

Key Variables in the Development of Eating Disorders During the Adolescence: Implications for Sex Differences

Pilar Ramos¹, Francisco Rivera² and Carmen Moreno¹

¹University of Seville, Department of Developmental and Educational Psychology,

²University of Huelva, Department of Clinical, Experimental and Social Psychology,
Spain

1. Introduction

Eating disorders such as anorexia or bulimia are associated with unsuitable behavior, cognition and emotions, which could have negative consequences for a person's well-being and health. These risks frequently appear during adolescence, as this developmental stage is characterized by physiological, emotional, cognitive, and above all, social changes that lead to a greater concern for physical appearances. The propensity of adolescents to be unhappy with their body image has been stated in many studies, in which case, the adolescent can go so far as to create distorted perceptions of his/her own body. In short, this population shows major discrepancy between the subjective measurements of their body shape (contributed by the subjects) and the real measurements assessed with objective methods, this leading to a larger proportion of eating disorders (Conley & Boardman, 2007; Gardner, 1996; Martin & Gentry, 1997). Perceiving oneself as «obese» when this is not the case indicates a cognitive problem that can be explained by learning imposed by social and cultural pressures. Thus, the self-perception of one's body becomes a decisive factor for the development of an eating disorder, which is, in turn, more important than body weight itself (Barker & Galambos, 2003; Bessenoff & Snow, 2006; Cash & Deagle, 1997).

The most common behavior that follows this body dissatisfaction is to go on some type weight-loss diet. Most diets reduce the daily energy intake below the recommended quantities. If, in addition to the above, there is a lack of medical surveillance that usually accompanies such diets, it is easy to understand the serious, health-related danger linked to this type of diet (Eisenberg et al., 2005; Larson et al., 2009; Neumark-Sztainer et al., 2007). One system young people erroneously use to control their weight is to skip breakfast (Cho et al., 2003; Niemeier et al., 2006; Timlin et al., 2008), a practice that is somewhat more usual than skipping lunch or supper (Woodruff et al., 2008). In fact, excluding breakfast or having an inadequate or insufficient breakfast is a relatively frequent eating habit among adolescents (Alexy et al., 2010; Woodruff et al., 2008).

Although several studies have demonstrated the relationship existent among the Body Mass Index (BMI), body image and weight control during adolescence, this has not been performed systematically with regards to the differences between boys and girls. Some

authors state that the concern for body image differs depending on the gender; that is to say, while boys are concerned with having a muscular body image, girls have beauty ideals that are inseparable from thinness, in most cases below a healthy size (Barker & Galambos, 2003; Espinoza et al., 2010; McArthur et al., 2005; Neumark-Sztainer et al., 1999).

Concretely, although girls have a more correct BMI than boys, girls show greater prevalence when it comes to suffering misperceptions of their body image and this creates a greater number of behaviors dedicated to control their weight (Ivarsson et al., 2006; Larson et al., 2009; Ramos, Rivera et al., 2010). For example, the percentage of adolescents who skip breakfast is higher among girls than among boys; that percentage, in many studies, is more than double (Mullie et al., 2006; Rampersaud et al., 2005; Vereecken et al., 2009; Woodruff et al., 2008; Wu et al., 2006).

Therefore, considering that the BMI represents the physiological aspect of body changes during adolescence, the perception of one's body image represents the cognitive component, the satisfaction with this image corresponds to the emotional component and the behavior of dieting, together with skipping breakfast, is the behavioral component. This work seeks to learn how these components interrelate differently in adolescent boys and girls. In addition to learning the systemic relationship among those four components, this work seeks to learn how these variables interact, with a score for the young people's bio-psycho-social adjustment, and also differentiating between boys and girls (see Figure 1).

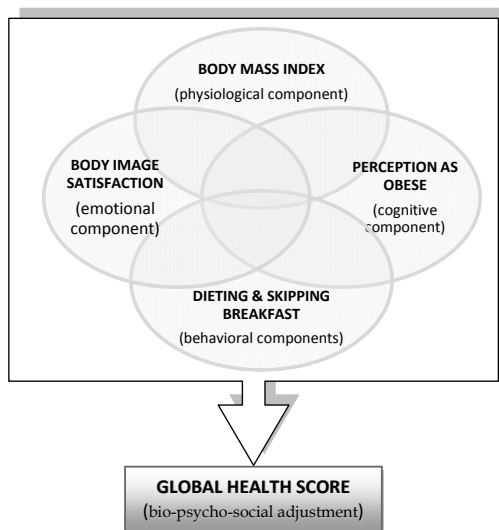


Fig. 1. General approach of the model presented in this study.

