Body mass index, personality traits, and body image in Italian pre-adolescents: An opportunity for overweight prevention

Veronica Rosa[1], Manuela Tomai[1], Marco Lauriola[2],
Gabriella Martino[3], and Michela Di Trani[1]

[1]Department of Dynamic and Clinical Psychology, Sapienza, Rome, Italy
*[2]Department of Psychology of Development and Socialization Processes,
Sapienza, Rome, Italy*
*[3]Department of Clinical and Experimental Medicine,
University of Messina, Messina, Italy*

We investigated the relationship between body mass index (BMI) and personality traits, socio-economic status (SES), and body image (BI) at the beginning of preadolescence. Data were collected from 238 Italian children aged 10–11 years using self-report scales. Information about SES was derived from parental education and professional status. BI was the variable the most strongly associated with BMI. Controlling for BI, SES, and gender, Agreeableness was inversely associated with BMI, whilst Extroversion was related to BMI in girls only. Gender did not moderate the associations between BI and BMI at this age. The relationship of certain personality traits with BMI is likely to emerge during preadolescence. Early interventions to reduce overweight and obesity could consider the interplay of Agreeableness and Extroversion with gender, BI, and SES.

Key words: Body Mass Index, Big-Five, Body Image; SES, preadolescent, gender differences

Highlights:

- Weight, body image, and personality in preadolescence were examined.
- Agreeableness and Extraversion are associated with body mass index.
- Gender moderates the relationship between personality traits and body mass index.

The prevalence of overweight and obesity among children and adolescents has increased dramatically in recent decades, becoming a major public health concern of the 21st century in developed and developing countries (Ahrens

Correspodnig author: manuela.tomai@uniroma1.it

et al., 2014; Wabitsch, Moss, & Kromeyer-Hauschild, 2014). Such increase occurs for both boys and girls of different age and in 2016, the World Health Organization (WHO) reported an increase in the prevalence of overweight of 18% in girls and 19% in boys (WHO, 2018). Overweight and obesity during childhood and adolescence are linked with adverse health consequences, such as increased risk for non-communicable and chronic diseases later in life (Lambert, Delvin, Levy, O'Loughlin, Paradis, Barnett, & McGrath, 2008) and significant social stigmatization and peer victimization (Lee & Vaillancourt, 2018; Pont, Puhl, Cook, & Slusser, 2017). Overweight individuals are also more likely to have negative feelings about and dissatisfaction with their bodies than normal-weight peers (Ahadzadeh, Rafik-Galea, Alavi, & Amini, 2018).

In this regard, body image (BI) is defined as an individual's perception, feeling and attitude about his or her body (e.g., Grogan, 2008). It encompasses a wide range of factors including the accuracy of self-estimation of body size, satisfaction with one's body, feelings about one's body, perceived body weight, perceived body shape, and body shape concerns (Alebachew & Ashagrie, 2017; Sutin & Terraciano, 2014). Concerns about weight and wanting a thinner or a larger shape are related to body-related self-esteem in pre-adolescence (Dion et al., 2016; Marsh, Hau, Sung, & Yu, 2007), playing an important role in the onset of BI disturbances (Schwartz & Brownell, 2004; Voelker, Reel, & Greenleaf, 2015). For instance, a high BMI during childhood has been strongly associated with a poor self-image, body dissatisfaction, social isolation, self-aggression, and development of eating disorders (El-Sayed & Galea, 2011). Interest in studying eating disorders, especially in association with overweight, has also increased in the past ten years, as their incidence in children and adolescents has started to rise (Cuzzocrea & Costa, 2017).

Body mass index (BMI) is widely acknowledged to be negatively associated with BI (Ahadzadeh et al., 2018; Kaminsky & Dewey, 2014; Kantanista, Król-Zielińska, Borowiec, & Osiński, 2017). In turn, BI was a mediator of the relationships between BMI and emotional well-being (Wertheim, Koerner, & Paxton, 2001), and increases in BMI during childhood predicted body dissatisfaction during adolescence and early adulthood (Eisenberg & Neumark-Sztainer, 2006). However, some recent studies have begun to look at the relationship between body image and BMI from an opposite perspective: whether deeper disaffection with one's body may lead to increases in overweight and adiposity in school-age children (Duchin et al., 2014). Using a prospective design, the study showed that being dissatisfied with the BI at the age of six led to a weight gain over time or to thinness, with some differences between boys and girls.

Several studies have investigated gender differences in BI at various ages. In general, women and girls are less satisfied with their body than men and boys (e.g., Behdarvandi, Azarbarzin, & Baraz, 2017; Fiske, Fallon, Blissmer, & Redding, 2014; Lunde Frisén, & Hwang, 2007; Wong & Say, 2013), and perceive their body to be fatter than it actually is (Grossbard, Neighbors, & Larimer, 2011; Paap & Gardner, 2011; Runfola et al., 2013). Regardless of BMI, girls reported being more dissatisfied with their body than boys (Biolcati, Ghigi, Mameli, & Passini, 2017). Only a few studies, particularly studies of adults,

have failed to detect gender differences in BI and the relationship between BI and BMI (Bhuiyan, Gustat, Srinivasan, & Berenson, 2003; Mäkinen et al., 2012).

