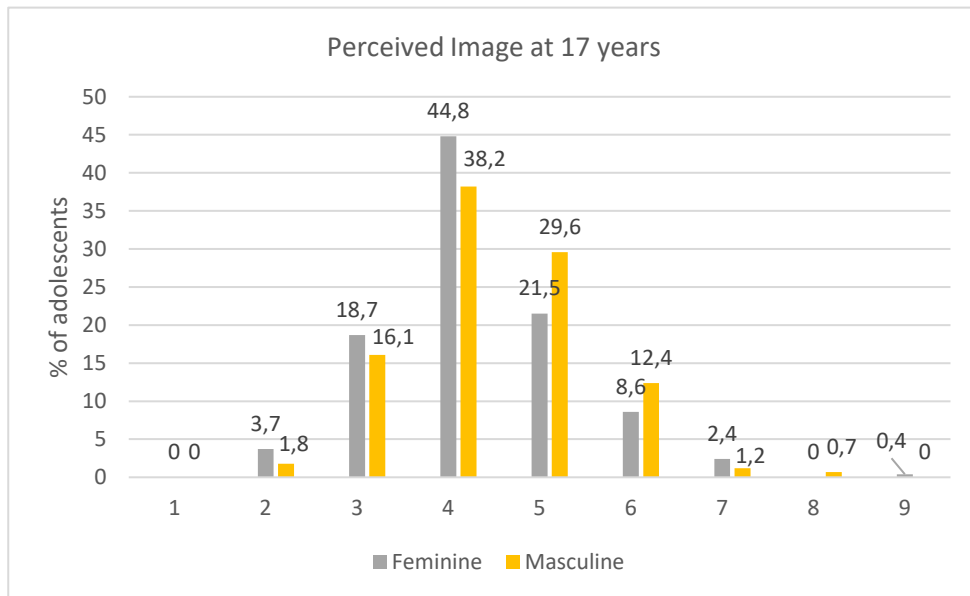
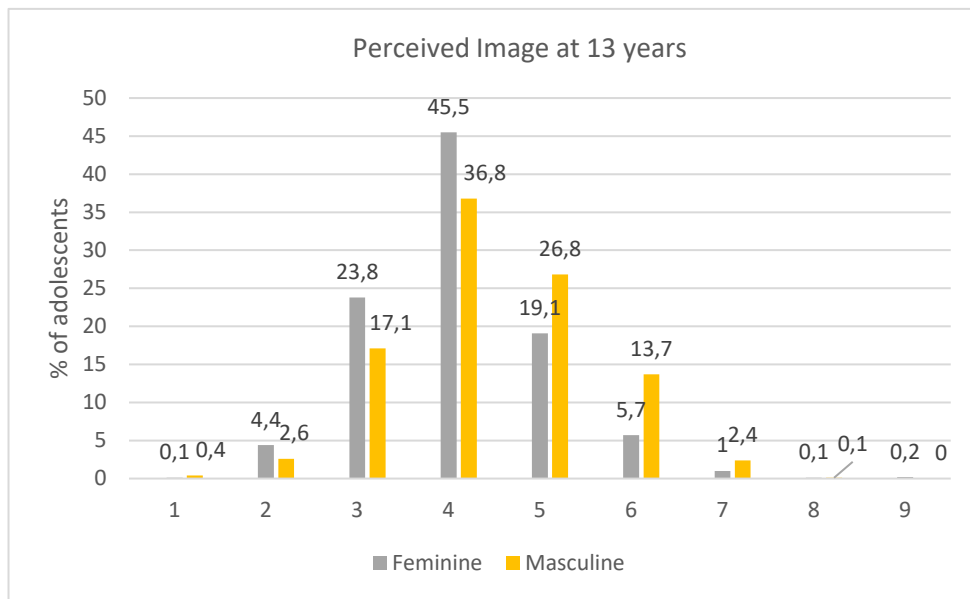


Figure 2 - Graphics that descriptively characterize the sample according to the Stunkard's images

4. References

1. Siervogel RM, Demerath EW, Schubert C, Remsberg KE, Chumlea WC, Sun S, et al. Puberty and body composition. *Hormone Research*. 2003;60(Suppl 1):36-45. <https://doi.org/10.1159/000071224>.
2. World Health Organization. The Health of young people: a challenge and a promise. Geneva: World Health Organization. 1993.
3. Voelker DK, Reel JJ, Greenleaf C. Weight status and body image perceptions in adolescents: current perspectives. *Adolesc Health Med Ther*. 2015;6:149-58. <https://doi.org/10.2147/AHMT.S68344>.
4. Evans P. "If Only I were Thin Like Her, Maybe I Could be Happy Like Her": The Self-Implications of Associating a Thin Female Ideal with Life Success. *Psychology of Women Quarterly*. 2003;27:209-14. <https://doi.org/10.1111/1471-6402.00100>.
5. Cribb VL, Haase AM. Girls feeling good at school: School gender environment, internalization and awareness of socio-cultural attitudes associations with self-esteem in adolescent girls. *Journal of Adolescence*. 2016;46:107-14. <https://doi.org/10.1016/j.adolescence.2015.10.019>.
6. Fitzsimmons-Craft EE, Bardone-Cone AM, Wonderlich SA, Crosby RD, Engel SG, Bulik CM. The Relationships Among Social Comparisons, Body Surveillance, and Body Dissatisfaction in the Natural Environment. *Behavior Therapy*. 2015;46(2):257-71. <https://doi.org/10.1016/j.beth.2014.09.006>
7. Jankauskiene R, Baceviciene M, Pajaujiene S, Badau D. Are Adolescent Body Image Concerns Associated with Health-Compromising Physical Activity Behaviours? *International Journal of Environmental Research and Public Health*. 2019;16(7). <https://doi.org/10.3390/ijerph16071225>.
8. Solomon-Krakus S, Sabiston CM, Brunet J, Castonguay AL, Maximova K, Henderson M. Body Image Self-Discrepancy and Depressive Symptoms Among Early Adolescents. *Journal of Adolescent Health*. 2017;60(1):38-43. <https://doi.org/10.1016/j.jadohealth.2016.08.024>.
9. Flores-Cornejo F, Kamego-Tome M, Zapata-Pachas MA, Alvarado GF. Association between body image dissatisfaction and depressive symptoms in adolescents. *Braz J Psychiatry*. 2017;39(4):316-22. <https://doi.org/10.1590/1516-4446-2016-1947>.
10. Murray K, Rieger E, Byrne D. The relationship between stress and body satisfaction in female and male adolescents. *Stress and Health*. 2015;31(1):13-23. <https://doi.org/10.1002/smi.2516>.
11. Lemes DCM, Camara SG, Alves GG, Aerts D. Body image satisfaction and subjective wellbeing among ninth-grade students attending state schools in Canoas, Brazil. *Ciência & Saúde Coletiva*. 2018;23(12):4289-98. <https://doi.org/10.1590/1413-812320182312.14742016>.

12. World Health Organization. Basic documents. WHO 38th ed. Geneva 1990.
13. National Research Council. 2013. Subjective Well-Being: Measuring Happiness, Suffering, and Other Dimensions of Experience. Washington, DC: The National Academies Press. <https://doi.org/10.17226/18548>.
14. Yager Z, Diedrichs PC, Ricciardelli LA, Halliwell E. What works in secondary schools? A systematic review of classroom-based body image programs. *Body Image*. 2013;10(3):271-81. <https://doi.org/10.1016/j.bodyim.2013.04.001>.
15. Schilder P. The Image and Appearance of the Human Body. Studies in the Constructive Energies of the Psyche. London: Routledge. 1950.
16. Cash TF, Smolak L. Body image: a handbook of science, practice, and prevention. New York: Guilford Press. 2011.
17. Ribeiro; A. O Corpo que Somos. Aparência, Sensualidade, Comunicação. *Casadasletras*. 2003.
18. Sklar EM. Body Image, Weight, and Self-Concept in Men. *Am J Lifestyle Med*. 2015;11(3):252-8. <https://doi.org/10.1177/1559827615594351>.
19. Thompson, JK, Heinberg, LJ, Altabe, MN, Tantleff-Dunn, S. Exacting Beauty: Theory, Assessment and Treatment of Body Image Disturbance. 1999. *Psychology Faculty Publications*. 1993. https://scholarcommons.usf.edu/psy_facpub/1993.
20. de Vries DA, Vossen HGM, van der Kolk-van der Boom P. Social Media and Body Dissatisfaction: Investigating the Attenuating Role of Positive Parent-Adolescent Relationships. *J Youth Adolesc*. 2019;48(3):527-36. <https://doi.org/10.1007/s10964-018-0956-9>.
21. Espinoza G, Juvonen J. The pervasiveness, connectedness, and intrusiveness of social network site use among young adolescents. *Cyberpsychology, Behavior and Social Networking*. 2011;14(12):705-9. <https://doi.org/10.1089/cyber.2010.0492>.
22. Chua T, Chang L. Follow me and like my beautiful selfies: Singapore teenage girls' engagement in self-presentation and peer comparison on social media. *Computers in Human Behavior*. 2016;55:190-7. <https://doi.org/10.1016/j.chb.2015.09.011>.
23. Xu X, Mellor D, Kiehne M, Ricciardelli LA, McCabe MP, Xu Y. Body dissatisfaction, engagement in body change behaviors and sociocultural influences on body image among Chinese adolescents. *Body Image*. 2010;7(2):156-64. <https://doi.org/10.1016/j.bodyim.2009.11.003>.
24. Dumas AA, Desroches S. Women's Use of Social Media: What Is the Evidence About Their Impact on Weight Management and Body Image? *Current Obesity Reports*. 2019;8(1):18-32. <https://doi.org/10.1007/s13679-019-0324-4>.
25. Thompson JK. Body image, Eating Disorders and Obesity – an integrative guide for assessment and treatment. American Psychological Association Washington, DC. 1996.

26. Latner JD, Stunkard AJ. Getting worse: the stigmatization of obese children. *Obesity Research*. 2003;11(3):452-6. <https://doi.org/10.1038/oby.2003.61>.
27. Inchley J, Currie D, Budisavljevic S, Torsheim T, Jåstad A, Cosma A et al., editors. Spotlight on adolescent health and well-being. Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report. Volume 1. Key findings. Copenhagen: WHO Regional Office for Europe; 2020. Licence: CC BY-NC-SA 3.0 IGO.
28. Fabian LJ, Thompson JK. Body image and eating disturbance in young females. *International Journal of Eating Disorders*. 1989; 8,63-74. [https://doi.org/10.1002/1098108X\(198901\)8:1<63::AIDEAT2260080107>3.0.CO;2-9](https://doi.org/10.1002/1098108X(198901)8:1<63::AIDEAT2260080107>3.0.CO;2-9).
29. WHO Study Group on Young People Health for All by the Year World Health Organization. Young people's health - a challenge for society : report of a WHO Study Group on Young People and "Health for All by the Year 2000" [meeting held in Geneva from 4 to 8 June 1984]. Geneva: World Health Organization; 1986.
30. Craike M, Young JA, Symons CM, Pain MD, Harvey JT, Eime RM. *et al.* Trends in body image of adolescent females in metropolitan and non-metropolitan regions: a longitudinal study. *BMC Public Health*. 2016;16(1):1143. <https://doi.org/10.1186/s12889-016-3815-1>.
31. Cole DA, Maxwell SE, Martin JM, Peeke LG, Seroczynski AD, Tram JM, *et al.* The development of multiple domains of child and adolescent self-concept: a cohort sequential longitudinal design. *Child development*. 2001;72(6):1723-46. <https://doi.org/10.1111/1467-8624.00375>.
32. Ata R, Ludden A, Lally M. The Effects of Gender and Family, Friend, and Media Influences on Eating Behaviors and Body Image During Adolescence. *Journal of Youth and Adolescence*. 2006;36:1024-37. <https://doi.org/10.1007/s10964-006-9159-x>.
33. Trzesniewski KH, Donnellan MB, Moffitt TE, Robins RW, Poulton R, Caspi A. Low self-esteem during adolescence predicts poor health, criminal behavior, and limited economic prospects during adulthood. *Developmental Psychology*. 2006;42(2):381-90. <https://doi.org/10.1037/0012-1649.42.2.381>.
34. Crow S, Eisenberg ME, Story M, Neumark-Sztainer D. Suicidal behavior in adolescents: relationship to weight status, weight control behaviors, and body dissatisfaction. *The International Journal of Eating Disorders*. 2008;41(1):82-7. <https://doi.org/10.1002/eat.20466>.
35. Juli MR. Perception of body image in early adolescence. An investigation in secondary schools. *Psychiatria Danubina*. 2017;29(Suppl 3):409-15.

36. Slater A, Tiggemann M, Hawkins K, Werchon D. Just one click: a content analysis of advertisements on teen web sites. *The Journal of Adolescent Health*. 2012;50(4):339-45. <https://doi.org/10.1016/j.jadohealth.2011.08.003>.
37. Santana ML, Silva Rde C, Assis AM, Raich RM, Machado ME, de JPE, et al. Factors associated with body image dissatisfaction among adolescents in public schools students in Salvador, Brazil. *Nutricion Hospitalaria*. 2013;28(3):747-55. <https://doi.org/10.3305/nh.2013.28.3.6281>.
38. Lawler M, Nixon E. Body dissatisfaction among adolescent boys and girls: the effects of body mass, peer appearance culture and internalization of appearance ideals. *J Youth Adolesc*. 2011;40(1):59-71. <https://doi.org/10.1007/s10964-009-9500-2>.
39. Ben Ayed H, Yaich S, Ben Jemaa M, Ben Hmida M, Trigui M, Jedidi J, et al. What are the correlates of body image distortion and dissatisfaction among school-adolescents? *International Journal of Adolescent Medicine and Health*. 2019. <https://doi.org/10.1515/ijamh-2018-0279>.
40. Claumann GS, Laus MF, Felden É PG, Silva DAS, Pelegrini A. Association between dissatisfaction with body image and health-related physical fitness among adolescents. *Ciência & Saúde Coletiva*. 2019;24(4):1299-308. <https://doi.org/10.1590/1413-81232018244.17312017>.
41. Griffiths S, Murray SB, Bentley C, Gratwick-Sarll K, Harrison C, Mond JM. Sex Differences in Quality of Life Impairment Associated With Body Dissatisfaction in Adolescents. *The Journal of Adolescent Health*. 2017;61(1):77-82. <https://doi.org/10.1016/j.jadohealth.2017.01.016>.
42. Silva L, Tucan ARO, Rodrigues EL, Del Ré PV, Sanches PMA, Bresan D. Dissatisfaction about body image and associated factors: a study of young undergraduate students. *Einstein (Sao Paulo)*. 2019;17(4):eAO4642. https://doi.org/10.31744/einstein_journal/2019ao4642.
43. Jiménez Flores P, Jiménez Cruz A, Bacardi Gascón M. Body-image dissatisfaction in children and adolescents: a systematic review. *Nutricion Hospitalaria*. 2017;34(2):479-89. <https://doi.org/10.20960/nh.455>.
44. Monteiro Gaspar MJ, Amaral TF, Oliveira BMPM, Borges N. Protective effect of physical activity on dissatisfaction with body image in children – A cross-sectional study. *Psychology of Sport and Exercise*. 2011;12(5):563-9. <https://doi.org/10.1016/j.psychsport.2011.05.004>.
45. Markey CN. Invited commentary: Why body image is important to adolescent development. *J Youth Adolesc*. 2010;39(12):1387-91. <https://doi.org/10.1007/s10964-010-9510-0>.