2. Method

2.1 Participants

This paper is classified within the 2006 edition of the international study, *Health Behaviour in School-aged Children* (HBSC). The participants in this study are a representative sample of the adolescent population in Spain. The same was selected with a random multi-stage sampling,

stratified by conglomerates, bearing in mind -in addition to the age of the adolescents- the geographical area (region of the country), habitat (rural and urban) and type of education centre (public or private). The resulting sample from this selection process was made up of a total of 6945 Spanish adolescents. Table 1 describes the details of this sample.

	13-14 años		15-16 años		17-18 años		Total	
	N	%	N	%	N	%	N	%
Boys	1212	17.5%	1260	18.1%	876	12.6%	3348	48.2%
Girls	1341	19.3%	1430	20.6%	826	11.9%	3597	51.8%
Total	2553	36.8%	2690	38.7%	1702	24.5%	6945	100.0%

Table 1. Sample description by sex and age.

2.2 Measures

The HBSC questionnaire collects information about the adolescents based upon various topics related to their lifestyles, their positive health and the contexts in which they grow up. Given the detailed information provided, the following paragraphs only cite references to papers that validate the instruments used in this work.

The *Body Mass Index* (BMI) was used, calculating the formula $\text{weight}/\text{height}^2$. To understand the body image of the adolescents, the two items described below were used. Firstly, participants were asked about their *perception of body image*, a measurement created by the international HBSC protocol, with five possible answer options (too thin / a little thin / I am an appropriate size / a little fat / too fat). For this study, this measurement was used as a quantitative, 5-point scale, ordering the answer values from too thin to too fat so that the measurement indicated the degree of perceived obesity. Secondly, the subjects were asked about their *satisfaction with their body image*, for which the sub-scale of feelings and attitudes toward one's body, belonging to the *Body Investment Scale*, was used (Orbach & Mikulincer, 1998). This sub-scale is made up of 6 items (I feel frustrated with my physical appearance / I am satisfied with my appearance / I hate my body / I feel comfortable with my body / I reject my body / I like my appearance despite my defects), with 5 answer options, ranging from 1 - very much disagree - to 5 - very much agree. The sub-scale presented a Cronbach alpha in this sample of .88. On the other hand, to explore the behavior of dieting, a measurement was used that was created by the international HBSC protocol. With this measurement, the adolescents were asked whether, at that moment, they were on any type of diet or doing anything to lose weight. Also, they were asked how many days of the week they had more than a glass of milk or a piece of fruit for breakfast, with a possible response ranging from 0 to 7 days a week.

As an indicator of the bio-psycho-social health level of the adolescents, the *Global Health Score* (GHS) was used. This measurement was created from 20 items related to life satisfaction, perception of health, quality of life related to health and psychosomatic problems. This is a typified score that has good reliability and validity criteria (Ramos, Moreno et al., 2010). This score assesses the physical, psychological and social state of the adolescents, following the most broadly accepted definition of health at the moment; in other words, the definition outlined by the World Health Organization (WHO, 1948).

2.3 Procedure

The international coordination of the HBSC study indicates that there are three basic conditions that must be complied with during the data collection procedure. Firstly, it must be the students themselves who respond to the questionnaire; secondly, the anonymity of the answers must be strictly guaranteed and, lastly, the administration of the questionnaires must be carried out within the school context.

In those geographical areas where there was more than one official language, a bilingual questionnaire was used. The questions in one of the two official languages was on one side of the questionnaire and translated into the other language on the other side, so that each student could freely choose the language they felt more comfortable with to complete the questionnaire.

Using the aforementioned measurements (BMI, perception of obesity, satisfaction with body image, dieting, skipping breakfast and GHS) two structural equation models were performed; one for boys and the other for girls. To perform these models, the statistical program EQS 6.1 was used. The parameters were obtained by means of the Maximum Verisimilitude method and the scores were provided using the regression system. The FIT coefficient taken into consideration to evaluate the accuracy of the measuring model was: χ^2 (chi-square). Being that to evaluate the adjustment, the chi-square test alone should not be used because it is affected by the sample size, the following relative adjustment indicators were calculated: Root Mean-Square Error of Approximation (RMSEA), Bentler-Bonett Non-Normed Fit Index (BBNNFI) and incremental indexes (CFI, IFI and MFI). These accuracy adjustment indexes are considered acceptable when the incremental indexes (CFI, IFI and MFI) are greater than .85 (ideally above .90), the BBNNFI is between .90 and .95 (ideally above .95) and the error indexes (RMSEA) are less than .08 (ideally below .05).