Dispositional characteristics, especially personality traits encompassed in the Five Factor Model (FFM; Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to experience), are found to be associated with overweight and obesity risk (e.g., Cuzzocrea, Costa, Larcan, & Rosano, 2013; Sutin, Ferrucci, Zonderman, & Terracciano, 2011). Conscientiousness, reflecting high self-control, order, and adherence to social norms, appears to be most strongly and negatively associated with overweight and the development and persistence of obesity (Brummett et al., 2006; Jokela et al., 2013; Sutin & Terracciano, 2016a). Some studies found that Neuroticism (or emotional instability) was associated with being underweight only in women (e.g., Brummett et al., 2006), while others reported this relationship in both genders (e.g., Terraciano et al., 2009). One longitudinal study showed that participants high on Neuroticism had higher BMI, if measured concurrently, while longitudinally Neuroticism scores predicted weight fluctuations, not merely being underweight or overweight (Sutin et al., 2011). Mixed evidence was reported for the relationship between Extraversion, Agreeableness, and Openness to experience and body weight (i.e., Chapman, Fiscella, Duberstein, Kawachi, & Coletta, 2009; Terraciano et al., 2009). This literature has mainly studied samples of adults, while interest in younger age groups has started more recently (Sutin & Terracciano, 2016b). The relationship between overweight in childhood or adolescence and persistent obesity in adulthood is also established (e.g., El-Sayed & Galea, 2011). Obese children and adolescents were about five times more likely to be obese in adulthood than those who were not obese at younger ages (Simmonds, Llewellyn, Owen, & Woolacott, 2018). Longitudinal studies have found associations between various childhood personality traits and BMI (e.g., Cheng & Furnham, 2013). There is also evidence that childhood personality, and even more adolescent personality, might influence health in adulthood and be associated with adolescent weight problems and adult obesity (Hampson, Goldberg, Vogt, & Dubanoski, 2007; Kern & Friedman, 2008).

Since the literature highlights a fairly reliable association between Conscientiousness and normal weight in children, adolescents, and adults, while other FFM traits have been shown to be associated with overweight and obesity at different stages of the life cycle (Jokela et al., 2013), it seems important to investigate these relationships during preadolescence (ranging from 10 to 13 years), a developmental phase not covered by previous research. The goal of the present study was to examine the associations between BMI and both personality traits and BI at the beginning of pre-adolescence. Our first aim was to assess whether the traits are associated with BMI in children aged 10–11 years old. Soto and colleagues (2011) showed that the mean level and the inter-correlations of personality traits in the FFM change with age, especially from childhood to the adult age. So, it would not be entirely surprising to uncover age-specific associations during the preadolescence when impulsivity is higher, and the levels of conscientiousness are lower compared to older ages. Other traits, like Extraversion or Neuroticism might be specifically associated with BMI during this developmental period (Hypothesis 1).

Although gender differences moderated the relationships between personality and body weight during adolescence and adulthood (Behdarvandi et al., 2017; Fiske et al., 2014; Lunde et al., 2007; Wong & Say, 2013), there is less evidence regarding gender differences during preadolescence. To our knowledge, only one study analyzed gender differences in the relationship between personality and BMI in the 6–12 age group and showed that boys and girls who were less extraverted, were more likely to be overweight or obese (Vollrath, Hampson, & Júlíusson, 2012). Indeed, the second aim of the study was to investigate this moderation effect. We expect that associations between BMI and personality traits will be different for girls and boys (Hypothesis 2).

Several studies described an inverse relation between socio economic status (SES) and obesity, (e.g., Bona, Prodram, & Ricotti, 2015; Morgen et al., 2013; Schooling, Yau, Cowling, Lam, & Leung, 2010; Wabitsch et al., 2014). Interestingly, Loureiro and Nayga (2005) reported a lower frequency of obesity among the low-income and less educated strata of the population, while this frequency dropped significantly as both education and income increase. In keeping with this literature, our third goal was to explore whether the relationship between SES and BMI holds during preadolescence and whether SES moderates the associations of both personality and BI with BMI (Hypothesis 3).

The extant literature suggests that BMI and BI are highly correlated (Bhuiyan et al., 2003; Mäkinen et al., 2012; Schwartz & Brownell, 2004). Accordingly, our fourth objective was to explore the relationship between BI and BMI in pre-adolescence. Because gender differences in BI are associated with the perceived appropriateness of one's weight; we also investigated whether gender moderated the association between BI and BMI in this age group weight (Hypothesis 4).

Method

Participants and Procedure

Two-hundred-thirty-eight schoolchildren (108 girls, 130 boys), attending the 5th grade of Italian primary schools, were recruited from five schools. All participants were 10 or 11 years of age (M = 10.51; SD = 0.58). Participants were from all regions of Italy: 24% of participants were from northern, 32% from central, and 44% from southern regions, including Sicily and Sardinia). Two percent (girls: 1%; boys: 3% boys) of children were underweight, 67% were normal weight (girls: 78%; boys: 58%), 22% were overweight (girls: 18%; boys: 26%) and 9% were obese (girls: 3%; boys: 14%).

The distribution of children's weight was in line with national statistics (OKkio alla SALUTE, 2016) showing that 21% and 9.3% of Italian children 6–11 years old are overweight and obese, respectively. Inclusion criteria for the study were: age 10–11 years, attending the fifth grade of the primary school, written comprehension of the Italian language, ability to fill in a paper and pencil questionnaire. Exclusion criteria were a refusal to cooperate, a present or a history of mental illness. The refusal rate was around 2%. No children were excluded because of mental illness.

Participants completed the Big Five Questionnaire for Children (see instruments) anonymously during the class time under the supervision of trained research assistants with the help of the class teacher. Research assistants and the teacher were available to help children who were having difficulties to complete the questionnaire. All questionnaires

were checked to make sure that every question had been answered, and that there were no inappropriate patterns of answers. Weight was measured to the nearest 0.1 kg using portable digital scales with a range of 0–150 kg. Height was measured to the nearest 0.5 cm using a portable stadiometer. Children's height and weight were measured after they had taken away the heavier clothes and took off their shoes in a private room. All children participated in the weight and height measurements. We followed a stringent consent procedure, which consisted of obtaining parental permission, approval from school councils, and giving children the opportunity to refuse to participate. The local ethical committee of the school approved the study. The participants were informed about the aim of the study and its procedures and the parents gave written consent for the participation.

Instruments

Demographic and socioeconomic status (SES) data. We used a self-report instrument to collect demographic data (i.e., age, gender, grade attended, city of residence) and data useful to obtain a SES index. The Hollingshead SES Index is a widely used composite score to assess the socioeconomic status of a child's family (Hollingshead & Redlich, 1958). It is based on coding the professional status and educational level of both parents using a scale from 1 (e.g., *farm laborers/menial service workers*) to 9 (e.g., *higher executives and major professionals*) for profession, and from 1 (i.e., *less than seventh grade*) to 7 (i.e., *graduate professional training*) for education. The composite index is then obtained as a weighted average of profession and education, using a weight of 5 and 3 for profession and education, respectively. As such, the Hollingshead Index range is from 8 to 66, with higher scores reflecting higher SES.