46. Smidova S, Svancara J, Andryskova L, Simunek J. Adolescent body image: results of Czech ELSPAC study. *Central European Journal of Public Health*. 2018;26(1):60-4. <https://doi.org/10.21101/cejph.a4930>.
47. Kilpatrick M, Ohannessian C, Bartholomew JB. Adolescent Weight Management and Perceptions: An Analysis of the National Longitudinal Study of Adolescent Health. *Journal of School Health*. 1999;69(4):148-52. <https://doi.org/10.1111/j.1746-1561.1999.tb04173.x>.
48. Mitchison D, Hay P, Slewa-Younan S, Mond J. The changing demographic profile of eating disorder behaviors in the community. *BMC Public Health*. 2014;14:943. <https://doi.org/10.1186/1471-2458-14-943>.
49. Senin-Calderon C, Rodriguez-Testal JF, Perona-Garcelan S, Perpina C. Body image and adolescence: A behavioral impairment model. *Psychiatry Research*. 2017;248:121-6. <https://doi.org/10.1016/j.psychres.2016.12.003>.
50. Bearman SK, Martinez E, Stice E, Presnell K. The Skinny on Body Dissatisfaction: A Longitudinal Study of Adolescent Girls and Boys. *Journal of Youth and Adolescence*. 2006;35(2):217-29. <https://doi.org/10.1007/s10964-005-9010-9>.
51. Fortes LS, Conti MA, Allmeida, SS, Ferreira, MEC. Body dissatisfaction in adolescents: a longitudinal study. *Revista de Psiquiatria Clínica*. 2013 40(5):167-171. <https://doi.org/10.1590/S0101-60832013000500001>.
52. Burnette CB, Kwitowski MA, Mazzeo SE. "I don't need people to tell me I'm pretty on social media:" A qualitative study of social media and body image in early adolescent girls. *Body Image*. 2017;23:114-25. <https://doi.org/10.1016/j.bodyim.2017.09.001>.
53. Rodgers RF, Melioli T. The Relationship Between Body Image Concerns, Eating Disorders and Internet Use, Part I: A Review of Empirical Support. *Adolescent Research Review*. 2016;1(2):95-119. <https://doi.org/10.1007/s40894-015-0016-6>.
54. Carvalho P, Roriz M. Comer Crescer Treinar. Matéria Prima Edições. 2018.
55. Precioso J. As Escolas Promotoras de Saúde: uma via para promover a saúde e a educação para a saúde da comunidade escolar. Educação, Porto Alegre. 2009 v32, n1, p 84-91.
56. Carvalho A. Referencial para a Educação para a Saúde. Ministério da Educação. Direção Geral da Educação. 2017.
57. Assembleia da República. Lei n.º 85/2009, de 27/08. Lei de Bases do Sistema Educativo. 2009.
58. Organização Mundial de Saúde. Carta de Ottawa para a promoção da saúde. Lisboa: Divisão da educação para a saúde. 1986.
59. Ryle A, Lunghi M. Late Adolescent Problems as Seen in the Student Population [Abridged]:The Psychology and Psychiatry of Academic Difficulties in Students.

Proceedings of the Royal Society of Medicine. 1969;62(12):1263-6.
<https://doi.org/10.1177/003591576906201229>.

60. World Health Organization. Local action: creating Health Promoting Schools. Geneva: World Health Organization, UNESCO. 2001.

61. Dunstan CJ, Paxton SJ, McLean SA. An evaluation of a body image intervention in adolescent girls delivered in single-sex versus co-educational classroom settings. *Eating Behaviors.* 2017;25:23-31. <https://doi.org/10.1016/j.eatbeh.2016.03.016>.

62. Lee GY, Park EJ, Kim YR, Kwag KH, Park JH, An SH, et al. Feasibility and acceptability of a prevention program for eating disorders (Me, You and Us) adapted for young adolescents in Korea. *Eating and Weight Disorders.* 2018;23(5):673-83. <https://doi.org/10.1007/s40519-017-0436-3>.

63. Diedrichs PC, Atkinson MJ, Steer RJ, Garbett KM, Rumsey N, Halliwell E. Effectiveness of a brief school-based body image intervention 'Dove Confident Me: Single Session' when delivered by teachers and researchers: Results from a cluster randomised controlled trial. *Behaviour Research and Therapy.* 2015;74:94-104. <https://doi.org/10.1016/j.brat.2015.09.004>.

64. Halliwell E, Diedrichs P, Orbach S. Costing the invisible: A review of the evidence examining the links between body image, aspirations, education and workplace confidence. Discussion Paper. Centre for Appearance Research, University of the West of England. 2014. <http://eprints.uwe.ac.uk/24438/>

65. de Araujo TS, Barbosa Filho VC, Gubert FDA, de Almeida PC, Martins MC, Carvalho Q, et al. Factors Associated With Body Image Perception Among Brazilian Students From Low Human Development Index Areas. *The Journal of School Nursing: the Official Publication of the National Association of School Nurses.* 2018;34(6):449-57. <https://doi.org/10.1177/1059840517718249>.

66. De Oliveira da Silva P, Miguez Nery Guimarães J, Härter Griep R, Caetano Prates Melo E, Maria Alvim Matos S, Del Carmem Molina M, et al. Association between Body Image Dissatisfaction and Self-Rated Health, as Mediated by Physical Activity and Eating Habits: Structural Equation Modelling in ELSA-Brasil. *International Journal of Environmental Research and Public Health.* 2018;15(4). <https://doi.org/10.3390/ijerph15040790>.

67. Stewart A, Marfell Jones M, Olds T, Ridder H. International standards for anthropometric assessment. Glasgow, UK: International Society for the Advancement of Kinanthropometry. 2011.

68. Garner DM, Olmstead MP, Polivy J. Development and validation of a multidimensional eating disorders inventory for anorexia and bulimia nervosa. *The*

International Journal of Eating Disorders. 1983;2:15-34. [https://doi.org/10.1002/1098-108X\(198321\)2:2<15::AID-AT2260020203>3.0.CO;2-6](https://doi.org/10.1002/1098-108X(198321)2:2<15::AID-AT2260020203>3.0.CO;2-6).

69. Machado PPP, Gonçalves S, Martins C, Soares IC. The Portuguese version of the eating disorders inventory; Evaluation of its psychometric properties. *European Eating Disorders Review*. 2001;9:43-52. <https://doi.org/10.1002/erv.359>.

70. Costa C, Ramos E, Barros H, Roma-Torres A, Severo M, Lopes C. Propriedades psicométricas do Eating Disorders Inventory em adolescentes portuguesas. *Acta Med Port*; 2007; 20(6):511-24.

71. Costa C, Ramos E, Severo M, Barros H, Lopes C. Determinants of eating disorders symptomatology in Portuguese adolescents. *Archives of Pediatrics & Adolescent Medicine*. 2008;162(12):1126-32. <https://doi.org/10.1001/archpedi.162.12.1126>.

72. Stunkard AJ, Sørensen T, Schulsinger F. Use of the Danish adoption register for the study of obesity and thinness. *Res Publ Assoc Res Nerv Ment Dis*. 1983;60:115-120.

5. Manuscript

Introduction

Body image is a three-dimensional image created by each individual (1) and, therefore, subjective and susceptible to change. Body image embeds four components: the perceptual component, related to physical characteristics perceived by the person; the affective component, which concerns individual's feelings about his body and appearance; the cognitive component, which is related to each person's beliefs/thoughts about their body aspect, and the behavioral component, which corresponds to individual's behaviors about their appearance (2).

Body image dissatisfaction covers a wide range, being adolescence an important period for its development (3-6). In fact, it is noteworthy that most adults with body dissatisfaction began this feeling during adolescence (7). In adolescence, the rapid morphological changes make adolescents more prone to develop body dissatisfaction which correspond to a disagreement between what they want and what they recognize to be their body (8). This period is especially critical for females because, unlike what happens with males in which the increase in muscle mass, a puberty' characteristic, brings them closer to their most desired image (9), in females, puberty leads to an increase in body fat that promotes a departure from the most socially desired image (10). So, puberty' changes, added with the low pressure that society applies to males (11) are strong reasons to explain the lower levels of body dissatisfaction found in males than in females (12-15).

Body image dissatisfaction is associated with short and long term consequences, affecting the overall health of adolescents not only during their development and growth, but eventually for life (9, 16). Body dissatisfaction increases the risk of obesity, eating disorders and unhealthy diet (3, 5, 17). In addition, especially in adolescence, is associated with insufficient physical activity and higher probability to engage on unsafe behaviors, such as smoking and alcohol (18, 19). Dissatisfaction with body image also contributes to a poor mental health, namely low self-esteem, stress, depression and anxiety (20-23). Body dissatisfaction has also been linked to poor school results which can condition the adolescent's future (24).

There are several factors that influence body image perception during adolescence. Social pressure is particularly felt in adolescence, because young people want to fully adjust to those around them (9) and frequently compare themselves to their ideals on television, social networks and magazines (25, 26). Also, family characteristics in which the adolescent is inserted influences their body satisfaction. For example, adolescents who experienced better relationships with parents are less dissatisfied with their bodies, unlike adolescents who have at least 1 obese father (5, 9, 26-29). Furthermore, it is in school that adolescents spend most of their time and where exists their main peer relationships

that are essentials in building body image perception, which makes school one of the main place of socialization in adolescence (30). Additionally, school can state the student' social and psychological profile (31). Although the importance of all these variables is recognized, it is crucial to understand how individual, familiar and school' characteristics interact and influences adolescent's body image perception.

Thus, this study aims to explore the role of school, in addition to individual and familiar characteristics, on body image perception in adolescents and to evaluate if the magnitude of school influences depends on adolescent's gender and age.

Methods

Study design and sampling

This work is part of the EPITeen (Epidemiological Investigation of Adolescent Health in Porto) cohort study, that began in 2003/2004 school year, and included adolescents born in 1990, enrolled in public and private schools in Porto, Portugal. The cohort was previously described in detail (32). In the 2003/2004 school year, 2159 adolescents participated in the first evaluation of which 1716 were evaluated again at 17 years. At age 17, 783 young people were also evaluated for the first time.

For this paper, only schools that had at least 4 males and 4 females were considered. Therefore, at 13 years, 5 schools were excluded (students=42) and 41 schools were included in this study (26 public and 15 private). At 17 years, 24 schools were excluded (students= 242) and 32 were included in this study (20 public, 10 private and 2 vocational school). Since at 17y school is not compulsory, some of the participants had already left school, all of them were considered as one "school". Thus, the final sample was 2117 for the 13y and 2257 for the 17y evaluations. Of the included students, 1468 were included on both waves.

Ethic

The Ethics Committee of the Hospital de São João approved both cohort evaluations. Procedures and policies have been developed to ensure data confidentiality and protection, including separate recording of data necessary to identify study respondents. In both evaluations, written informed consent was obtained from adolescents and their parents or legal guardians.

Data Collection

For both waves all the procedures were standardized. Two self-reported questionnaires were used to collect data on sociodemographic characteristics, lifestyles, eating habits and health status of adolescents - one at home and the other at school, during the research team's visit. In addition, anthropometric assessment was performed by the research team at schools. For this work, data was considered according to two levels of information: individual (individual and family characteristics) and school.

Individual information

The anthropometric assessment was completed with the subject standing, wearing light underwear and without shoes, by a single observer trained in accordance with international guidelines (33). Weight was measured using a Tanita® digital scale (in kg, to the nearest tenth), and height was measured (in cm, to the nearest tenth) using a portable stadiometer. Body mass index (BMI) was calculated using weight (Kg) divided by square height (m²) (34) and, in this study, the z-scores unit was used. Besides, age-and-gender-specific BMI reference percentiles developed by the World Health Organization (WHO) were used to classify participants as being underweight (<-2SD), with a proper weight, pre-obese (>+1SD), or obese (>+2SD) (35).

Physical activity was evaluated by the self-perception of leisure-time activities out of school according to four subjective categories (mainly sitting, mainly standing, active or very active (36). Sports practice was assessed based on a dichotomy question (yes/no), about the practice of sport. Finally, data about time spent studying, reading, watching television, playing computer or console at weekend was obtained by recording the time spent in each of those activities. The "sedentary activity at weekend", was computed by the sum of time spent on those activities.

Participants were considered smokers if they smoke or have ever smoked including just try it out. At 17y, the frequency of tobacco consumption was also analyzed considering three categories: "Already tried but don't smoke", "Smokes but not every day" and "Smokes at least 1 cigarette a day". Similar procedure was taken regarding alcohol intake but at 17y, data regarding alcohol intoxication (been drunk at least once in life) was analyzed.