Prior to showing the result of the structural equation models, the relationship between the various variables included in the models was assessed, differentiating boys and girls (using the statistical program SPSS 15.0). To understand the relationship between the quantitative variables (BMI, perception of obesity, satisfaction with body image, skipping breakfast and GHS), the Pearson correlation was used. To understand the relationship between the quantitative variables and the categorical variable (dieting) the chi-square test was used as a statistical significance test, while the *phi* coefficient was used to assess the effect size, with the following intervals: from 0 to .09, insignificant; from .10 to .29, low effect size; from .30 to .49, medium effect size; and over .50, large effect size.

3. Results

Table 2 shows the comparison of measurements between boys and girls for the different scale variables included in the study. Specifically, were obtained statistically significant differences and low effect sizes (between 0.22 and 0.44) for all of the variables analyzed. It was observed that girls have lower GHS, smaller BMI, perceive themselves as fatter, are less satisfied with their body image and skip breakfast more often.

With regards to dieting behavior, while 18.4% of the girls diet to lose weight, for boys, it was only 9.8%: $\chi^2(1, N = 6917) = 105.33, p < .001, \Phi = .12$.

		<i>N</i>	<i>M</i>	<i>SD</i>	<i>Sig.</i>	<i>d'</i> <i>Cohen</i>
Global Health Score	Boys	3348	0.04	0.78	<.001	0.37
	Girls	3597	-0.25	0.78		
Body Mass Index	Boys	3348	21.18	3.41	<.001	0.23
	Girls	3597	20.44	3.10		
Perception of body as obese	Boys	3348	2.06	0.76	<.001	-0.34
	Girls	3597	2.33	0.79		
Satisfaction with body image	Boys	3348	3.03	0.83	<.001	0.44
	Girls	3597	2.64	0.92		
Skipping breakfast	Boys	3348	1.58	2.15	<.001	-0.22
	Girls	3597	2.07	2.33		

Table 2. Comparison of measurements between boys and girls for the different scale variables.

On the other hand, Table 3 shows the Pearson correlation between the different quantitative variables. This table shows that all the variables correlate with each other, in which case, the correlation coefficients equal or greater than 0.10. Moreover, the size of the correlations indicates interesting sex differences. For example, the correlation between the GHS and perceiving one’s body image as obese is more than twice as high for girls ($r = .26$) than for boys ($r = .12$). Furthermore, the correlation between the perception of obesity and satisfaction with one’s body image is twice as high for girls ($r = .50$) when compared to boys ($r = .25$). Lastly, the correlation between the GHS and skipping breakfast is greater for girls ($r = .23$) than for boys ($r = .18$).

		I	II	III	IV	V
Boys	I. Global Health Score	-				
	II. Body Mass Index	-.15	-			
	III. Perception of body as obese	-.12	.50	-		
	IV. Satisfaction with body image	.43	-.23	-.25	-	
	V. Skipping breakfast	-.18	.11	.11	-.16	-
Girls	I. Global Health Score	-				
	II. Body Mass Index	-.18	-			
	III. Perception of body as obese	-.26	.52	-		
	IV. Satisfaction with body image	.48	-.30	-.50	-	
	V. Skipping breakfast	-.23	.10	.16	-.20	-

Table 3. Matrix of correlations between the different quantitative variables, for boys and girls.

Table 4 shows the relationship between the categorical variable for dieting and all other variables included in the scale. All of the comparisons are statistically significant ($p < .001$) and have appreciable effect sizes (greater than 0.2), both for boys and for girls. In some comparisons, the effect size is large (greater than 0.9), as is the case of the relationship between dieting and the perception of body image as being obese for boys ($d = 1.03$) and for girls ($d = 1.02$). The same holds true for the relationship with satisfaction with their body image for girls ($d = 0.93$).

With regards to the sex differences, in some cases the effect sizes are considerably greater for girls when compared to boys. Specifically, the effect size of the relationship between the GHS and the dieting behavior is almost twice as great for girls ($d = 0.47$) as for boys ($d = 0.29$). Likewise, the effect size of the relationship between dieting and being unsatisfied with one's body image is greater for girls (boys 0.70, girls 0.93), it is the same for the relationship between dieting and skipping breakfast (boys 0.23, girls 0.30).