Body mass index (BMI). BMI is defined as the body mass in kg divided by the square of the body height in m. We used the BMI expressed in kg/m^2 to estimate the risk of weight-related health problems; we used objective measurements of weight and height to eliminate the self-report bias (Elgar, Roberts, Tudor-Smith, & Moore, 2005). For descriptive purposes, we used the Italian cross-sectional growth charts for height, weight and BMI (2 to 20 years) (Cacciari et al., 2006) to define the range of percentiles for underweight, normal weight, overweight and obesity. Continuous BMI data was used as dependent variable in regression analyses.

Big Five Questionnaire for Children (BFQ-C). Personality traits were measured using the Big Five Questionnaire for children (Barbaranelli, Caprara, & Rabasca, 1998), a self-report questionnaire consisting of sixty-five-items assessing Extraversion (e.g., expansiveness and assertiveness), Agreeableness (e.g., sensitivity, solicitude to others), Conscientiousness (e.g., precision, responsibility, perseverance), Neuroticism (e.g., presence of anxiety and emotional problems, irritability), and Openness to experience (e.g. openness to new ideas, interest in the values of other cultures). Respondents are required to rate each item on a three-point scale (1 = *almost never*, 2 = *sometimes*, 3 = *many times*). In our sample, the internal reliability for the subscales were as following: above the psychometric standards (i.e., Extraversion, α = .70; Agreeableness, α = .81; Conscientiousness, α = .72; Emotional Stability, α = .75; Openness to experience, α = .75.

Body image (BI). In the present study we used a categorical item: "Do you think your body is: *thin* (1), *the right-size* (2), *a little-overweight* (3), or *fat* (4)" to measure Body image (Cinelli & O'Dea, 2009) and as a proxy of Body image perception.

Data Analysis

BMI data were subjected to a natural-log transformation to ensure that they met with the requirements for parametric statistical analysis (O'Dea & Wilson, 2006). We used two hierarchical regression analyses to test our hypotheses with BMI as the dependent variable.

Because we aimed to study interactions effects on BMI involving personality traits, gender, body image, and SES, we mean centered the predictors prior to computing specific product terms (Aiken & West, 1991). In the first hierarchical regression, gender and SES were entered in Step 1. BI and all five-personality traits were entered in Step 2. The product terms for the interaction of each trait with BI were entered in Step 3, and those for the interaction of each trait with SES were entered in Step 4. In the second regression analysis gender and SES were entered in Step 1. BI was entered in Step 2. The interaction term for gender and BMI was entered in Step 3 and that for SES and BI was enter in Step 4.

Results

Data Cleaning and Assumption Checks

We had no missing data. No cases were identified as univariate outliers, and no data was removed. Data for all variables met the assumptions for parametric statistical analysis including normal distribution of the errors (residuals), multicollinearity, and homoscedasticity of residuals.

Descriptive Statistics and Correlations

Means, standard deviations and correlations between personality traits, BI, BMI, and SES are presented in Table 1. Personality traits were not correlated with BMI. There was a small-medium positive correlation between gender and agreeableness ($r = .22$, $p < .001$) and a small negative correlation between gender and BMI ($r = -.15$, $p = .02$). BMI was strongly correlated with BI ($r = .51$, $p < .001$). BI was correlated with Openness to experience to a small degree ($r = -.15$, $p = .019$). SES was positively correlated with Openness to experience (r = .24, $p < .001$) and negatively correlated with BMI ($r = -.14$, $p = .027$).

Table 1
Descriptive statistics and correlations

Variables	1	2	3	4	5	6	7	8	9	*Mean*	*SD*
1. Gender	1.00									0.45	0.50
2. BI	-.04	1.00								2.07	0.69
3. Extraversion	.01	-.02	1.00							2.36	0.29
4. Agreeableness	.22***	-.01	.31***	1.00						2.24	0.35
5. Conscientiousness	.09	-.11	.30***	.44***	1.00					2.30	0.32
6. Openness	.04	-.15*	.33***	.41***	.51***	1.00				2.34	0.33
7. Emotional Stability	-.08	-.07	.02	.04	.14*	.08	1.00			1.98	0.34
8. BMI	-.15*	.52***	-.03	-.12	-.07	-.11	-.05	1.00		2.92	0.16
9. SES	.01	.01	.03	.11	.02	.24***	-.08	-.14*	1.00	28.36	12.51

Note. *$p < .05$; **$p < .01$; ***$p < .001$; BI = body image; BMI = Log-transformed body mass index; SES = Socio economic status.

Main Effects and Interactions of Personality Traits and BI on BMI

The results of the first regression analysis are shown in Table 2. Model 1 accounted for about 3% of the variance in BMI. Neither gender nor SES were

significantly associated with BMI, but SES approached statistical significance (B = -.03, p = .164; and B = -.03, p = .053). Model 2 accounted for 30% of the variance in BMI and significantly added to the prediction of the dependent variable (of additional 28%). After controlling for gender and SES, BI and Agreeableness were associated with BMI (B = .12, p < .000; and B = -.08, p = .010). Different from Model 1, SES was negatively associated with BMI (B = -.01, p = .022), whilst gender was still nonsignificant (B = -.01, p = .542), Other personality traits were not associated with BMI; Extraversion (B = .01, p = .754); Conscientiousness (B = .04; p = .312), Emotional Stability (B = .01, p = .897), and Openness to experience (B = .03, p < .295). Model 3 accounted for 34% of the variance in BMI, an increase of 4% over Model 2. In Model 3, BMI was negatively associated with SES (B = -.01, p = .026), positively with BI (B = .12, p < .001), and marginally with Agreeableness in a negative direction (B = -.07, p = .032). Furthermore, the gender–Extraversion interaction was negatively associated with BMI (B = -.19, p = .008). No other interaction was found to be significant. To interpret the interaction effect, we carried out a simple slope analysis and it showed that Extraversion was negatively associated with BMI in girls, while the trend for boys, although slightly increasing, was quite small. Model 4, adding the interactions of personality traits and SES, did not add up to the prediction of BMI (see Table 2)