Concerning eating habits, participants were considered to have breakfast if they claimed to have this habit usually, although a definition of breakfast is not given in the questionnaire. Adolescents were also categorized in relation to their intake of fried foods, namely in terms of their consumption at least 4 times a week, 1 to 3 times a week, or less than 1 time a week. Light products consumption was assessed using the question "Do you usually drink or eat light or diet products?". Adolescents who answered affirmatively were considered consumers of light products.

Depressive symptoms were assessed using second edition of the Beck Depression Inventory II (BDI-II) (37). This inventory consists of 21 items, regarding the most recent two weeks, including the day of evaluation. The answers were summed up, producing a series of scores from 0 to 63, with higher scores indicating greater depressive symptoms. The following cut-off score guidelines were pointed out: less than or equal to 13 (minimal depression) and over 13 (mild and severe depression). BDI-II has been previously validated in Portuguese adolescents (38).

Body image related measurements (outcomes)

Eating disorders were assessed using the Portuguese version of the Eating Disorders Inventory (EDI) that was previously validated in the Portuguese population (39). Eight subscales were described for the EDI, but only the three that presented the best internal consistency and best psychometric characteristics were used in this work: impulse to thinness, bulimia and body dissatisfaction (40). The score of each subscale results from the sum of the score of the items that compose it and higher values indicate more pronounced symptoms. In addition, in this study, the bulimia subscale variable in both curves was dogmatized. The total value EDI total score is used in this study as an indirect measure of increased behavioral disorders and image dissatisfaction.

Body image perception, named the perceived image and the desired image, was assessed through the silhouette scale made by Stunkard *et al* (41), which consists of a set of drawings of human silhouette figures of both sexes with nine variations in increasing order of body size, in which number one represents extreme thinness and number nine morbid obesity. In this way, each adolescent indicated not only the number of the figure which liked to look like (ideal/desired image) but also the number that most identified with.

Family Information

For both parents, anthropometric, educational level, history of tobacco use, and the family history of disease were collected by self-reported questionnaires. For educational level they were asked to report the number of completed years of formal schooling and the adolescent was classified according to the information from the parent with the higher educational level. Regarding tobacco use, parents are classified as smokers if they claim to be smokers, at the time of the questionnaire, or if they claim that have already smoked, and as non-smokers if they deny it.

Each parent was asked, through closed-ended questions (yes, no, does not know), if they had ever been diagnosed with depression, anorexia and bulimia. History of parents' disease was classified as positive, when at least one of the parents had any of these diseases and all the others were classified as negative.

Parents' BMI was calculated using self-reported weight and height, and according to WHO as normal (>18.5 and <25 Kg/m²), overweight (≥ 25 and <30 Kg/m²) or obese (≥ 30 Kg/m²) (42). Parents with a BMI <18.5 Kg/m² were included in the normal category, due to their low prevalence. The highest BMI category was considered to classified the adolescent family.

School Level Information

Schools were classified as public and private according its official classification on the educational system. At the age of 17, two more categories were included: vocational schools and not attending school. Regarding the other variables considered for school level (parents' education; adolescents' BMI, BDI-II and EDI total score) for each school was assigned the average value of the participants enrolled in this school.

Statistical Analysis

A multilevel sample structure was considered in the project in which teenagers are embedded in schools. To assess the effect of schools (school-to-school differences) on body image measurement variables, the intra-cluster coefficient (ICC) was used. The ICC measures the proportion of the total variance on the outcomes considered that is explained by schools. We considered that schools had an effect on the body image related measures only if ICC was equal or higher 1%. Only for the outcomes where this criterion was fulfilled for the all sample or stratified by sex were study regarding the effect of each school variables or individual variables.

For each of the five body image related variables studied (perceived and desired image, bulimia, body dissatisfaction and impulse for thinness) to identify which school, family, and/or individual characteristics explains differences between schools, a first model adjusted only for school level was considered. Other five models were performed, each one evaluating the effect of one of the variables used to characterized the school (school type, average of parents' education and average of adolescent' BMI, BDI-II and EDI total score). All the models included the exposure measure at individual level and at the school level (average of the exposure in the school). A final model was performed for each of the five body image related variables studied considering all individual, familiar and school characteristics that show significant effect on previous analyses.

To measure the amount of difference between schools explained by each variable or set of variables in the model, the proportion of variance was calculated comparing to the baseline model (school model). Regression coefficients and confidence intervals (CI) and the variance by school were estimated by linear mixed model with random effect by school to quantify the association between each variable and the body image related outcomes.

When the % explained variance for individual characteristics was below 85%, a last multilevel model was adjusted taking into account only the individual, family and school characteristics that initially had statistical significance.

For this analysis it was assumed the missing at random (MAR) (43). The descriptive analyses were replicated considering the adolescents evaluated at both waves (13 and 17 years) (n=1468).

Statistical significance was considered at 0.05. Statistical analysis was performed using Software Package for Social Sciences (SPSS) for Windows Version 23.0 and the R program with lme4 package and Version R 3.6.1.

Results

Table 1 (and Supplementary Table 1) describe the characteristics of the sample by age and sex. The median (interquartile range) for Impulse for Thinness subscale score is 2.0 (6.0) at 13y and 2.0 (4.0) at 17y; for Bulimia subscale score is 0.0 (2.0) at 13y and 0.0 (1.0) at 17y; for Body Dissatisfaction subscale score is 4.0 (8.0) at 13y and 4.0 (8.0) at 17y. The figure most select is the 4, for both sex and ages, both as self-perceived and as desired figure. A sensitivity analysis was carried out with the sub-sample that was evaluated both at 13y and 17y, and similar results were found (Supplementary Table 2).

The variability of body image related measures between schools is presented in Table 2. In general, the variance between schools is higher at 17y than at 13y in both sexes, and is higher among females than in males, except for bulimia at 17y that is higher in males. Only for perceived image school did not show a relevant effect (for all groups evaluated the ICC was lower than 1%).

To understand how the differences between schools on individual, familiar and school characteristics explain the variance between schools, and to identify which of those variables were associated with each of the body image related measures evaluated, we performed a linear mixed model with random effect by school adjusting for the body image related measures for which the variance explained by schools is equal or higher than 1% of were considered. The results regarding the effect of individual and family characteristics were presented on table 3 for 13y and on table 4 for 17y; the role of school characteristics were presented on tables 5 and 6, respectively for 13 and 17 years old. The multilevel model, considering the individual, family ad school characteristics with significant effect on each body image related measure considered in this study was described on table 7.

Individual and family characteristics

Figure the adolescent would like to look like – Stunkard Image

Regarding the figure that the adolescent would like to look, in females, the variance between schools explained by the individual characteristics was 63% at 13y and 17% at 17y; regarding familiar characteristics, those variables explain 29% and 89% at 13y and 17y, respectively. The desired of a high image at 13y significantly increases with adolescents' BMI and decreases with parents' education; at 17y, the effect of adolescents' BMI and parents' education remain and additionally we found of a high image desire among those who usually had breakfast that increases also with parents' BMI, contrary, is lower among those who practice sports and eat light products (tables 3 and 4).

Bulimia – EDI subscale

Individual characteristics explain the variance between schools regarding bulimia more than 90% at 13y, both for females and males, at 17y, this effect decrease in both sex but remain close to 90% in females and fall to 59% in males. Familiar characteristics explain more of the variance between schools in males at 13y (16% vs 66%) but more in females at 17y (90% vs 9%). Levels of bulimia increased with depressive symptoms regardless of age and gender; additionally, at 13y were higher among smokers and lower in females that drink and in males with higher sedentary activities and higher frequency of fried food eating. At 17y, bulimia was higher among females that reported history of alcohol intoxication and male smokers. Regarding family characteristics, at 13y values of bulimia increases in females with mothers' smokers and decrease in males with increasing parents' education; at 17y, in females, values of bulimia increases with parental education and if there is family history of anorexia, bulimia or depression and with increasing parents BMI in males (tables 3 and 4).

Impulse for Thinness – EDI subscale

In females, individual characteristics explain 89% at 13y of the variance between schools. At 17y individual and family characteristics attenuates this same effect 64% and 100%, respectively. An increase in this outcome is significantly associated with adolescents' BMI, depressive symptoms, among those who consume light products and with the reduction in eating fried foods. At 17y, this outcome is also positively associated with sports practice, alcohol intoxication, increase in parents' BMI and with a smoking mother (tables 3 and 4).

Body Dissatisfaction – EDI subscale

Concerning body dissatisfaction, in males, individual characteristics explain 100% of the variance between schools at 13y, and familiar characteristics attenuates in 97% this same effect at 17y. Body dissatisfaction significantly increases with adolescents' BMI and depressive symptoms. Besides these effects, at 13y, this outcome is higher among those who consume light products and with increases on parents' BMI; in females, is higher among those who have a smoking mother and practice sports. This outcome is lower with increasing in active time in 17y females. In males, body dissatisfaction is lower among those who usually had breakfast and with increases on parents' education at 13y and higher with the increase on parents' BMI at 17y (tables 3 and 4).

School characteristics

Figure the adolescent would like to look like – Stunkard Image

After considering the individual level (individual and family characteristics), at 17y, school characteristics (school type, the average of parents' education and of adolescent' EDI total score and BMI) explain more than 40% of the variance between schools regarding adolescent' desired image. Besides, the average of adolescent' BDI-II attenuates this effect. At 17y, the desired of a high image significantly decreases, in females, with the average of parents' education and of adolescent' EDI total score and, in males, with the average of adolescent' BMI. Concerning school type, at 17y, females who attend a private school are associated with lower desired images values and males who attend a vocational school or does not attend any school, are associated with higher desired images values, compared to those who attend a public school (tables 6).

Bulimia – EDI subscale

School characteristics, at 17y, explain the differences between schools regarding bulimia more in females than in males. At 17y males, bulimia significantly decreases among those who attend a vocational school compared to public schools. At 13y, bulimia significantly decreases on those who attend a private school compared to public schools and, in males, is negatively associated with the average of parents' education (tables 5 and 6).

Impulse for Thinness – EDI subscale

Regarding school characteristics, the average of adolescents' BDI-II and EDI total score explain more than 50% of the variance between schools at 13y, while at 17y it is the average

of parents' education that has most effect. At 17y, females who attend vocational schools are associated with a reduced impulse to thinness, compared to those who attend public schools (tables 5 and 6).

Body Dissatisfaction – EDI subscale

Concerning body dissatisfaction, school characteristics explain the differences between schools regarding body dissatisfaction more in males than in females. In males, body dissatisfaction significantly increases with the average of adolescents' depressive symptoms at 13y and decreases in those who attend a private school compared to those who attend a public school at 17y (tables 5 and 6).

Final model (individual and school characteristics)

A final model considering all individual, familiar and school characteristics is presented in table 7 whenever the % explained variance for individual characteristics was below 85%. Regarding desired image, in 17y males, the school type and the school's BMI explain 95.9% of the difference between schools in relation to the adolescent' desired image. Concerning bulimia, in 17y males, tobacco, depressive symptoms and school type explain 92% the real difference between schools regarding adolescent' bulimia. In the last multilevel model performed for impulse to thinness, in 17y females, sports practice, alcohol intoxication, fried foods and light products consumption, BMI, BDI-II, smoking mother, parents' BMI and school type attenuates by 200% the real difference between schools in relation to the adolescent' impulse to thinness. As for adolescent' body dissatisfaction, the model that includes sports practice, intake of light products, BMI, BDI-II, smoking mother and parents' BMI (in 13y females) and BMI, BDI-II, parents' BMI, and school type (in 17y males) explain 34.9% and 54.9% of the difference between schools in relation to the adolescent' body dissatisfaction, respectively.

Discussion

According to this study, the school role in explaining each of the body image related measures is different according the outcome evaluated and depend on age and gender. School variability in explaining body image related measures is greater in females than in males, however in late adolescence (17y) the effect of school characteristics increases in males.

The variability explained between schools regarding body image related measures are higher at 17y for desired image and body dissatisfaction, probably due to the social pressure and the concern about body image that tends to growth in this stage of life (44). School is

seen as one of the main means of socialization in adolescence (30) and, therefore, a place that can influence adolescents' body image related measures as observed in this study, but literature regarding the school role on adolescents' body image is still scarce and more studies are needed to verify the veracity of our results.

It is curious to realize that, in females, the variability of schools decreases with age, in general, and specially for bulimia and impulse to thinness. According to the literature, it seems that early maturation in females may predispose them to social disadvantage (45), so the effect of school is stronger early in adolescence (46). Since puberty happens later in boys, this may help explain why the effect of school occurs later in boys.

Individual information

BMI and depressive symptoms stand out as being related to body image related measures. These variables are positively related to body dissatisfaction and impulse for thinness and, in addition, BMI is positively associated with the desired image and depressive symptoms with bulimia. A previous study also carried out on Porto with 234 children (10-17 years) established a positive association between body image distortion and BMI (19). Besides, depressive symptoms appear to have a positive association with body dissatisfaction (18) and bulimia (7). Moreover, overweight adolescents are each time less accepted socially (47), making it easy to understand the relationship, in this study, between BMI and depressive symptoms with the impulse to thinness. The positive association found between BMI and the desired image in this study is not consistent with the literature that indicates that a higher BMI is associated with a lesser desire to increase the silhouette (48). In fact, our result may seem strange, but can possibly be explained by knowing that woman's beauty ideal is changing in the last years and images with a greater muscular and toned body weight have been more accepted, such as the current existence of models with large body sizes (49, 50). A previous study of young females showed that when they are exposed to ideal athletic and thin images led them to increased body dissatisfaction, but ideal muscle exposure images did not (51). Stunkard images do not consider individual's body composition, so this search for an increase in the desired image can possibly be explained by the desire of a toned and muscular body.

Sports practice, in females, is positively related with body dissatisfaction at 13y and with impulse to thinness and lower desired image values at 17y. These results seem to demonstrate that girls use sports to lose weight and achieve greater body satisfaction, a fact that has been previously described in the literature (52, 53).

The consumption of light products, in females, is associated with a greater impulse to lose weight, a lesser desired image at 17y, and with a greater body dissatisfaction at 13y, being this effect also relevant in 13y males. These results are easily explained since in this same

sample at 13y, light products consumption was associated with overweight adolescents (54). Thus, it can be assumed that this ingesting occurs in an attempt to lose weight and achieve a thinner physically body.