		Without dieting			With dieting			Sig.	<i>d</i>
		<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>		
Global Health Score	Boys	3004	0.06	0.76	326	-0.16	0.83	<.00	0.29
	Girls	2926	-0.18	0.76	661	-0.54	0.79	<.00	0.47
Body Mass Index	Boys	3004	20.91	3.22	326	23.61	4.03	<.00	0.82
	Girls	2926	20.05	2.90	661	22.17	3.37	<.00	0.71
Perception of body as obese	Boys	3004	1.99	0.73	326	2.74	0.72	<.00	1.03
	Girls	2926	2.19	0.75	661	2.94	0.64	<.00	1.02
Satisfaction with body image	Boys	3004	3.08	0.80	326	2.52	0.91	<.00	0.70
	Girls	2926	2.79	0.86	661	1.98	0.90	<.00	0.93
Skipping breakfast	Boys	3004	1.53	2.13	326	2.02	2.31	<.00	0.23
	Girls	2926	1.94	2.27	661	2.63	2.48	<.00	0.30

Table 4. Comparison of measurements between dieting behavior and the other scale variables for boys and girls.

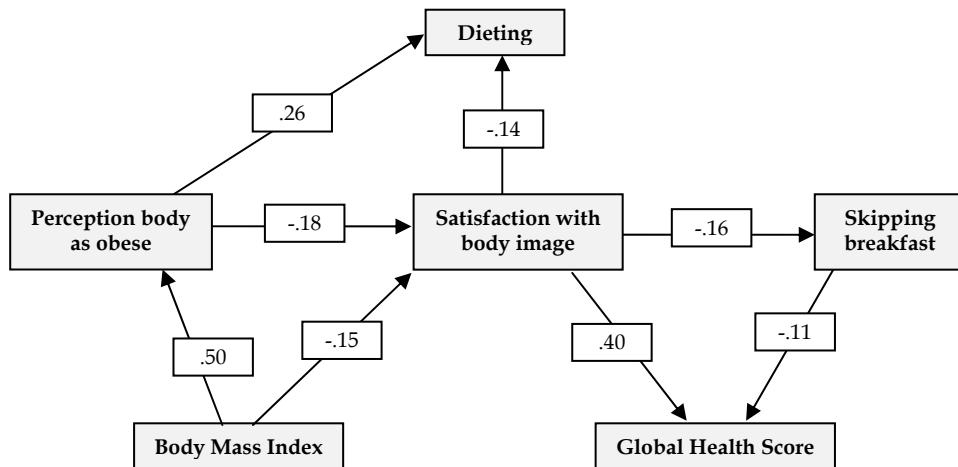
To conclude, two structural equation models were performed; one for girls and the other for boys. The following variables were included in both models: GHS, BMI, perception of one's body as obese, satisfaction with one's body image, dieting and skipping breakfast. Both structural equation models presented good indexes of fitness for boys, χ^2 (5, $N = 3348$) = 41.85, $p < .001$, CFI = .98, IFI = .98, MFI = .99, BBNNFI = .94, RMSEA = .05; and for girls, χ^2 (8, $N = 3597$) = 56.96, $p < .001$, CFI = .99, IFI = .99, MFI = .99, BBNNFI = .97, RMSEA = .04).

Both in the case of boys and girls, certain bi-varied relationships demonstrated previously wane in the structural equation models. Such is the case for the relationship between BMI and GHS and the relationship between dieting and skipping breakfast. In these cases, there continues to be a relationship between both variables but in an indirect way through other variables, such as perception and satisfaction with one's body image.

On one hand, the influence of the BMI is evidenced through the perception of body image. Moreover, for boys, the BMI influences satisfaction with one's body image. In fact, one aspect, in the case of girls, that highlights the indirect influence of the BMI on satisfaction with body image, through the perception of one's body image, is that the coefficient is higher for girls ($\beta = -.50$, $p < .001$) than for boys ($\beta = -.18$, $p < .001$). Therefore, the perception of obesity entails poorer satisfaction with one's body image in the case of girls when compared with boys. This data is logical if the coefficient for the influence of the BMI on body satisfaction is observed; it is significant in the case boys ($\beta = -.15$, $p < .001$) but nonexistent in the case of girls.

On the other hand, there are also sex differences when it comes to the influence of body satisfaction on the behavior of dieting. Concretely, Figure 2 shows that this influence is higher for girls ($\beta = -.21$, $p < .001$) than for boys ($\beta = -.14$, $p < .001$).