Table 2

Hierarchical regression analysis for body mass index (BMI) and personality traits and body image (BI)

	Model 1	Model 2	Model 3	Model 4
Variables in the equation	*B/β /t/p*	*B/β /t/p*	*B/β /t/p*	*B/β /t/p*
Gender	-.03/-.10/-1.40/ns	-.01/-.04/-.61/ns	-.01/-.04/-.70/.490	-.01/-.03/-.51/ns
SES	.00/-.14/-1.94/*	.00/-.15/-2.32/*	.00/-.14/-2.24/*	.00/-.14/-2.11/*
BI		.12/.52/8.49/***	.12/.54/8.84/***	.11/.51/8.17/***
Extraversion		.01/.02/.31/ns	.00/-.01/-.12/.900	.01/.02/.36/ns
Agreeableness		-.08/-.18/-2.59/*	-.07/-.16/-2.16/*	-.08/-.18/-2.41/*
Conscientiousness		.04/.07/1.01/ns	.05/.11/1.46/ns	.04/.08/1.04/ns
Emotional Stability		.00/.01/.13/ns	.01/.01/.23/ns	.00/-.01/-.09/ns
Openness		.03/.08/1.05/ns	.03/.07/.87/ns	.02/.06/.67/ns
Gender × Extraversion			-.19/-.18/-2.67/**	
Gender × Agreeableness			.09/.10/1.39/ns	
Gender × Conscientiousness			.01/.01/.08/ns	
Gender × Openness			.04/.04/1.19/ns	
Gender × Emotional Stability			.07/.09/.62/ns	
SES × Extraversion				.00/-.09/-1.25/ns
SES × Agreeableness				.00/-.04/-.56/ns
SES × Conscientiousness				.00/-.02/-.31/ns
SES × Openness				.00/.01/.11/ns
SES × Emotional Stability				.00/.05/.54/ns
SES × Emotional Stability				.00/.05/.54/ns
R^2	.03*	.29***	.33	.30
F for R^2 Change	3.27	12.10	1.81	.48

Note. †p ≤.10; *p ≤ .05; **p ≤ .01; ***p ≤ .001; BI = body image; BMI = Log-transformed body mass index; SES = socio economic status; ns = not significant.
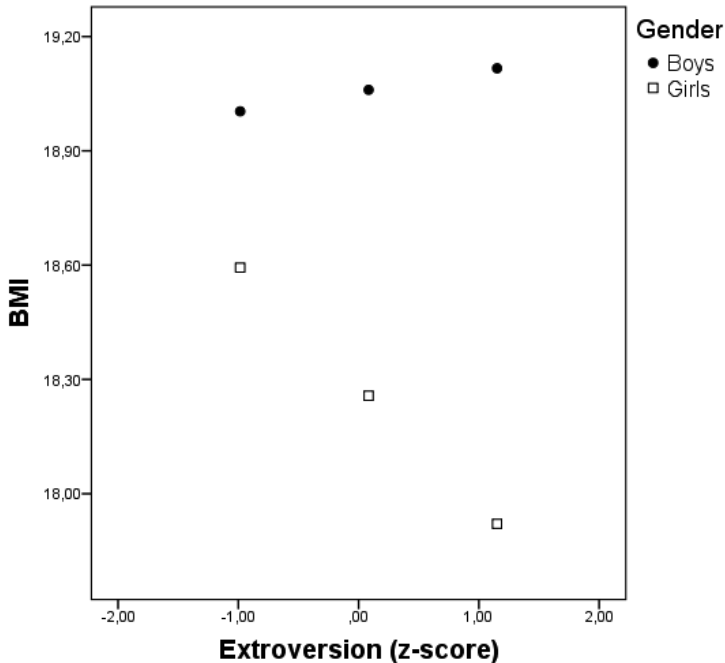
Figure 1. Gender as a function of extraversion and BMI.
Note. BMI = Body mass index.

Results of the second regression analysis are shown in Table 3. Model 1 accounted for 3% of the variance in BMI and there was a marginal negative association between gender and SES with BMI ($B = -.04$, $p = .086$; and $B = -.01$, $p = .109$, respectively). Model 2 accounted for 28% of the variance in BMI, an increase of 25% over Model 1. In Model 2, BI was significantly associated with BMI ($B = .11$, $p < .001$). SES was also associated with BMI ($B = -.01$, $p = .049$). In this Model, gender was not associated with BMI ($B = -.25$, $p = .181$). Model 3 accounted for 28% of the variance in BMI, providing no increase over Model 2. As in Model 2, the associations of both BI and SES with BMI remained statistically significant ($B = .11$, $p < .001$; and $B = -.01$, $p = .048$, respectively). Furthermore, gender was not associated to BMI ($B = -.02$, $p = .179$). Gender did not moderate the association between BI and BMI ($B = -.02$, $p = .526$), whilst BI-SES interaction approached conventional levels of statistical significance ($B = .02$, $p = .092$).

Table 3
Hierarchical regression analysis for body mass index (BMI) and body image (BI)

	Model 1	Model 2	Model 3	Model 4
Variables in the equation	*B/β /t/p*	*B/β /t/p*	*B/β /t/p*	*B/β /t/p*
Gender	-.04/-.12/-1.73/†	-.03/-.08/-1.34/ns	-.03/-.08/-1.35/ns	-.02/-.08/-1.30/ns
SES	-.01/-.11/-1.61/ns	-.01/-.12/-1.98/*	-.01/-.12/-1.99/*	-.01/-.12/-1.96/†
BI		.11/.50/8.45/***	.11/.51/8.47/***	.12/.51/8.60/***
BI x Gender			-.01/-.04/-0.64/ns	
BI x SES				.02/.10/1.69/†
R^2	.03	.28	.28	.29
F for R^2 Change	2.84†	71.46***	.40	2.86†

Note. †$Pp \leq .10$; *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$; BI = body image; BMI – Log-transformed body mass index; SES = Socio Economic Status; ns = not significant.