Bulimia, in turn, is related with a set of specific variables. Females have lower levels of bulimia if they drink alcohol at 13y, but higher levels of this outcome if they had already had an alcohol intoxication at 17y, which in turn is also associated with a greater impulse to lose weight in this age. At 13y and in 17y males, smokers have higher levels of bulimia. In 2017, a prior study with 875 children (13-17 years) showed that adolescents with body dissatisfaction and who consumed alcohol or smoked had more depressive symptoms (18). It can be said that this result is in agreement with ours because smoking or having had an alcohol intoxication are positively associated with bulimia, as well as depressive symptoms. Instead, alcohol intake by itself is negatively associated with bulimia, perhaps due to the calories number associated with alcohol consumption. In addition, other studies have already found positive relations between intensive alcohol and tobacco consumption and binge eating existence (55, 56). Furthermore, in this study, 13y males who ingest less fried foods have lower levels of bulimia and females have higher levels of impulse to thinness. A previous study conducted in adolescents showed that energy and total fat intake is lower among those who try to lose weight, compared to those who have never did (57). Presumably, our bulimia result is related to the fact that healthy eating habits are seen as preventive in relation to eating disorders (58).

Family information

Parental education is negatively associated with females' desired image and with body dissatisfaction at 13y males. In Mexico, a study showed that students with mothers with higher education levels were more likely to see themselves overweight (59) and, as such, probably want a lower Stunkard image (48) as stated in this work, and have more body dissatisfaction, disagreeing with these data. In this study, higher levels of parents' education can lead to less body dissatisfaction in adolescents, probably because these parents can be associated with their children's healthier eating habits (60) and, therefore, maybe with a normal weight and less body dissatisfaction. An interesting data to analyze is the differences in parents' education impact in both genders regarding bulimia. It is certain that weight-teasing by family members is associated with a binge eating increase (61) and it is also normal to understand that this weight control often comes from parents with a higher education level which tend to underestimate child's weight (62), which is in agreement with our result in 17y females. In our study, increase in parental education decreases bulimia score in 13y males, making this family determinant a hypothetical protective factor in

relation to bulimia in these adolescents. Indeed, in another study, this outcome was positively associated with females but not with males (63).

Parents' BMI has a considerable impact in all body image related measures. An increase in parents' BMI is related, at 13y, to more body dissatisfaction, and, at 17y, to an increase in the desired image and the impulse to thinness in females, and with bulimia and body dissatisfaction in males. Regarding a previous study, having at least 1 overweight parent is positively associated with higher body dissatisfaction (5), which is consistent with this study and helps to explain the resultant greater impulse to lose weight and bulimia. On the other hand, we can possibly explain that higher levels of parents' BMI lead to a higher desired image in adolescents, due to the fact that, during pediatric age, children consider parents as examples and models to follow (64) and so, possibly want to be like them in relation to the physical aspect too, considering parents' body shape as something normal and good to achieve. If so, many ethical issues arise related to adolescent health and further studies on these data are needed since that it is known that there is a direct and positive relationship between parents and children' BMI (65).

Having a smoking mother has an important effect on females concerning body image related measures. As such, females with smoking mothers have greater impulse to lose weight at 17y and greater bulimia and body dissatisfaction at both ages. Smoking mothers are positively associated with intrauterine growth restriction (IUGR) during pregnancy (66). According to some studies, IUGR is associated with greater weight *catch-up* in the first years of life and, so, with higher levels of obesity associated (67, 68). In contrast, sometimes, IUGR is also associated with a reduced growth and with low stature in adults (68). In any of these, the association between these body image related outcomes and having a smoking mothers are easily understood.

School information

The average of parents' education is negatively associated with the desired image in females at 17 and with bulimia in males at 13, results that are in line with the findings at the family level. Moreover, the average of adolescents' EDI total score is also negatively associated with the desired image in females at 17. The EDI total score is used as an indirect measure of behavioral disorders and food dissatisfaction existence. In this study, at 17, the increase in this value is associated with a lower desired image, which is easily understandable because, in adolescence, eating disorders are frequently associated with body dissatisfaction (69). Furthermore, the average of adolescents' BDI-II is positively related to body dissatisfaction in 13y males. Previous studies in adolescents presented identical results for the individual level (18, 70). In addition, the average of adolescent' BMI of each school was negatively associated with the desired image of 17y males. Yang &

Çelebioglu claim that obesogenic environments (high mean of BMI) contribute to increase individual BMI and decrease body satisfaction (71), which is in agreement with this result of wanting a smaller Stunkard figure. However, to our knowledge, further studies regarding school characteristics are need given the scarce information existed.

Finally, school type has a substantial influence in all body image related measures and with a highest effect at 17y. Regarding the desired image, this study indicates that, in 17y females, attendance at private schools is negatively associated compared to attend public schools; in 17y males, which non-attendance at schools or frequent a vocational school is positively associated this desired image. In addition, attending private schools seems to be more associated with lower rates of bulimia at 13y and less body dissatisfaction in 17y males when compared to those who attend public schools. Finally, at 17y, attending vocational schools is associated with less bulimia in males and less impulse to lose weight in females. It appears that frequent a private school is seem as a protective factor against bulimia at an early stage of adolescence and body dissatisfaction in males at the end of it. On the contrary, in older females, these schools are associated with inferior Stunkard figures desired, possibly, feeling a greater social pressure exerted by media and peers. To our knowledge, further studies are needed to prove and study this relationship due to the limited information present in the literature regarding the school type with these outcomes.

Strengths and Limitations

The main limitations of this work are the following ones: the fact that, for each wave, the analysis is cross-sectional, making it not possible to draw cause-effect relationships; the lack of evaluation of other factors such as media and peers influence, given the known importance of these variables in this theme; the fact that parents' weight and height are self-reported and, therefore, these variables may be underestimated; and, finally, the circumstance that the sample at 13y and at 17y is not exactly the same due to the follow-up losses and because part of the participants only joined the cohort at 17y. However, the sensitivity analysis conducted using only the sub-sample with evaluation at 13y and 17y showed similar results, which supports that the fact of having used the whole sample allowed to increase the power without conditioning the results. The main strengths of this work are the following ones: the large sample size; the fact that, to our knowledge, this is the first study that investigates school effect on adolescents' body image; children's weight and height were measured by a trained professional; the use of questionnaires to collect information, since there is scientific evidence that shows that subjects who report eating disorders may be more accurate to answer through the questionnaire methodology (72).

The interest of this work in Public Health and approach to school programs

The need of a body image primary intervention carried out in schools must be considered and it is in the definition of which characteristics to be considered that the results of the present work come into play. In fact, it had already been addressed that, more than finding the "perfect time" to interfere on body image, it was needed to know what to approach and what to talk about according to each age (73). This investigation states the school role in explaining each of the body image related measures is different depending on age and gender and indicates which determinants contribute to this impact: regarding individual information: fried foods and light products consumption, tobacco, alcohol, sports practice, BMI and symptoms depressives; concerning family information: parents' education, having a smoking mother and parents' BMI; and finally, at the school level: the school type and the average of parents' education and of adolescents' depressive symptoms, total EDI and BMI. Furthermore, all of these determinants should be adjusted to each age, gender and environment, namely the school and integrated into a public health project created from the needs and resources of each country and region, on a continuous basis and, ideally, integrated into the school curriculum, in order to help to promote body satisfaction in adolescence. It is important to emphasize that school programs must be adjusted according to the needs of each school and the age and gender of the students. This is in accordance with *Zali Yager et al* who states that programs created for body image are not effective everywhere and, therefore, it cannot be assumed that because it worked in one school it will work in others (73).

The need of a body image primary intervention carried out in schools must be considered with a holistic approach (individual, family and school characteristics) (17, 25, 28).

Conclusion

School influences body image related measures in adolescence in a different way regarding age and sex. This effect is greater for females than for males. In females, this effect increases with age for desired image and body dissatisfaction and decreases for bulimia and impulse to thinness. In males, increase with age for all the body image related measures. Therefore, regarding individual information, in general, consumption of light products, no sports practice, decrease in intake fried foods, high levels of BMI and depressive symptoms and the consumption of tobacco and alcohol (intoxication) are associated with higher levels of body image related measures. Concerning family characteristics, high values of parents' BMI and having a smoking mother are also associated with this problematic, while, in general, parents' education is negatively associated with this. Finally, at the school level, we can conclude that school type, the average of parents' education and of adolescent' BMI, BDI-II and EDI total score also have

an impact on the differences between schools regarding the adolescent's body image perception.

However, more studies are needed to better understand the school effect regarding adolescents' body image, as well as is need the elaboration of longitudinal projects that approach this theme in a holistic way, in order to prove what is suggested in this work.

References

1. Schilder P. *The Image and Appearance of the Human Body*. Studies in the Constructive Energies of the Psyche. London: Routledge. 1950.
2. Cash TF, Smolak L. *Body image: a handbook of science, practice, and prevention*. New York: Guilford Press. 2011.
3. Santana ML, Silva Rde C, Assis AM, Raich RM, Machado ME, de JPE, *et al*. Factors associated with body image dissatisfaction among adolescents in public schools students in Salvador, Brazil. *Nutricion Hospitalaria*. 2013;28(3):747-55. <https://doi.org/10.3305/nh.2013.28.3.6281>.
4. Lawler M, Nixon E. Body dissatisfaction among adolescent boys and girls: the effects of body mass, peer appearance culture and internalization of appearance ideals. *J Youth Adolesc*. 2011;40(1):59-71. <https://doi.org/10.1007/s10964-009-9500-2>.
5. Ben Ayed H, Yaich S, Ben Jemaa M, Ben Hmida M, Trigui M, Jedidi J, *et al*. What are the correlates of body image distortion and dissatisfaction among school-adolescents? *International Journal of Adolescent Medicine and Health*. 2019. <https://doi.org/10.1515/ijamh-2018-0279>.
6. Claumann GS, Laus MF, Felden É PG, Silva DAS, Pelegrini A. Association between dissatisfaction with body image and health-related physical fitness among adolescents. *Ciência & Saúde Coletiva*. 2019;24(4):1299-308. <https://doi.org/10.1590/1413-81232018244.17312017>.
7. Thompson JK. *Body image, Eating Disorders and Obesity – an integrative guide for assessment and treatment*. American Psychological Association Washington, DC. 1996.
8. Siervogel RM, Demerath EW, Schubert C, Remsberg KE, Chumlea WC, Sun S, *et al*. Puberty and body composition. *Hormone Research*. 2003;60(Suppl 1):36-45. <https://doi.org/10.1159/000071224>.
9. Smidova S, Svancara J, Andryskova L, Simunek J. Adolescent body image: results of Czech ELSPAC study. *Central European Journal of Public Health*. 2018;26(1):60-4. <https://doi.org/10.21101/cejph.a4930>.
10. Markey CN. Invited commentary: Why body image is important to adolescent development. *J Youth Adolesc*. 2010;39(12):1387-91. <https://doi.org/10.1007/s10964-010-9510-0>.

11. Sklar EM. Body Image, Weight, and Self-Concept in Men. *Am J Lifestyle Med.* 2015;11(3):252-8. <https://doi.org/10.1177/1559827615594351>.
12. Inchley J, Currie D, Budisavljevic S, Torsheim T, Jåstad A, Cosma A et al., editors. Spotlight on adolescent health and well-being. Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report. Volume 1. Key findings. Copenhagen: WHO Regional Office for Europe; 2020. Licence: CC BY-NC-SA 3.0 IGO.
13. Griffiths S, Murray SB, Bentley C, Gratwick-Sarll K, Harrison C, Mond JM. Sex Differences in Quality of Life Impairment Associated With Body Dissatisfaction in Adolescents. *The Journal of Adolescent Health.* 2017;61(1):77-82. <https://doi.org/10.1016/j.jadohealth.2017.01.016>.
14. Silva L, Tucan ARO, Rodrigues EL, Del Ré PV, Sanches PMA, Bresan D. Dissatisfaction about body image and associated factors: a study of young undergraduate students. *Einstein (Sao Paulo).* 2019;17(4):eAO4642. https://doi.org/10.31744/einstein_journal/2019ao4642.
15. Jiménez Flores P, Jiménez Cruz A, Bacardi Gascón M. Body-image dissatisfaction in children and adolescents: a systematic review. *Nutricion Hospitalaria.* 2017;34(2):479-89. <https://doi.org/10.20960/nh.455>.
16. De Oliveira da Silva P, Miguez Nery Guimarães J, Härter Griep R, Caetano Prates Melo E, Maria Alvim Matos S, Del Carmem Molina M, et al. Association between Body Image Dissatisfaction and Self-Rated Health, as Mediated by Physical Activity and Eating Habits: Structural Equation Modelling in ELSA-Brasil. *International Journal of Environmental Research and Public Health.* 2018;15(4). <https://doi.org/10.3390/ijerph15040790>.
17. Juli MR. Perception of body image in early adolescence. An investigation in secondary schools. *Psychiatria Danubina.* 2017;29(Suppl 3):409-15.
18. Flores-Cornejo F, Kamego-Tome M, Zapata-Pachas MA, Alvarado GF. Association between body image dissatisfaction and depressive symptoms in adolescents. *Braz J Psychiatry.* 2017;39(4):316-22. <https://doi.org/10.1590/1516-4446-2016-1947>.
19. Monteiro Gaspar MJ, Amaral TF, Oliveira BMPM, Borges N. Protective effect of physical activity on dissatisfaction with body image in children – A cross-sectional study. *Psychology of Sport and Exercise.* 2011;12(5):563-9. <https://doi.org/10.1016/j.psychsport.2011.05.004>.
20. Solomon-Krakus S, Sabiston CM, Brunet J, Castonguay AL, Maximova K, Henderson M. Body Image Self-Discrepancy and Depressive Symptoms Among Early Adolescents. *Journal of Adolescent Health.* 2017;60(1):38-43. <https://doi.org/10.1016/j.jadohealth.2016.08.024>