Discussion

This study investigated the associations between BMI and personality traits, taking into account BI, gender and SES in a sample of Italian pre-adolescents. Body image was the variable most strongly associated with BMI. In particular, the more preadolescents viewed their body as fat, the greater their BMI was. This was also previously reported (Ahadzadeh et al., 2018; Kaminsky & Dewey, 2014; Kantanista et al., 2017). Controlling for BI, SES, and gender, Agreeableness was associated with lower BMI, whilst Extraversion was related to lower BMI in girls, only. These findings are different from previous studies carried out in older or younger age groups. Previous research indicated that Conscientiousness was a negative predictor of BMI (Cheng & Furnham, 2013; Jokela et al., 2013; Kern & Friedman, 2008), while the role of other personality characteristics was mixed, age-related, and perhaps gender specific (i.e., Chapman et al., 2009; Terraciano et al., 2009). In keeping with this literature, we showed that during the preadolescence, Agreeableness and Extraversion, but not Conscientiousness, played a significant role. While one could expect that Conscientiousness could be less relevant to BMI at this age, because the level of this trait is extremely low in children (e.g., Soto et al., 2011), a somewhat unexpected finding was the relationship between BMI and Agreeableness.

This finding suggests that the more boys and girls were friendly, prosocial, and considerate toward others, the lower their risk of being overweight. Studies describing Agreeableness as one of the strongest protective factors during the delicate transition from childhood to adolescence seem to support this interpretation. Being friendly and considerate toward peers supports the development of informal networking (Jensen-Campbell et al., 2002; Selden, & Goodie, 2018) and promotes self-regulation skills associated with weight-related factors in preadolescence of in both boys and girls (Graziano, Kelleher, Calkins, Keane, & Brien, 2013; McCarthy, Wood, & Holmes, 2017). Conversely, low Agreeableness is associated with the externalization of problems and risk behaviors (Pandolfi, 2010).

Contrary to our prediction, we did not find an association between Extraversion and BMI; a significant relationship emerged when gender was included in the analysis as a moderator. Indeed, the association of Extraversion with body weight was different in boys and girls. It appears that girls who were more extraverted and active were also at lower risk of being overweight, whilst this relationship was not supported for boys. Thus, our findings are against the literature concerning adolescents but are in line with the study by Vollrath and colleagues (2012), which explored a sample of children and preadolescents where low Extroversion girls were high in overweight or obesity.

Concerning the third hypothesis, our study confirmed the relationship between SES and BMI, also during preadolescence. Italian pre-teens from families with higher SES were less overweight or obese. This finding agrees with the literature on SES and BMI (e.g., Bona, Prodram, & Ricotti, 2015; Morgen et al., 2013; Schooling et al., 2010; Wabitsch et al., 2014).

We found that BI was positively associated with BMI. Boys and girls who believed they were fat were more likely to have a high BMI than children who believed they were thin or normal weight. However, gender was not a moderator of this relationship. We found a close association between BI and BMI, but only in girls. This finding is consistent with the vast literature on gender differences, reporting a greater concern for body image and dissatisfaction with their body among girls and women (Biolcati et al., 2017; Grossbard, Neighbors, & Larimer, 2011; Paap & Gardner, 2011; Runfola et al., 2013).

This study has some noteworthy limitations. First, the cross-sectional design and a relatively small convenience sample precluded any causal interpretation and limited the generalizability of our conclusions to larger and more representative samples. Another noteworthy limitation was the use of a single-item to assess individual differences in BI. Longitudinal research with larger samples and multi-item instruments should be used to confirm our findings. The replication of this study with larger samples and the use of other tools for the study of different weight categories (such as eating habits, sport activities, emotional eating) may reduce the bias associated with using BMI as an indicator of the risk of obesity and overweight (Klaczynski et al., 2004). Furthermore, a clinical approach (Langher, Caputo, & Martino, 2017) could contribute to clarify the possible role of emotional dimensions in the relation between BMI and BI.

Conclusions

Our study shows that traits associated with body weight during pre-adolescence are different from those that are most consistently associated with body weight in adults and teenagers.

Personality traits, seemingly unrelated to BMI in correlation analyses, like Agreeableness and Extraversion, were related to BMI during pre-adolescence. The current study sought to fill a gap in existing literature by exploring the effect of personality traits on BMI, controlling for potentially confounding factors. Given the exploratory nature of the study, a firm conclusion cannot be drawn

based on these data only. However, if confirmed in future studies, our findings draw attention to strategies needed to address overweight and obesity later in life through early intervention in schoolchildren.

Therefore, any intervention aimed to prevent overweight and obesity starting at school age, should consider the interplay of these factor with personality. Beyond prioritizing low SES children, young girls, and preadolescents dissatisfied with their bodies, school-programs, and health-promoting interventions should consider increasing children competences that might help them to be friendly, pro-social, and respectful of others and the rules, along with offering guidance on diets and physical activity.

Future research should also focus on contextual factors, which may moderate or mediate bidirectional associations involving BMI, BI, body satisfaction, personality traits, physical activity and eating habits, using multilevel data and comparing samples at different stages of adolescence.

References

Ahrens, W., Pigeot, I., Pohlabeln, H., De Henauw, S., Lissner, L., Molnár, D., Moreno, L. A., ... & Siani, A. (2014). Prevalence of overweight and obesity in European children below the age of 10. *International Journal of Obesity*, *38*(2), 99–107. doi:10.1038/ijo.2014.140

Aiken, L. S., & West, S. G. (1991). *Multiple regressions: Testing and interpreting interactions.* Thousand Oaks: Sage Publications.

Alebachew, F., & Ashagrie, M. (2017). The Body-Image concept analysis of youth and adolescent. *American Journal of Biomedical and Life Sciences*, *5*(6), 130–134. doi:10.11648/j.ajbls.20170506.14

Ahadzadeh, A. S., Rafik-Galea, S., & Alavi, M., Amini, M. (2018). Relationship between body mass index, body image, and fear of negative evaluation: Moderating role of self-esteem. *Health Psychology Open*, *5*(1), 1–8. doi:10.1177/2055102918774251

Barbaranelli, C., Caprara, G. V., & Rabasca, A. (1998). *Manuale del BFQ-C. Big Five Questionnaire for Children*. Firenze: O. S. Organizzazioni Speciali, Firenze.

Behdarvandi, M., Azarbarzin, M., & Baraz, S. (2017). Comparison of Body Image and its relationship with Body Mass Index (BMI) in high school students of Ahvaz, Iran. *International Journal of Pediatrics*, *5*(2), 4353–4360. doi:10.22038/ijp.2016.7627

Bhuiyan, A. R., Gustat, J., Srinivasan, S. R., & Berenson, G. S. (2003). Differences in body shape representations among young adults from a bi-racial (Black-White), semi-rural community. *American Journal of Epidemiology*, *158*(8), 792–797.

Biolcati, R., Ghigi, R., Mameli, C., & Passini, S. (2017). What can I do with my body? Boys and girls facing body. *Dissatisfaction International Journal of Adolescence and Youth*, *22*, 283–295. doi:10.1080/02671522.2016.1167748

Brummett, B. H., Babyak, M. A., Williams, R. B., Barefoot, J. C., Costa, P. T., & Siegler, I. C. (2006). NEO personality domains and gender predict levels and trends in body mass index over 14 years during midlife. *Journal of Research in Personality, 40*, 222–236. doi:10.1016/j.jrp.2004.12.002

Cacciari, E., Milani, S., Balsamo, A., Spada, E., Bona, G., Cavallo, L., ... & Cicognani, A. (2006). Italian cross-sectional growth charts for height, weight and BMI (2 to 20 yr). *Journal of Endocrinological Investigation*, *29*(7), 581–93.

Cheng, H., & Furnham, A. (2013). Personality traits, education, physical exercise, and childhood neurological function as independent predictors of adult obesity. *PLOS ONE*, *8*(11), e79586. doi.org/10.1371/journal.pone.0079586

Chapman, B. P., Fiscella, K., Duberstein, P., Coletta, M., Kawachi, I. (2009). Can the influence of childhood socioeconomic status on men's and women's adult body mass be explained by adult socioeconomic status or personality? Findings from a national sample. *Health Psychology, 28,* 419–427. doi:10.1037/a0015212

Cinelli, R. L., & O'Dea, J. A. (2009). Body image and obesity among Australian adolescents from indigenous and Anglo-European backgrounds: Implications for health promotion and obesity prevention among Aboriginal youth. *Health Education Research*, *24*, 1059–1068. doi:10.1093/her/cyp040

Cuzzocrea, F., & Costa, S. (2017). Multidimensional preventive intervention on eating disorders and obesity in the life cycle-how to guarantee an adequate quality of life. *Epidemiology* (Sunnyvale) *7*, 121. doi:10.4172/2161-1165.1000e121

Cuzzocrea, F., Costa, S., Larcan, R., & Rosano, M. (2013). Are personality and eating behaviors equally related in no clinical males and females adolescents? *International Journal of Advances in Psychology*, *2*(3), 166–171. pISSN: 2169-494X – eISSN: 2169-4958

Dion, J., Hains, J., Vachon, P., Plouffe, J., Laberge, L., Perron, M., ... & Leone, M. (2016). Correlates of body dissatisfaction in children. *The Journal of Pediatrics*, *171*, 202–207. doi: 10.1016/j.jpeds.2015.12.045.

Duchin, O., Marin, C., Mora-Plazas, M., de Leon, C. M., Lee, J. M., Baylin, A., & Villamor, E. (2015). A prospective study of body image dissatisfaction and BMI change in school-age children. *Public Health Nutrition*, *18*(2), 322–328. doi:10.1017/S1368980014000366

Eisenberg, M.E., Neumark-Sztainer, D., & Paxton, S .J. (2006). Five-year change in body satisfaction among adolescents. *Journal of psychosomatic research*, *61*(4), 521–527. doi:10.1016/j.jpsychores.2006.05.007

Elgar, F. J., Roberts, C., Tudor-Smith, C., & Moore, L. (2005).Validity of self-reported height and weight and predictors of bias in adolescents. *The Journal of Adolescent Health, 37*, 371–375. doi:10.1016/j.jadohealth.2004.07.014

El-Sayed, A. M., & Galea, S. (2011). Maternal immigrant status and high birth weight: Implication for childhood obesity. *Ethnicity & Disease*, *21*(1)*,* 47–51.

Fiske, L., Fallon, E. A., Blissmer, B., & Redding, C.A. (2014). Prevalence of body dissatisfaction among United States adults: Review and recommendations for future research. *Eating Behaviors*, *15*(3), 357–365. doi:10.1016/j.eatbeh.2014.04.010

Graziano, P. A., Kelleher, R., Calkins, S. D., Keane, S. P., & Brien, M. O. (2013). Predicting weight outcomes in preadolescence: The role of toddlers' self-regulation skills and the temperament dimension of pleasure. *International Journal of Obesity*, *37*(7), 937. doi:10.1038/ijo.2012.165.

Grogan, S. (2008). *Body image understanding body dissatisfaction in men, women, and children*. East Sussex: Routledge

Grossbard, J. R., Neighbors, C., & Larimer, M. E. (2011). Perceived norms for thinness and muscularity among college students: What do men and women really want?. *Eating behaviors*, *12*(3), 192–199. doi:10.1016/j.eatbeh.2011.04.005.