21. Ata R, Ludden A, Lally M. The Effects of Gender and Family, Friend, and Media Influences on Eating Behaviors and Body Image During Adolescence. *Journal of Youth and Adolescence*. 2006;36:1024-37. <https://doi.org/10.1007/s10964-006-9159-x>.
22. Murray K, Rieger E, Byrne D. The relationship between stress and body satisfaction in female and male adolescents. *Stress and Health*. 2015;31(1):13-23. <https://doi.org/10.1002/smi.2516>.
23. Vieira AI, Machado BC, Moreira CS, Machado PPP, Brandão I, Roma-Torres A, et al. Eating disorders and non-suicidal self-injury: Structural equation modelling of a conceptual model. *European Eating Disorders Review: the Journal of the Eating Disorders Association*. 2018;26(5):431-7. <https://doi.org/10.1002/erv.2611>
24. Halliwell E, Diedrichs P, Orbach S. Costing the invisible: A review of the evidence examining the links between body image, aspirations, education and workplace confidence. Discussion Paper. Centre for Appearance Research, University of the West of England. 2014. <http://eprints.uwe.ac.uk/24438/>
25. Burnette CB, Kwitowski MA, Mazzeo SE. "I don't need people to tell me I'm pretty on social media:" A qualitative study of social media and body image in early adolescent girls. *Body Image*. 2017;23:114-25. <https://doi.org/10.1016/j.bodyim.2017.09.001>.
26. de Vries DA, Vossen HGM, van der Kolk-van der Boom P. Social Media and Body Dissatisfaction: Investigating the Attenuating Role of Positive Parent-Adolescent Relationships. *J Youth Adolesc*. 2019;48(3):527-36. <https://doi.org/10.1007/s10964-018-0956-9>.
27. Webb HJ, Haycraft E. Parental body dissatisfaction and controlling child feeding practices: A prospective study of Australian parent-child dyads. *Eat Behav*. 2019;32:1-6. <https://doi.org/10.1016/j.eatbeh.2018.10.002>
28. Dumas AA, Desroches S. Women's Use of Social Media: What Is the Evidence About Their Impact on Weight Management and Body Image? *Current Obesity Reports*. 2019;8(1):18-32. <https://doi.org/10.1007/s13679-019-0324-4>.
29. Jankauskiene R, Baceviciene M, Pajaujiene S, Badau D. Are Adolescent Body Image Concerns Associated with Health-Compromising Physical Activity Behaviours? *International Journal of Environmental Research and Public Health*. 2019;16(7). <https://doi.org/10.3390/ijerph16071225>
30. Precioso J. As Escolas Promotoras de Saúde: uma via para promover a saúde e a educação para a saúde da comunidade escolar. *Educação*, Porto Alegre. 2009 v32, n1, p 84-91.
31. Ryle A, Lunghi M. Late Adolescent Problems as Seen in the Student Population [Abridged]:The Psychology and Psychiatry of Academic Difficulties in Students.

Proceedings of the Royal Society of Medicine. 1969;62(12):1263-6. <https://doi.org/10.1177/003591576906201229>.

32. Ramos E. Health Determinants in Porto Adolescents: the EPITeen Cohort PhD Thesis Porto, Portugal: Medical School of the University of Porto. 2006.

33. Stewart A, Marfell Jones M, Olds T, Ridder H. International standards for anthropometric assessment. Glasgow, UK: International Society for the Advancement of Kinanthropometry. 2011.

34. WHO Expert Committee on Physical Status: the Use and Interpretation of Anthropometry (1993: Geneva, Switzerland) & World Health Organization. Physical status: the use of and interpretation of anthropometry, report of a WHO expert committee. World Health Organization. 1995. <https://apps.who.int/iris/handle/10665/37003>

35. World Health Organization. Growth reference 5-19 years. BMI-for-age (5-19 years). Disponível em https://www.who.int/growthref/who2007_bmi_for_age/en/. Acedido a 08/05/2020.

36. Magalhães A, Severo M, Autran R, Araújo J, Santos P, Pina MF, Ramos R. Validation of a Single Question for the Evaluation of Physical Activity in Adolescents. *Int J Sport Nutr Exerc Metab.* 2017;Aug;27(4):361-369. <https://doi.org/10.1123/ijsnem.2016-0276>.

37. Beck AT, Steer RA, Brown GK. Manual for the Beck Depression Inventory-II. San Antonio, TX: Psychological Corporation. 1996.

38. Martins A, Coelho R, Ramos E, Barros H. Administração do BDI-II a adolescentes portugueses: Resultados preliminares. *Revista Portuguesa de Psicossomática.* 2000;2(1):123-32.

39. Machado PPP, Gonçalves S, Martins C, Soares IC. The Portuguese version of the eating disorders inventory; Evaluation of its psychometric properties. *European Eating Disorders Review.* 2001;9:43-52. <https://doi.org/10.1002/erv.359>.

40. Costa C, Ramos E, Barros H, Roma-Torres A, Severo M, Lopes C. Propriedades psicométricas do Eating Disorders Inventory em adolescentes portugueses. *Acta Med Port;* 2007; 20(6):511-24.

41. Stunkard AJ, Sørensen T, Schulsinger F. Use of the Danish adoption register for the study of obesity and thinness. *Res Publ Assoc Res Nerv Ment Dis.* 1983;60:115-120.

42. The American Journal of Clinical Nutrition. Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. *Am J Clin Nutr.* 1998;68(4): 899-917. <https://doi.org/10.1093/ajcn/68.4.899>.

43. Sterne JA, White IR, Carlin JB, Spratt M, Royston P, Kenward MG, et al. Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. *BMJ.* 2009;338:b2393. <https://doi.org/10.1136/bmj.b2393>

44. Helfert S, Warschburger P. The face of appearance-related social pressure: gender, age and body mass variations in peer and parental pressure during adolescence. *Child and Adolescent Psychiatry and Mental Health*. 2013;7(1):16. <https://doi.org/10.1186/1753-2000-7-16>
45. Sanders RA. Adolescent psychosocial, social, and cognitive development. *Pediatrics in Review*. 2013;34 8:354-8; quiz 8-9. <https://doi.org/10.1542/pir.34-8-354>.
46. Dohnt H, Tiggemann M. Body Image Concerns in Young Girls: The Role of Peers and Media Prior to Adolescence. *Journal of Youth and Adolescence*. 2006;35(2):135-45. <https://doi.org/10.1007/s10964-005-9020-7>
47. Latner JD, Stunkard AJ. Getting worse: the stigmatization of obese children. *Obesity Research*. 2003;11(3):452-6. <https://doi.org/10.1038/oby.2003.61>.
48. de Araujo TS, Barbosa Filho VC, Gubert FDA, de Almeida PC, Martins MC, Carvalho Q, et al. Factors Associated With Body Image Perception Among Brazilian Students From Low Human Development Index Areas. *The Journal of School Nursing: the Official Publication of the National Association of School Nurses*. 2018;34(6):449-57. <https://doi.org/10.1177/1059840517718249>.
49. McKinley NM. Resisting body dissatisfaction: fat women who endorse fat acceptance. *Body Image*. 2004;1(2):213-9. <https://doi.org/10.1016/j.bodyim.2004.02.001>.
50. Halliwell E, Dittmar H. Does Size Matter? The Impact of Model's Body Size on Women's Body-Focused Anxiety and Advertising Effectiveness. *Journal of Social and Clinical Psychology*. 2004;23:104-22. <https://doi.org/10.1521/jscp.23.1.104.26989>
51. Robinson L, Prichard I, Nikolaidis A, Drummond C, Drummond M, Tiggemann M. Idealised media images: The effect of fitspiration imagery on body satisfaction and exercise behaviour. *Body Image*. 2017;22:65-71. <https://doi.org/10.1016/j.bodyim.2017.06.001>.
52. Reina AM, Monsma EV, Dumas MD, Gay JL. Body image and weight management among Hispanic American adolescents: Differences by sport type. *Journal of Adolescence*. 2019;74:229-39. <https://doi.org/10.1016/j.adolescence.2019.06.014>
53. Toselli S, Spiga F. Sport practice, physical structure, and body image among university students. *Journal of Eating Disorders*. 2017;5:31. <https://doi.org/10.1186/s40337-017-0163-1>
54. Ramos E, Barros H. Family and school determinants of overweight in 13-year-old Portuguese adolescents. *Acta Pediátrica*. 2007;96:281-6. <https://doi.org/10.1111/j.1651-2227.2007.00107.x>
55. Bornioli A, Lewis-Smith H, Smith A, Slater A, Bray I. Adolescent body dissatisfaction and disordered eating: Predictors of later risky health behaviours. *Social Science & Medicine*. 2019;238:112458. <https://doi.org/10.1016/j.socscimed.2019.112458>.

56. Field AE, Sonneville KR, Micali N, Crosby RD, Swanson SA, Laird NM, et al. Prospective Association of Common Eating Disorders and Adverse Outcomes. *Pediatrics*. 2012;130(2):e289-e95.
57. Brown T, Overcash F, Reicks M. Frequency of Trying to Lose Weight and Its Association with Children's Weight Perception and Dietary Intake (NHANES 2011-2012). *Nutrients*. 2019;11(11). <https://doi.org/10.3390/nu11112703>
58. Jones Bell M, Zeiler M, Herrero R, Kuso S, Nitsch M, Etchemendy E, et al. Healthy Teens @ School: Evaluating and disseminating transdiagnostic preventive interventions for eating disorders and obesity for adolescents in school settings. *Internet Interventions*. 2019;16:65-75. <https://doi.org/10.1016/j.invent.2018.02.007>
59. Bojorquez I, Villatoro J, Delgadillo M, Fleiz C, Fregoso D, Unikel C. Social factors, weight perception, and weight control practices among adolescents in Mexico. *Journal of Health Psychology*. 2018;23(7):939-50. <https://doi.org/10.1177/1359105316643596>
60. Arcila-Agudelo AM, Ferrer-Svoboda C, Torres-Fernández T, Farran-Codina A. Determinants of Adherence to Healthy Eating Patterns in a Population of Children and Adolescents: Evidence on the Mediterranean Diet in the City of Mataró (Catalonia, Spain). *Nutrients*. 2019;11(4). <https://doi.org/10.3390/nu11040854>
61. Neumark-Sztainer D, Bauer KW, Friend S, Hannan PJ, Story M, Berge JM. Family weight talk and dieting: how much do they matter for body dissatisfaction and disordered eating behaviors in adolescent girls? *The Journal of Adolescent Health*. 2010;47(3):270-6. <https://doi.org/10.1016/j.jadohealth.2010.02.001>.
62. Ruiter ELM, Saat JJEH, Molleman GRM, Fransen GAJ, van der Velden K, van Jaarsveld CHM, et al. Parents' underestimation of their child's weight status. Moderating factors and change over time: A cross-sectional study. *Plos One*. 2020;15(1):e0227761-e. <https://doi.org/10.1371/journal.pone.0227761>
63. Ahren JC, Chiesa F, Koupil I, Magnusson C, Dalman C, Goodman A. We are family-parents, siblings, and eating disorders in a prospective total-population study of 250,000 Swedish males and females. *The International Journal of Eating Disorders*. 2013;46(7):693-700. <https://doi.org/10.1002/eat.22146>.
64. Carvalho P, Roriz M. Comer Crescer Treinar. Matéria Prima Edições. 2018.
65. Boutelle KN, Cafri G, Crow SJ. Parent predictors of child weight change in family based behavioral obesity treatment. *Obesity (Silver Spring)*. 2012;20(7):1539-43. <https://doi.org/10.1038/oby.2012.48>.
66. Nunes E, Narigão M. Cessação Tabágica na Gravidez. Guia para Profissionais de Saúde. Direção Geral da Saúde. 2015.
67. Silveira PP, Pokhvisneva I, Gaudreau H, Rifkin-Graboi A, Broekman BFP, Steiner M, et al. Birth weight and catch up growth are associated with childhood impulsivity in two

- independent cohorts. *Scientific Reports*. 2018;8(1):13705. <https://doi.org/10.1038/s41598-018-31816-5>
68. Rugolo L. Growth and developmental outcomes of the extremely preterm infant. *J Pediatr (Rio J)*. 2005;81(1 Supl):S101-110. <https://doi.org/10.2223/1309>.
69. Stice E, Shaw HE. Role of body dissatisfaction in the onset and maintenance of eating pathology: a synthesis of research findings. *Journal of Psychosomatic Research*. 2002;53(5):985-93. [https://doi.org/10.1016/s0022-3999\(02\)00488-9](https://doi.org/10.1016/s0022-3999(02)00488-9).
70. Senin-Calderon C, Rodriguez-Testal JF, Perona-Garcelan S, Perpina C. Body image and adolescence: A behavioral impairment model. *Psychiatry Research*. 2017;248:121-6. <https://doi.org/10.1016/j.psychres.2016.12.003>.
71. Yayan EH, Celebioglu A. Effect of an obesogenic environment and health behaviour-related social support on body mass index and body image of adolescents. *Global Health Promotion*. 2018;25(3):33-42. <https://doi.org/10.1177/1757975916675125>.
72. Keel PK, Crow S, Davis TL, Mitchell JE. Assessment of eating disorders: comparison of interview and questionnaire data from a long-term follow-up study of bulimia nervosa. *Journal of Psychosomatic Research*. 2002;53(5):1043-7. [http://dx.doi.org/10.1016/s0022-3999\(02\)00491-9](http://dx.doi.org/10.1016/s0022-3999(02)00491-9).
73. Yager Z, Diedrichs PC, Ricciardelli LA, Halliwell E. What works in secondary schools? A systematic review of classroom-based body image programs. *Body Image*. 2013;10(3):271-81. <https://doi.org/10.1016/j.bodyim.2013.04.001>

Table 1 – Body image related measures of the sampled participants, by age and sex.