Hampson, S. E., Goldberg, L. R., Vogt, T. M., & Dubanoski, J. P. (2007). Mechanisms by which childhood personality traits influence adult health status: Educational attainment and healthy behaviors. *Health psychology: Official journal of the Division of Health Psychology, American Psychological Association*, *26*(1), 121–125. doi:10.1037/0278-6133.26.1.121

Hollingshead, A. B., & Redlich, F. C. (1958). *Social class and mental illness: Community study*. Hoboken, NJ, US: John Wiley & Sons Inc.

Jensen-Campbell, L. A., Adams, R., Perry, D. G., Workman, K. A., Furdella, J. Q., & Egan, S. K. (2002). Agreeableness, extraversion, and peer relations in early adolescence: Winning friends and deflecting aggression. *Journal of Research in Personality*, *36*(3), 224–251.

Jokela, M., Hintsanen, M., Hakulinen, C., Batty, G. D., Nabi, H., Singh-Manoux, A., & Kivimäki, M. (2013). Association of personality with the development and persistence of obesity: a meta-analysis based on individual-participant data. *Obesity Reviews*, *14*(4), 315–323. doi: 10.1111/obr.12007

Kaminsky L. A., & Dewey D. (2014) The association between body mass index and physical activity, and body image, self esteem and social support in adolescents with type 1 diabetes. *Canadian Journal of Diabetes 38*(4), 244–249. doi:10.1016/j.jcjd.2014.04.005

Kantanista, A., Król-Zielińska, M., Borowiec, J., & Osiński, W. (2017). Is Underweight Associated with more Positive Body Image? Results of a Cross-Sectional Study in Adolescent Girls and Boys. *The Spanish Journal of Psychology, 20*, E8. doi:10.1017/sjp.2017.4

Kern, M. L., & Friedman, H. S. (2008). Do conscientious individuals live longer? A quantitative review. *Health psychology*, *27*(5), 505. doi:10.1037/0278-6133.27.5.505

Klaczynski, P. A., Goold, K. W., & Mudry, J. J. (2004). Culture, obesity stereotypes, self-esteem, and the "thin ideal": A social identity perspective. *Journal of Youth and Adolescence*, *33*, 307–317. doi:10.1023/B:JOYO.0000032639.71472.19

Lambert, M., Delvin, E. E., Levy, E., O'Loughlin, J., Paradis, G., Barnett, T., & McGrath, J. J. (2008). Prevalence of cardiometabolic risk factors by weight status in a population-based sample of Quebec children and adolescents. *Canadian Journal of Cardiology*, *24*(7), 575–583. doi:10.1016/S0828-282X(08)70639-1

Langher, V., Caputo, A., & Martino, G. (2017). What happened to the clinical approach to case study in psychological research? A clinical psychological analysis of scientific articles in high impact-factor journals. *Mediterranean Journal of Clinical Psychology 5*(3), 1–16. doi:10.6092/2282-1619/2017.5.1670

Lee, K. S., & Vaillancourt, T. (2018). Developmental pathways between peer victimization, psychological functioning, disordered eating behavior, and body mass index: A review and theoretical model. *Aggression an Violent Behavior*, *39*, 15–24. doi:10.1016/j.avb.2018.01.004

Loureiro, M. L., Nayga, R. M. Jr. (2006). Obesity, weight loss, and physician's advice. *Social Science & Medicine 62*(10), 2458–68. doi:10.1016/j.socscimed.2005.11.011

Lunde, C., Frisén, A., & Hwang, C. P. (2007). Ten-year-old girls' and boys' body composition and peer victimization experiences: Prospective associations with body satisfaction. *Body Image*, *4*, 11–28. doi:10.1016/j.bodyim.2006.10.002

Mäkinen, M., Puukko-Viertomies, L. R., Lindberg, N., Siimes, M. A., Aalberg, V. (2012). Body dissatisfaction and body mass in girls and boys transitioning from early to mid-adolescence: Additional role of self-esteem and eating habits. *BMC Psychiatry*, *12*, 35. doi:10.1186/1471-244X-12-35

Marsh, H. W., Hau, K. T., Sung, R. Y. T., & Yu, C. W. (2007). Childhood obesity, gender, actual-ideal body image discrepancies, and physical self-concept in Hong Kong children: Cultural differences in the value of moderation. *Developmental Psychology, 43*, 647–662. doi:10.1037/0012-1649.43.3.647

McCarthy, M. H., Wood, J. V., & Holmes, J. G. (2017). Dispositional pathways to trust: Self-esteem and agreeableness interact to predict trust and negative emotional disclosure. *Journal of Personality and Social Psychology, 113*(1), 95–116. doi:10.1037/pspi0000093

Morgen, C. S., Rokholm, B., Brixval, C. S., Andersen, C. S., Andersen, L. G., Rasmussen, M., ... & Sørensen, T. I. (2013). Trends in prevalence of overweight and obesity in Danish infants, children and adolescents – Are we still on a plateau?. *Plos One*, *8*(7), e69860. doi: 10.1371/journal.pone.0069860

O'Dea, J. A., & Wilson, R. (2006). Socio-cognitive and nutritional factors associated with body mass index in children and adolescents: Possibilities for childhood obesity prevention. *Health Education Research*, *21*, 796–805. doi:10.1093/her/cyl125

OKkio alla SALUTE (2016). *Sistema di indagini sui rischi comportamentali in età 6-17 anni* [*System of surveys on behavioral risks for age 6–17 year*s]. Available from https://www.epicentro.iss.it/okkioallasalute/

Paap, C. E., & Gardner, R. M. (2011). Body image disturbance and relationship satisfaction among college student. *Personality and Individual Differences*, *51*, 715–719. doi: 10.1016/j.paid.2011.06.019

Pandolfi, E. (2010). I disturbi esternalizzanti nell'infanzia: Fattori di rischio e traiettorie di sviluppo [Externalizing disorders in childhood: Risk factors and developmental trajectories]. *Psicoterapeuti in Formazione*, *6*, 50–69.

Pont, S. J., Puhl, R., Cook, S. R., & Slusser, W. (2017). Stigma experienced by children and adolescents with obesity. *Pediatrics*, e20173034. doi:10.1542/peds.2017-3034

Runfola, C. D., Von Holle, A., Trace, S. E., Brownley, K. A., Hofmeier, S. M., Gagne, D. A., & Bulik, C. M. (2013). Body dissatisfaction in women across the lifespan: Results of the UNCSELF and gender and body image (GABI) studies. *European Eating Disorders Review*, *21*(1), 52–59. doi: 10.1002/erv.2201. Epub 2012 Sep 5

Schooling, C. M., Yau, C., Cowling, B. J., Lam, T. H., & Leung, G. M. (2010). Socio-economic disparities of childhood body mass index in a newly developed population: Evidence from Hong Kong's 'Children of 1997' birth cohort. *Archives of Disease in Childhood, 95*(6), 437–443. doi:10.1136/adc.2009.168542

Schwartz, M. B., & Brownell, K. D. (2004). Obesity and body image. *Body Image*, *1*, 43–56.

Selden, M., & Goodie, A. S. (2018). Review of the effects of five factor model personality traits on network structures and perceptions of structure. *Social Networks*, *52*, 81–99. doi:10.1016/j.socnet.2017.05.007

Simmonds M., Llewellyn A., Owen C. G., Woolacott N. (2018) Predicting adult obesity from childhood obesity: a systematic review and meta-analysis. *Obesity Reviews, 17*, 95–107. doi: 10.1111/obr.12334

Soto, C. J., John, O. P., Gosling, S. D., & Potter, J. (2011). Age differences in personality traits from 10 to 65: Big five domains and facets in a large cross-sectional sample. *Journal of Personality and Social Psychology*, *100*, 330–348. doi:10.1037/a0021717

Sutin, A. R., & Terracciano, A. (2014). Five-Factor Model Personality Traits and the Objective and Subjective Experience of Body Weight. *Journal of Personality*, *84*(1), 102–112. doi:10.1111/jopy.12143

Sutin, A. R., & Terracciano, A. (2016a). Personality traits and body mass index: modifiers and mechanisms. *Psychology & Health*, *31*(3), 259–275. doi:10.1080/08870446.2015.1082561

Sutin, A. R., & Terracciano, A. (2016b). Five-factor model personality traits and the objective and subjective experience of body weight. *Journal of Personality*, *84*(1), 102–112. doi: 10.1111/jopy.12143.

Sutin, A. R., Ferrucci, L., Zonderman, A.B., & Terracciano, A. (2011). Personality and obesity across the adult life span. *Journal of Personality and Social Psychology*, *101*, 579–592. doi:10.1037/a0024286

Terracciano, A., Sutin, A. R., McCrae, R. R., Deiana, B., Ferrucci, L., Schlessinger, D., & Costa, P.T.Jr. (2009). Facets of personality linked to underweight and overweight. *Psychosomatic Medicine*, *71*, 682–689. doi:10.1097/PSY.0b013e3181a2925b

Voelker, D. K., Reel, J. J., & Greenleaf, C. (2015). Weight status and body image perceptions in adolescents: current perspectives. *Adolescent health, medicine and therapeutics*, *6*, 149–158. doi:10.2147/AHMT.S68344

Vollrath, M. E., Hampson, S. E., & Júlíusson, P. B. (2012). Children and eating. Personality and gender are associated with obesogenic food consumption and overweight in 6– to 12-year-olds. *Appetite*, *58*(3), 1113–1117. doi:10.1016/j.appet.2012.02.056

Wabitsch, M., Moss, A., & Kromeyer-Hauschild, K. (2014). Unexpected plateauing of childhood obesity rates in developed countries. *BMC medicine*, *12*(1), 17. doi:10.1186/1741-7015-12-17

Wertheim, E. H., Koerner, J., & Paxton, S. J. (2001). Longitudinal predictors of restrictive eating and bulimic tendencies in three different age groups of adolescent girls. *Journal of Youth and Adolescence*, *30*(1), 69–81.

Wong, L. M., & Say, Y. H. (2013). Gender differences in body image perception among northern Malaysian tertiary students. *British Journal of Medicine and Medical Research, 3*, 727–747. doi:10.9734/BJMMR/2013/3069

World Health Organizzation – WHO (2018). Obesity and Overweigth. http://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight

Indeks telesne mase, osobine ličnosti i slika tela kod italijanskih predadolescenata: mogućnost za prevenciju prekomerne težine

Veronica Rosa[1], Manuela Tomai[1], Marco Lauriola[2],
Gabriella Martino[3], and Michela di Trani[1]

[1]Department of Dynamic and Clinical Psychology, Sapienza, Rome, Italy
[2]Department of Psychology of Development and Socialization Processes,
Sapienza, Rome, Italy
[3]Department of Clinical and Experimental Medicine,
University of Messina, Messina, Italy

Istraživali smo povezanost između indeksa telesne mase (eng. body mass index; BMI), osobina ličnosti, socioekonomskog statusa i slike tela na početku predadolescencije. Podaci su prikupljeni od 238 italijanske dece uzrasta od 10–11 godina pomoću skala samoprocene. Infomacije o socioekonomskom statusu su zasnovane na obrazovanju roditelja i profesionalnom statusu. Slika tela je varijabla koja je naviše povezana sa BMI. Kada je kontrolisan efekat slike tela, socioekonomskog statusa i pola, utvrđeno je da je Prijatnost negativno povezna sa BMI, dok je Ekstraverzija povezana sa BMI samo kod devojčica. Pol se nije pokazao kao moderator odnosa između slike tela i BMI na ovom uzrastu. Povezanost određenih karakterstika ličnosti sa BMI je nešto što će se verovatno pojaviti tokom predadolescencije. U ranim intervencijama za prevenciju prekomerne težine bi se mogli uzeti u obzir međusobni odnosi prijatnosti i ekstraverzije sa polom, slikom tela i socioekonomskim statusom.

Ključne reči: Indeks telesne mase, Velikih pet, Slika tela, socioekonomski status, predadolescent, polne razlike