	13 years old n (%)			17 years old n (%)		
	Total Sample n=2117	Female 1093 (51.6)	Male 1024 (48.4)	Total sample n= 2257	Female 1151 (51.0)	Male 1106 (49.0)
Eating Disorders Index (EDI) †						
Drive For Thinness	2.0 (6.0)	3.0 (8.0)	1.0 (3.0)	2.0 (4.0)	3.0 (7.0)	1.0 (3.0)
Bulimia	0.0 (2.0)	0.0 (2.0)	0.0 (2.0)	0.0 (1.0)	0.0 (1.0)	0.0 (0.0)
Body Dissatisfaction	4.0 (8.0)	6.0 (10.0)	3.0 (7.0)	4.0 (8.0)	7.0 (11.0)	2.0 (6.0)
Total Score	30.3 (26.4)	33.0 (30.0)	28.7 (21.0)	25.7 (22.0)	30.0 (27.0)	22.0 (16.5)
“Figure you most identify with” – Stunkard images †						
	4.0 (2.0)	4.0 (2.0)	4.0 (1.0)	4.0 (1.0)	4.0 (1.0)	4.0 (1.0)
“Figure you would most like to look like” – Stunkard images †						
	4.0 (1.0)	4.0 (1.0)	4.0 (1.0)	4.0 (2.0)	4.0 (1.0)	4.0 (1.0)

† Median, interquartile range

Table 2 - Variability [measured by Intra-cluster coefficient (ICC)] of the body image related measures explained by school, by sex and age.

	13 years old ICC (%)			17 years old ICC (%)		
	Total	Female	Male	Total	Female	Male
Perceived Image	0.00	0.17	0.51	0.07	0.62	0.69
Desired Image	0.64	2.83*	0.87	4.85*	2.99*	1.22*
Bulimia (EDI subscale)	1.83	2.52*	1.57*	0.67	1.17*	3.05*
Body Dissatisfaction (EDI subscale)	0.41	1.79*	1.36*	0.83	2.16*	1.67*
Impulse for Thinness (EDI subscale)	0.45	2.67*	0.00	0.77	0.99*	0.00

* Body image related measures with ICC equal or higher 1% and for that considered that school had an effect on body image related measure

Table 3 – The role of individual and family characteristics on body image related measures at 13 years old by sex¹

	Desired Image	Bulimia		Impulse for Thinness	Body Dissatisfaction	
	Female	Female	Male	Female	Female	Male
Regression coefficients (95% IC)						
<i>Individual characteristics</i>						
Sports practice <i>yes</i>	-0.060 (-0.152; 0.031)	-0.059 (-0.166; 0.048)	0.017 (-0.111; 0.145)	0.148 (-0.523; 0.821)	1.177 (0.307; 2.043)	-0.686 (-1.482; 0.111)
Physical activity <i>increase in active time</i>	-0.026 (-0.070; 0.018)	0.024 (-0.028; 0.075)	0.024 (-0.032; 0.081)	0.050 (-0.275; 0.375)	-0.356 (-0.774; 0.064)	-0.072 (-0.424; 0.281)
Sedentary activity at weekend <i>continue</i>	0.001 (-0.001; 0.003)	0.000 (-0.003; 0.002)	-0.004 (-0.007; -0.001)	0.002 (-0.014; 0.017)	0.005 (-0.014; 0.025)	-0.014 (-0.037; 0.008)
Alcohol <i>yes</i>	-0.037 (-0.129; 0.056)	-0.115 (-0.222; -0.007)	-0.070 (-0.193; 0.052)	0.179 (-0.501; 0.876)	0.409 (-0.468; 1.289)	0.174 (-0.587; 0.936)
Tobacco <i>yes</i>	-0.052 (-0.155; 0.051)	0.146 (0.026; 0.266)	0.279 (0.117; 0.440)	0.251 (-0.508; 1.021)	0.800 (-0.179; 1.794)	0.905 (-0.100; 1.911)
Have breakfast <i>yes</i>	0.068 (-0.113; 0.250)	-0.100 (-0.312; 0.112)	0.104 (-0.243; 0.451)	0.644 (-0.695; 1.983)	0.394 (-1.332; 2.127)	-2.885 (-5.030; -0.741)
Frequency of eating fried foods <i>decreasing fried intake</i>	-0.026 (-0.073; 0.021)	-0.040 (-0.094; 0.015)	-0.082 (-0.149; -0.014)	0.354 (0.008; 0.696)	0.212 (-0.234; 0.650)	0.160 (-0.258; 0.578)
Frequency of eating light products <i>yes</i>	-0.046 (-0.163; 0.071)	0.092 (-0.047; 0.231)	-0.150 (-0.350; 0.048)	2.742 (1.868; 3.619)	1.350 (0.223; 2.472)	2.236 (1.005; 3.466)
Body Mass Index <i>Continue (SD)</i>	0.067 (0.023; 0.111)	-0.007 (-0.059; 0.044)	0.005 (-0.048; 0.057)	1.747 (1.421; 2.073)	2.935 (2.517; 3.356)	1.349 (1.021; 1.677)
Depressive symptoms <i>Continue</i>	-0.003 (-0.009; 0.003)	0.025 (0.018; 0.032)	0.029 (0.018; 0.040)	0.220 (0.175; 0.264)	0.298 (0.241; 0.355)	0.151 (0.083; 0.218)
Number of observations ²	730	759	641	764	754	634
Variance ²	0.0044	0.0001	0.0004	0.0872	0.9262	0.0000
Proportion of explained variance (%) ²	63.33	99.35	96.23	89.02	-6.02	100
<i>Family characteristics</i>						
Parents' education <i>Continue</i>	-0.013 (-0.023; -0.002)	-0.012 (-0.024; 0.010)	-0.022 (-0.036; -0.008)	0.003 (-0.089; 0.096)	0.024 (-0.093; 0.142)	-0.128 (-0.226; -0.027)
Mother Tobacco <i>yes</i>	-0.009 (-0.101; 0.082)	0.192 (0.080; 0.303)	0.005 (-0.119; 0.129)	0.617 (-0.179; 1.416)	1.099 (0.059; 2.139)	0.038 (-0.818; 0.905)
Father Tobacco <i>yes</i>	0.044 (-0.056; 0.144)	0.119 (-0.003; 0.242)	0.069 (-0.068; 0.204)	0.555 (-0.320; 1.436)	0.198 (-0.938; 1.342)	0.793 (-0.149; 1.729)
Existence of disease in at least 1 parent (anorexia, bulimia, depression) <i>Yes</i>	0.014 (-0.077; 0.105)	-0.025 (-0.136; 0.086)	0.095 (-0.032; 0.221)	0.329 (-0.467; 1.122)	0.400 (-0.641; 1.434)	-0.057 (-0.928; 0.822)
Parents BMI	0.010	0.003	0.010	0.500	1.567	1.317

<i>increasing</i>	(-0.051; 0.070)	(-0.071; 0.077)	(-0.078; 0.098)	(-0.031; 1.029)	(0.876; 2.255)	(0.713; 1.926)
Number of observations ³	761	790	675	796	783	667
Variance ³	0.0085	0.0129	0.0036	0.6853	1.0380	0.7583
Proportion of explained variance (%) ³	29.17	15.69	66.04	13.74	-18.82	-97.06

¹Multilevel model using a linear mixed model with random effect by school.

²Model school presented in table 5 adjusted for all individual characteristics.

³Model school presented in table 5 adjusted for all family characteristics.

Table 4 – The role of individual and family characteristics on body image related measures at 17 years old by sex¹

	Desired Image		Bulimia		Impulse for Thinness	Body Dissatisfaction	
	Female	Male	Female	Male	Female	Female	Male
Regression coefficients (95% CI)							
<i>Individual characteristics</i>							
Sports practice yes	-0.182 (-0.314; -0.051)	0.028 (-0.139; 0.194)	-0.040 (-0.140; 0.061)	0.044 (-0.081; 0.168)	0.834 (0.121; 1.552)	-0.083 (-1.022; 0.873)	-0.528 (-1.368; 0.305)
Physical activity increase in active time	-0.048 (-0.116; 0.020)	0.014 (-0.056; 0.083)	0.006 (-0.046; 0.058)	-0.007 (-0.061; 0.045)	0.092 (-0.277; 0.464)	-0.490 (-0.978; -0.001)	-0.295 (-0.648; 0.057)
Sedentary activity at weekend continue	-0.008 (-0.021; 0.004)	-0.006 (-0.019; 0.007)	0.002 (-0.007; 0.012)	0.003 (-0.006; 0.013)	0.015 (-0.057; 0.085)	0.033 (-0.060; 0.126)	-0.005 (-0.069; 0.058)
Alcohol yes	0.040 (-0.002; 0.082)	0.012 (-0.040; 0.064)	0.005 (-0.027; 0.037)	-0.004 (-0.041; 0.033)	-0.092 (-0.321; 0.138)	0.210 (-0.091; 0.517)	0.024 (-0.225; 0.274)
Alcohol intoxication yes	-0.157 (-0.326; 0.009)	0.013 (-0.159; 0.186)	0.293 (0.169; 0.416)	0.122 (-0.005; 0.253)	1.894 (1.012; 2.770)	0.698 (-0.454; 1.872)	0.650 (-0.200; 1.511)
Tobacco yes	0.035 (-0.034; 0.104)	-0.017 (-0.101; 0.064)	-0.040 (-0.095; 0.016)	0.076 (0.013; 0.139)	-0.201 (-0.596; 0.194)	0.229 (-0.293; 0.745)	-0.154 (-0.570; 0.262)
Have breakfast yes	0.207 (0.022; 0.384)	-0.044 (-0.314; 0.222)	-0.126 (-0.264; 0.014)	0.068 (-0.129; 0.265)	-0.906 (-1.900; 0.080)	-0.995 (-2.308; 0.304)	-0.873 (-2.178; 0.424)
Frequency of eating fried foods decreasing fried intake	-0.013 (-0.074; 0.047)	-0.027 (-0.109; 0.053)	-0.013 (-0.059; 0.033)	-0.035 (-0.094; 0.024)	0.453 (0.127; 0.780)	0.199 (-0.233; 0.630)	-0.047 (-0.437; 0.344)
Frequency of eating light products yes	-0.223 (-0.373; -0.077)	-0.166 (-0.411; 0.075)	0.086 (-0.024; 0.195)	-0.005 (-0.179; 0.168)	2.925 (2.142; 3.703)	1.932 (0.906; 2.968)	0.759 (-0.392; 1.910)
Body Mass Index Continue (SD)	0.141 (0.076; 0.207)	-0.049 (-0.117; 0.018)	-0.001 (-0.049; 0.048)	-0.018 (-0.068; 0.032)	1.686 (1.340; 2.028)	3.564 (3.108; 4.019)	1.602 (1.272; 1.932)
Depressive symptoms Continue	-0.008 (-0.016; 0.000)	0.010 (-0.003; 0.023)	0.026 (0.020; 0.032)	0.015 (0.005; 0.026)	0.173 (0.129; 0.216)	0.283 (0.225; 0.340)	0.169 (0.100; 0.237)
Number of observations ²	505	435	720	624	720	718	621
Variance ²	0.0122	0.0074	0.0069	0.0071	0.4481	0.5682	0.4242
Proportion of explained variance (%) ²	17.01	-15.63	89.32	59.43	-63.96	48.81	-11.28
<i>Family characteristics</i>							
Parents' education Continue	-0.018 (-0.035; -0.001)	-0.011 (-0.029; 0.007)	0.012 (0.001; 0.024)	0.011 (-0.004; 0.025)	0.043 (-0.053; 0.141)	-0.010 (-0.142; 0.128)	-0.071 (-0.160; 0.018)
Mother Tobacco yes	0.023 (-0.123; 0.172)	-0.047 (-0.211; 0.122)	0.153 (0.001; 0.259)	0.010 (-0.118; 0.139)	0.928 (0.078; 1.776)	1.400 (0.223; 2.597)	-0.277 (-1.109; 0.562)
Father Tobacco	0.070	-0.070	0.060	0.002	0.639	0.307	0.097

yes	(-0.079; 0.221)	(-0.248; 0.105)	(-0.001; 0.167)	(-0.133; 0.134)	(-0.233; 1.496)	(-0.907; 1.501)	(-0.782; 0.963)
Existence of disease in at least 1 parent (anorexia, bulimia, depression) yes	-0.032 (-0.176; 0.115)	0.067 (-0.100; 0.233)	0.109 (0.001; 0.213)	-0.003 (-0.130; 0.124)	0.056 (-0.773; 0.889)	-0.175 (-1.331; 0.990)	0.219 (-0.598; 1.059)
Parents BMI <i>increasing</i>	0.136 (0.036; 0.237)	0.036 (-0.079; 0.149)	0.029 (-0.001; 0.101)	0.103 (0.192; 0.013)	0.722 (0.143; 1.296)	0.751 (-0.056; 1.557)	1.317 (0.739; 1.902)
Number of observations ³	386	327	663	560	662	662	556
Variance ³	0.0016	0.0064	0.0066	0.0159	0.5495	0.3985	0.1650
Proportion of explained variance (%) ³	89.12	0.00	89.78	9.14	-100	64.10	56.72

¹Multilevel model using a linear mixed model with random effect by school.

²Model school presented in table 6 adjusted for all individual characteristics.

³Model school presented in table 6 adjusted for all family characteristics.

Table 5 – The role of school and school characteristics on body image related measures that have impact on school at 13 years old by sex.¹

	Model School	Model School type	Model Parents' education	Model BMI	Model BDI-II	Model EDI total score
<i>13 years old</i>						
Desired Image						
<i>Female</i>						
Number of observations	977	977	951	970	965	926
Variance	0.0120	0.0118	0.0088	0.0111	0.0094	0.0095
Proportion of explained variance (%)	Reference	1.67	26.67	7.50	21.67	20.83
ICC (%)	2.83	3.04	2.39	2.91	2.50	2.64
β (95% IC) Individual	--	--	-0.008 (-0.018; 0.003)	0.063 (0.024; 0.101)	0.002 (-0.003; 0.007)	-0.001 (-0.003; 0.001)
β (95% IC) School	--	-0.011 (-0.133; 0.110) ²	-0.013 (-0.033; 0.008)	-0.079 (-0.365; 0.207)	0.026 (-0.013; 0.063)	0.004 (-0.004; 0.012)
Bulimia (EDI subscale)						
<i>Female</i>						
Number of observations	1011	1011	984	1002	1005	975
Variance	0.0153	0.0140	0.0145	0.0166	0.0101	0.0082
Proportion of explained variance (%)	Reference	8.50	5.23	-8.50	33.99	46.41
ICC (%)	2.52	2.32	2.45	2.76	1.82	1.91
β (95% IC) Individual	--	--	-0.008 (-0.021; 0.005)	0.047 (-0.002; 0.095)	0.028 (0.022; 0.033)	0.018 (0.016; 0.020)
β (95% IC) School	--	-0.179 (-0.324; -0.038)²	-0.024 (-0.050; 0.003)	-0.055 (-0.309; 0.202)	0.013 (-0.014; 0.040)	0.002 (-0.006; 0.010)
<i>Male</i>						
Number of observations	940	940	900	930	930	906
Variance	0.0106	0.0104	0.0052	0.0106	0.0063	0.0059
Proportion of explained variance (%)	Reference	1.89	50.94	0.00	40.57	44.34
ICC (%)	1.57	1.56	0.81	1.57	1.01	1.48
β (95% IC) Individual	--	--	-0.035 (-0.049; -0.021)	-0.031 (-0.077; 0.015)	0.036 (0.028; 0.045)	0.026 (0.024; 0.028)
β (95% IC) School	--	-0.152 (-0.299; -0.008)²	-0.003 (-0.021; -0.028)	0.036 (-0.217; 0.287)	0.031 (-0.012; 0.074)	-0.001 (-0.010; 0.008)
Impulse for Thinness (EDI subscale)						
<i>Female</i>						
Number of observations	1020	1020	993	1011	1013	975
Variance	0.7945	0.8526	0.6702	0.5798	0.3449	0.3078
Proportion of explained variance (%)	Reference	-7.31	15.65	27.02	56.59	61.26
ICC (%)	2.67	2.86	2.29	2.29	1.29	2.32
β (95% IC) Individual	--	--	-0.041 (-0.132; 0.048)	2.069 (1.761; 2.387)	2.006 (1.679; 2.333)	0.175 (0.165; 0.185)
β (95% IC) School	--	0.006 (-1.019; 1.033) ²	0.107 (-0.070; 0.282)	0.669 (-1.494; 2.831)	-1.934 (-3.964; 0.125)	-0.009 (-0.053; 0.034)

Body Dissatisfaction (EDI subscale)						
<i>Female</i>						
Number of observations	1002	1002	975	993	998	975
Variance	0.8736	0.9329	0.9287	0.7331	0.8586	0.6700
Proportion of explained variance (%)	Reference	-6.79	-6.31	16.08	1.72	23.31
ICC (%)	1.79	1.91	1.88	1.87	1.96	2.36
β (95% IC) Individual	--	--	-0.007 (-0.126; 0.110)	3.120 (2.731; 3.511)	0.288 (0.236; 0.341)	0.193 (0.179; 0.208)
β (95% IC) School	--	-0.239 (-1.471; 0.994) ²	-0.021 (-0.205; 0.245)	-0.447 (-3.135; 2.230)	0.061 (-0.321; 0.447)	-0.024 (-0.087; 0.040)
<i>Male</i>						
Number of observations	925	925	887	916	918	906
Variance	0.3848	0.3673	0.4900	0.2739	0.1701	0.2708
Proportion of explained variance (%)	Reference	4.55	-27.34	28.82	55.80	29.63
ICC (%)	1.36	1.30	1.74	1.12	0.63	1.43
β (95% IC) Individual	--	--	-0.204 (-0.296; 0.111)	1.550 (1.274; 1.832)	0.167 (0.110; 0.225)	0.153 (0.138; 0.167)
β (95% IC) School	--	-0.684 (-1.608; 0.232) ²	0.114 (-0.064; 0.292)	-0.269 (-2.207; 1.680)	0.289 (0.020; 0.561)	0.002 (-0.057; 0.063)

¹Multilevel model using a linear mixed model with random effect by school.

² - β (95% CI) for private schools compared to public schools

Model School: Model only adjusted for each school.

Model School type: Model school adjusted for school type.

Model Parents' education: Model school adjusted for the average of parents' education in each school and for parent's education of each adolescent.

Model BMI: Model school adjusted for the average of Body Mass Index (BMI) in each school and for the BMI of each adolescent.

Model BDI-II: Model school adjusted for the average of Beck Depressive Inventory (BDI-II) in each school and for the BDI-II of each adolescent.

Model EDI total score: Model school adjusted for the average of Eating Disorders Inventory (EDI) Total Score in each school and for the EDI Total Score of each adolescent.

Table 6 – The role of school and school characteristics on body image related measures that have impact on school at 17 years old by sex.¹

	Model School	Model School type	Model Parents' education	Model BMI	Model BDI-II	Model EDI total score
<i>17 years old</i>						
Desired Image						
<i>Female</i>						
Number of observations	675	648	666	667	663	629
Variance	0.0147	0.0000	0.0000	0.0162	0.0179	0.0038
Proportion of explained variance (%)	Reference	100	100	-10.20	-21.77	74.15
ICC (%)	2.99	0.000	0.00	3.40	3.64	0.82
β (95% IC) Individual	--	--	-0.010 (-0.024; 0.004)	0.104 (0.048; 0.161)	-0.004 (-0.011; 0.003)	-0.004 (-0.007; -0.002)
β (95% IC) School	--	--	-0.034 (-0.061; -0.008)	-0.235 (-0.616; 0.139)	-0.004 (-0.045; 0.037)	-0.013 (-0.006; -0.020)
β (95% IC) School – private ²	--	-0.191 (-0.311; -0.071)				
β (95% IC) School - professional ²	--	0.201 (-0.062; 0.465)				
β (95% IC) School – does not attend ²	--	0.262 (-0.072; 0.597)				
<i>Male</i>						
Number of observations	622	591	611	617	607	575
Variance	0.0064(12)	0.0002	0.0035	0.0034	0.0093	0.0019
Proportion of explained variance (%)	Reference	96.88	45.31	46.88	-45.31	70.30
ICC (%)	1.22	0.04	0.67	0.64	1.84	0.36
β (95% IC) Individual	--	--	-0.016 (-0.031; 0.001)	-0.034 (-0.090; 0.021)	0.009 (-0.002; 0.020)	-0.001 (-0.005; 0.002)
β (95% IC) School	--	--	-0.007 (-0.034; 0.001)	-0.310 (-0.620; -0.005)	0.008 (-0.043; 0.058)	0.010 (-0.001; 0.020)
β (95% IC) School – private ²	--	-0.117 (-0.253; 0.020)				
β (95% IC) School - professional ²	--	0.294 (0.006; 0.582)				
β (95% IC) School – does not attend ²	--	0.366 (0.0139; 0.719)				
Bulimia (EDI subscale)						
<i>Female</i>						
Number of observations	1069	1038	1057	1057	941	1044
Variance	0.0646	0.0035	0.0641	0.0050	0.0057	0.0063
Proportion of explained variance (%)	Reference	94.58	0.77	92.26	91.18	90.25
ICC (%)	1.17	0.75	1.16	1.06	1.32	1.85
β (95% IC) Individual	--	--	0.019 (-0.017; 0.056)	0.035 (-0.010; 0.081)	0.028 (0.022; 0.033)	0.017 (0.015; 0.018)
β (95% IC) School	--	--	0.019 (-0.062; 0.101)	0.027 (-0.249; 0.305)	0.016 (-0.022; 0.055)	0.005 (-0.006; 0.015)
β (95% IC) School – private ²	--	0.066 (-0.050; 0.181)				
β (95% IC) School - professional ²	--	-0.221 (-0.481; 0.041)				
β (95% IC) School – does not attend ²	--	0.191 (-0.158; 0.539)				
<i>Male</i>						
Number of observations	1018	984	1004	1009	844	995
Variance	0.0175	0.0149	0.0202	0.0176	0.0067	0.0117
Proportion of explained variance (%)	Reference	14.86	-15.43	-0.57	61.71	33.15

ICC (%)	3.05	2.58	3.58	3.03	1.31	2.79
β (95% IC) Individual	--	--	0.014 (0.002; 0.026)	-0.026 (-0.070; 0.018)	0.025 (0.016; 0.035)	0.022 (0.020; 0.024)
β (95% IC) School	--	--	-0.005 (-0.033; 0.023)	0.025 (-0.330; 0.387)	-0.020 (-0.066; 0.027)	-0.001 (-0.011; 0.010)
β (95% IC) School – private ²	--	-0.154 (-0.317; 0.009)				
β (95% IC) School - professional ²	--	-0.447 (-0.786; -0.106)				
β (95% IC) School – does not attend ²	--	-0.026 (-0.438; 0.380)				
Impulse for Thinness (EDI subscale)						
<i>Female</i>						
Number of observations	1070	1039	1058	1058	941	1044
Variance	0.2733	0.2443	0.1114	0.2991	0.3962	0.3093
Proportion of explained variance (%)	Reference	10.61	59.24	-9.44	-44.97	-13.17
ICC (%)	0.99	0.90	0.41	1.24	1.57	2.36
β (95% IC) Individual	--	--	0.044 (-0.037; 0.125)	2.006 (1.679; 2.333)	0.203 (0.161; 0.245)	0.179 (0.169; 0.190)
β (95% IC) School	--	--	0.148 (-0.011; 0.307)	-1.934 (-3.964; 0.125)	-0.139 (-0.445; 0.162)	-0.043 (-0.111; 0.025)
β (95% IC) School – private ²	--	0.378 (-0.532; 1.288)				
β (95% IC) School - professional ²	--	-2.107 (-4.181; -0.050)				
β (95% IC) School – does not attend ²	--	-0.035 (-2.689; 2.610)				
Body Dissatisfaction (EDI subscale)						
<i>Female</i>						
Number of observations	1065	1034	1053	1053	937	1044
Variance	1.1100	1.1670	0.7586	1.092	0.9895	0.5473
Proportion of explained variance (%)	Reference	-5.14	31.66	1.62	10.86	50.67
ICC (%)	2.16	2.29	1.48	2.71	2.19	2.29
β (95% IC) Individual	--	--	0.028 (-0.082; 0.139)	3.675 (3.255; 4.096)	0.325 (0.269; 0.382)	0.241 (0.228; 0.256)
β (95% IC) School	--	--	0.165 (-0.082; 0.409)	-0.875 (-3.893; 2.200)	0.008 (-0.432; 0.436)	0.038 (-0.054; 0.129)
β (95% IC) School – private ²	--	0.130 (-1.305; 1.565)				
β (95% IC) School - professional ²	--	-2.127 (-5.142; 0.873)				
β (95% IC) School – does not attend ²	--	-2.443 (-6.576; 1.688)				
<i>Male</i>						
Number of observations	1004	970	992	995	833	995
Variance	0.3812	0.2110	0.3224	0.4748	0.5184	0.1546
Proportion of explained variance (%)	Reference	44.65	15.42	-24.55	-35.99	59.44
ICC (%)	1.67	0.93	1.43	2.36	2.30	1.12
β (95% IC) Individual	--	--	-0.068 (-0.145; 0.010)	1.468 (1.206; 1.727)	0.218 (0.156; 0.280)	0.172 (0.158; 0.186)
β (95% IC) School	--	--	-0.090 (-0.259; 0.077)	-0.345 (-2.380; 1.655)	-0.292 (-0.636; 0.045)	-0.018 (-0.075; 0.038)
β (95% IC) School – private ²	--	-1.154 (-2.041; -0.267)				
β (95% IC) School - professional ²	--	-1.804 (-3.757; 0.161)				
β (95% IC) School – does not attend ²	--	0.763 (-1.570; 3.125)				

¹Multilevel model using a linear mixed model with random effect by school.

² - β (95% CI) for private, professional and not attend school compared to public school

Model School: Model only adjusted for each school.

Model School type: Model school adjusted for school type.

Model Parents' education: Model school adjusted for the average of parents' education in each school and for parent's education of each adolescent.

Model BMI: Model school adjusted for the average of Body Mass Index (BMI) in each school and for the BMI of each adolescent.

Model BDI-II: Model school adjusted for the average of Beck Depressive Inventory (BDI-II) in each school and for the BDI-II of each adolescent.

Model EDI total score: Model school adjusted for the average of Eating Disorders Inventory (EDI) Total Score in each school and for the EDI Total Score of each adolescent.

Table 7 – The role of individual, family and school characteristics that were previously related to body image related measures at 13 and 17 years old, whenever the % explained variance for individual characteristics was below 85%¹

	13 years old		17 years old					
	Desired Image	Body Dissatisfaction	Desired Image		Bulimia	Impulse for Thinness	Body Dissatisfaction	
	Female	Female	Female	Male	Male	Female	Female	Male
	Regression coefficients (95% CI)							
<i>Individual characteristics</i>								
Sports practice yes	---	0.809 (-0.003; 1.619)	0.101 (-0.012; 0.215)	---	---	1.047 (0.337; 1.777)	---	---
Physical activity increase in active time	---	---	---	---	---	---	-0.421 (-0.920; 0.080)	---
Alcohol intoxication yes	---	---	---	---	---	2.112 (1.191; 3.016)	---	---
Tobacco yes	---	---	---	---	0.123 (0.059; 0.187)	---	---	---
Have breakfast yes	---	---	0.050 (-0.101; 0.151)	---	---	---	---	---
Frequency of eating fried foods decreasing fried intake	---	---	---	---	---	0.521 (0.177; 0.865)	---	---
Frequency of eating light products yes	---	1.414 (0.370; 2.458)	-0.361 (-0.513; -0.213)	---	---	3.091 (2.263; 3.899)	2.424 (1.360; 3.495)	---
Body Mass Index Continue (SD)	0.048 (0.010; 0.086)	2.932 (2.529; 3.336)	0.069 (0.009; 0.129)	---	---	1.419 (1.026; 1.802)	3.378 (2.867; 3.884)	1.779 (1.413; 2.162)
Depressive symptoms Continue	---	0.298 (0.247; 0.348)	---	---	0.021 (0.009; 0.032)	0.172 (0.123; 0.219)	0.309 (0.245; 0.371)	0.174 (0.101; 0.246)
EDI total score Continue	---	---	-0.001 (-0.003; 0.004)	---	---	---	---	---
<i>Family characteristics</i>								
Parents' education Continue	-0.010 (-0.197; -0.001)	---	-0.017 (-0.040; -0.005)	---	---	---	---	---
Mother Tobacco yes	---	0.579 (-0.220; 1.382)	---	---	---	0.395 (-0.319; 1.114)	0.583 (-0.360; 1.537)	---

Parents BMI <i>increasing</i>	---	0.323 (-0.246; 0.886)	0.005 (-0.035; 0.126)	---	-0.097 (-0.177; -0.015)	0.181 (-0.306; 0.669)	---	0.569 (0.009; 1.121)
<i>School characteristics</i>								
School type <i>Private</i>			-0.210 (-0.343; -0.077)	-0.113 (-0.250; 0.024)	-0.184 (-0.325; -0.040)	0.037 (-1.116; 1.186)		-1.179 (-2.173; -0.184)
<i>Professional</i>	---	---	0.229 (-0.026; 0.484)	0.248 (-0.054; 0.550)	-0.400 (-0.697; -0.100)	-2.811 (-5.046; -0.567)	---	-1.052 (-2.989; 0.882)
<i>Does not attend school</i>			0.269 (-0.136; 0.678)	0.323 (-0.038; 0.686)	-0.150 (-0.541; 0.235)	-1.935 (-5.492; 1.640)		1.594 (-0.834; 4.041)
Mean of Parents' education <i>Continue</i>	---	---	-0.020 (-0.030; 0.011)	---	---	---	---	---
Mean of Body Mass Index <i>Continue</i>	---	---	---	-0.158 (-0.469; 0.156)	---	---	---	---
Mean of EDI Total Score <i>Continue</i>	---	---	-0.002 (-0.006; 0.004)	----	---	---	---	---
Number of observations ²	945	821	769	591	501	592	610	508
Variance ²	0.08691	0.5243	0.0123	0.0006	0.0014	0.8202	1.047	0.172
Proportion of explained variance (%) ²	27.6	34.9	16.3	95.9	92.0	-200%	5.7	54.9

¹Multilevel model using a linear mixed model with random effect by school.

²Model school presented in table 5 (for 13 years) and in table 6 (for 17years) adjusted to these individual, family and school characteristics.

Supplementary Table 1 – Characteristics of the sampled participants by age and sex.

	13 years old n (%)			17 years old n (%)		
	Total Sample n=2117	Female 1093 (51.6)	Male 1024 (48.4)	Total sample n= 2257	Female 1151 (51.0)	Male 1106 (49.0)
School type						
Public	1639 (77.4)	835 (76.4)	804 (78.5)	1775 (78.6)	893 (77.6)	882 (79.7)
Private	478 (22.6)	258 (23.6)	220 (21.5)	389 (17.2)	211 (18.3)	178 (16.1)
Professional	Does not apply			57 (2.5)	30 (2.6)	27 (2.4)
Don't attend				36 (1.6)	17 (1.5)	19 (1.7)
Parents education considering the highest level †						
years	11.0 (8.0)	10.0 (9.0)	11.0 (8.0)	11.0 (8.0)	11.0 (8.0)	11.0 (10.0)
Smoking mother						
Smoker	948 (49.1)	508 (50.0)	440 (48.1)	685 (44.1)	367 (44.8)	318 (43.2)
No smoker	982 (50.9)	508 (50.0)	474 (51.9)	870 (55.9)	452 (55.2)	418 (56.8)
Missing	187	77	110	702	332	370
Smoking father						
Smoker	1333 (73.0)	721 (75.3)	612 (70.5)	981 (67.8)	522 (67.5)	459 (68.1)
No smoker	493 (27.0)	237 (24.7)	256 (29.5)	466 (32.2)	251 (32.5)	215 (31.9)
Missing	291	135	156	810	378	432
History of Parent's Disease (depression, anorexia, bulimia)						
At least one in one parent	628 (32.6)	349 (34.6)	279 (30.4)	479 (30.3)	266 (31.9)	213 (28.6)
None or does not know	1299 (67.4)	660 (65.4)	639 (69.6)	1101 (69.7)	568 (68.1)	533 (71.4)
Missing	190	84	106	677	317	360
Parent's BMI (considering the highest one)						
Normal and underweight	623 (33.5)	345 (35.1)	278 (31.7)	464 (30.2)	245 (30.4)	219 (30.0)
Pre obese	879 (47.3)	430 (43.7)	449 (51.3)	764 (49.7)	389 (48.2)	375 (51.3)
Obese	357 (19.2)	208 (21.2)	149 (17.0)	310 (20.2)	173 (21.4)	137 (18.7)
Missing	258	110	148	719	344	375
BMI, z-scores (SD) †						
	0.4 (1.4)	0.4 (1.3)	0.5 (1.6)	0.3 (1.3)	0.2 (1.2)	0.3 (1.3)
Adolescents' BMI, Percentiles according to WHO (z-scores)						
Underweight	28 (1.4)	5 (0.5)	23 (2.4)	18 (0.8)	4 (0.4)	14 (1.3)
Normal	1395 (69.9)	749 (72.7)	646 (66.9)	1719 (77.1)	908 (79.9)	811 (74.2)
Preobese	395 (19.8)	196 (19.0)	199 (20.6)	370 (16.6)	183 (16.1)	187 (17.1)
Obese	178 (8.9)	80 (7.8)	98 (10.1)	123 (5.5)	42 (3.7)	81 (7.4)
Missing	121	63	58	27	14	13
Beck Depression Inventory (BDI)						
≤13	1694 (86.6)	824 (81.0)	870 (92.6)	1655 (87.4)	829 (82.8)	826 (92.5)
>13	263 (13.4)	193 (19.0)	70 (7.4)	239 (12.6)	172 (17.2)	67 (7.5)
Missing	160	76	84	363	150	213

Sports practice						
Yes	905 (50.0)	380 (39.4)	525 (62.1)	1204 (55.2)	446 (40.1)	758 (71.0)
No	905 (50.0)	584 (60.6)	321 (37.9)	976 (44.8)	667 (59.9)	309 (29.0)
Missing	307	129	178	77	38	39
Physical activity						
Spends most of time sitting	496 (28.5)	284 (30.4)	212 (26.2)	413 (19.8)	216 (20.4)	197 (19.2)
Spends most of time standing and/or walking (without running)	391 (22.4)	284 (30.4)	107 (13.2)	578 (27.8)	410 (38.8)	168 (16.4)
Spends half of the time active (walking, playing) and the other half standing without any other activity.	521 (29.9)	235 (25.2)	286 (35.4)	704 (33.8)	312 (29.5)	392 (38.2)
Spends most of time very active (running, playing)	334 (19.2)	131 (14.0)	203 (25.1)	387 (18.6)	119 (11.3)	268 (26.1)
Missing	375	159	216	175	94	81
Time spent in sedentary activities, at weekend, hours †						
	8.5 (5.7)	8.0 (5.0)	9.2 (5.6)	9.0 (6.0)	8.5 (6.0)	9.0 (6.5)
Alcohol						
Never drank	907 (46.1)	457 (44.8)	450 (47.5)	368 (16.9)	186 (16.6)	182 (17.1)
Drinks at least 1 cup a week	1059 (53.9)	562 (55.2)	497 (52.5)	278 (12.7)	91 (8.1)	187 (17.5)
Drinks less than 1 cup a week				820 (37.6)	405 (36.2)	415 (39.0)
Have ever tried but don't drink				717 (32.8)	437 (39.1)	280 (26.3)
Missing	151	74	77	74	32	42
Alcohol intoxication						
Yes	<i>Does not apply</i>			575 (25.9)	248 (21.8)	327 (30.2)
No				1643 (74.1)	888 (78.2)	755 (69.8)
Missing				39	15	24
Tobacco						
Never smoked	1500 (76.5)	745 (72.9)	755 (80.4)	1221 (55.4)	606 (53.4)	615 (57.5)
Already tried but don't smoke	461 (23.5)	277 (27.1)	184 (19.6)	655 (29.7)	359 (31.6)	296 (27.7)
Smokes but not every day				115 (5.2)	56 (4.9)	59 (5.5)
Smokes at least 1 cigarette a day				214 (9.7)	114 (10.0)	100 (9.3)
Missing	156	71	85	52	16	36
Breakfast						
Yes	1740 (94.9)	921 (93.9)	819 (96.0)	1967 (89.7)	988 (88.0)	979 (91.3)
No	94 (5.1)	60 (6.1)	34 (4.0)	225 (10.3)	135 (12.0)	90 (8.4)
Missing	283	112	171	65	28	37
Frequency of fried food intake						

At least 4 times a week	227 (12.6)	110 (11.4)	117 (14.1)	294 (13.3)	116 (10.5)	172 (16.4)
1 to 3 times a week	1078 (59.9)	570 (59.1)	508 (60.9)	1186 (54.9)	570 (51.4)	616 (58.7)
Less than 1 time a week	494 (27.5)	285 (29.5)	209 (25.1)	685 (31.7)	424 (38.2)	261 (24.9)
Missing	318	128	190	98	41	57
Light products						
Yes	263 (14.6)	174 (18.1)	89 (10.6)	408 (18.9)	299 (26.9)	109 (10.4)
No	1542 (85.4)	788 (81.9)	754 (89.4)	1755 (81.1)	814 (73.1)	941 (89.6)
Missing	312	131	181	94	38	56

BMI, Body Mass Index; WHO, World Health Organization;

Values may not add up to 100% due to rounding up.

† Median, interquartile range

Supplementary Table 2 - Characteristics of the participants at 17y who participated at both ages.

	Adolescents present in both waves at 17 years old		
	Total sample n= 1468	Female 762 (51.9)	Male 706 (48.1)
School type			
Public	1171 (79.8)	606 (79.5)	565 (80.0)
Private	204 (13.9)	109 (14.3)	95 (13.5)
Professional	57 (3.9)	30 (3.9)	27 (3.8)
Don't attend	36 (2.5)	17 (2.2)	19 (2.7)
Parents education considering the highest level †			
years	11.0 (8.0)	11.0 (8.0)	11.0 (9.0)
Smoking mother			
Smoker	498 (48.3)	270 (49.7)	228 (46.8)
No smoker	532 (51.7)	273 (50.3)	259 (53.2)
Missing	438	219	219
Smoking father			
Smoker	676 (70.3)	359 (70.1)	317 (70.6)
No smoker	285 (29.7)	153 (29.9)	132 (29.4)
Missing	507	250	257
History of Parent's Disease (depression, anorexia, bulimia)			
At least one in one parent	326 (31.2)	180 (32.7)	146 (29.6)
None or does not know	718 (68.8)	370 (67.3)	348 (70.4)
Missing	424	212	212
Parent's BMI (considering the highest one)			
Normal and underweight	311 (30.6)	161 (30.4)	150 (30.8)
Pre obese	494 (48.6)	250 (47.2)	244 (50.1)
Obese	212 (20.8)	119 (22.5)	93 (19.1)
Missing	451	232	219
Eating Disorders Index (EDI) †			
Drive For Thinness	1.0 (4.0)	3.0 (7.0)	1.0 (3.0)
Bulimia	0.0 (1.0)	0.0 (1.0)	0.0 (1.0)
Body Dissatisfaction	4.0 (10.0)	6.0 (11.0)	2.0 (6.0)
Total Score	25.0 (21.5)	28.2 (26.0)	21.6 (15.5)
"Figure you most identify with" – Stunkard images †			
	4.0 (1.0)	4.0 (1.0)	4.0 (1.0)
"Figure you would most like to look like" – Stunkard images †			
	4.0 (2.0)	4.0 (1.0)	4.5 (1.0)
BMI, z-scores (SD) †			
	0.2 (1.3)	0.1 (1.3)	0.3 (1.4)
Beck Depression Inventory (BDI) †			
	4.0 (8.0)	6.0 (9.0)	3.0 (5.0)
Sports practice			
Yes	793 (55.6)	295 (39.9)	498 (72.5)
No	633 (44.4)	444 (60.1)	189 (27.5)
Missing	42	23	19
Physical activity			
Spends most of time sitting	266 (19.3)	142 (20.0)	124 (18.6)
Spends most of time standing and/or walking (without running)	422 (30.6)	299 (42.1)	123 (18.4)
Spends half of the time active (walking, playing) and the other half standing without any other activity.	457 (33.2)	195 (27.5)	262 (39.2)
Spends most of time very active (running, playing)	233 (16.9)	74 (10.4)	159 (23.8)
Missing	90	52	38
Time spent in sedentary activities, at weekend †			
hours	9.0 (6.0)	8.3 (5.5)	9.0 (6.0)
Alcohol			
Never drank	242 (16.8)	125 (16.8)	117 (16.9)

Drinks at least 1 cup a week	172 (12)	53 (7.1)	119 (17.2)
Drinks less than 1 cup a week	554 (38.6)	272 (36.8)	282 (40.8)
Have ever tried but don't drink	469 (32.6)	295 (39.6)	174 (25.1)
Missing	31	17	14
Alcohol intoxication			
Yes	371 (25.4)	153 (20.2)	218 (31.1)
No	1087 (74.6)	604 (79.8)	483 (68.9)
Missing	10	5	5
Tobacco			
Never smoked	806 (55.8)	406 (53.8)	400 (58.0)
Already tried but don't smoke	423 (29.3)	237 (31.4)	186 (27.0)
Smokes but not every day	71 (4.9)	34 (4.5)	37 (5.4)
Smokes at least 1 cigarette a day	145 (10.0)	78 (10.3)	67 (9.7)
Missing	23	7	16
Breakfast			
Yes	1290 (90.0)	662 (88.9)	628 (91.3)
No	143 (10.0)	83 (11.1)	60 (8.7)
Missing	35	17	18
Frequency of fried food intake			
At least 4 times a week	189 (13.3)	72 (9.7)	117 (17.3)
1 to 3 times a week	784 (55.4)	388 (52.5)	396 (58.7)
Less than 1 time a week	441 (31.2)	279 (37.8)	162 (24.0)
Missing	54	23	31
Light products			
Yes	250 (17.6)	183 (24.7)	67 (9.8)
No	1172 (82.4)	558 (75.3)	614 (90.2)
Missing	46	21	25

BMI, Body Mass Index; WHO, World Health Organization;
 Values may not add up to 100% due to rounding up.
 † Median, interquartile rang

SEDE ADMINISTRATIVA

FACULDADE DE MEDICINA

FACULDADE DE PSICOLOGIA E DE CIÊNCIAS DA EDUCAÇÃO