BOYS:



GIRLS:

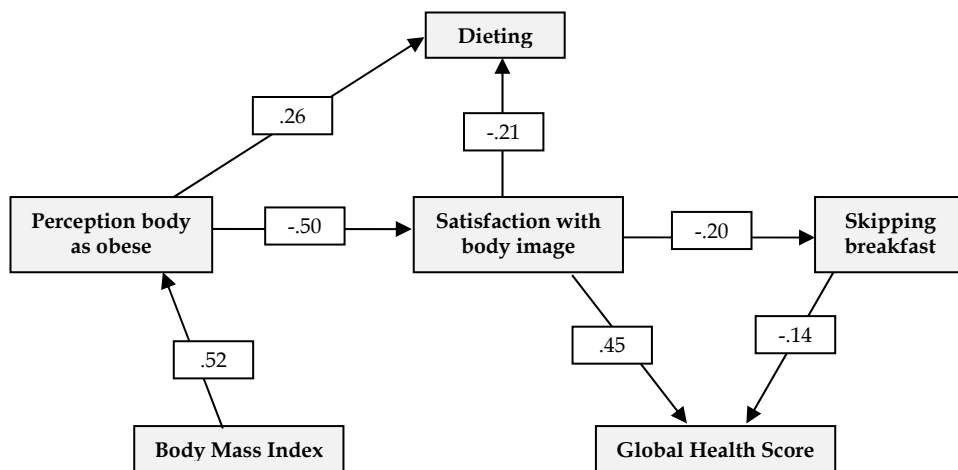


Fig. 2. Standardized estimates of the model parameters for boys and girls.

In conclusion, it can be seen that the main variable of both models is satisfaction with body image. On one hand, this variable is influenced by the perception of one's body image and the BMI (in the girls this influence would be indirect). On the other hand, body satisfaction influences other variables such as the behavior of dieting, skipping breakfast and the GHS. Thus, body satisfaction can be seen as the nexus of both models. In fact, the adjustment variable measured with the GHS is determined, for the most part, by satisfaction with body image (for boys $\beta = .40, p < .001$; for girls $\beta = .45, p < .001$). Despite the fact that the behavior of skipping breakfast also influences GHS, this influence is much lower (for boys $\beta = -.11, p < .001$; for girls $\beta = -.14, p < .001$) than it obtain through of body satisfaction.

4. Discussion

The results of this study show that the four components related to eating disorders (*physiological*: BMI, *cognitive*: perception of one's body as obese, *emotional*: satisfaction with one's body image and *behavioral*: dieting and skipping breakfast) entail a decrease in the Global Health Score (GHS) for adolescents, this being understood from a broad and integrative point of view, as is recommended by the World Health Organization with the bio-psycho-social paradigm. The bi-varied tests (Pearson correlation and Student *t* test) demonstrate that all the variables included in this research are related to the GHS in adolescents. However, when those variables are included in the global model, some maintain a direct relationship with the GHS while others have an indirect influence, especially in term of satisfaction with one's body image. In short, it has been seen that the BMI ceases to have a direct relationship on health and begins having an indirect influence through the perception that young people have of their body image, which in turn influences their satisfaction with their body image, which, in the end, is a variable that has a high correlation with the GHS.

On the other hand, body image also becomes the nexus between the BMI and the behaviors of dieting and skipping breakfast. Therefore, during adolescence, what makes the young people adopt certain behaviors to control their weight is not so much their real weight (BMI) but the self-perception of their body and the satisfaction they have with their figure. These results are coherent with the discoveries found by other experts who show the mediator role of body image on weight control behaviors and real weight, which takes second place (e.g., Isik et al., 2005; Fan et al., 2010).

Thus, it has been demonstrated that during adolescence certain variables related to the physiological (BMI), cognitive (perception of obesity), emotional (body satisfaction) and behavioral (weight control) components show a dangerous relationship pattern that persists in both boys and girls. This relationship pattern between the various components orbits around the satisfaction with body image, a variable related to the emotion associated with the subjective image of the body figure. This emotional component is shown to play a more central role by influencing behaviors that are potentially dangerous for health (such as dieting without a high BMI or skipping breakfast on a daily basis), as well as its influence on the bio-psycho-social health of the young people (GHS).

These results allow us to suggest the need to impact even more on the emotional component, along with other more cognitive or behavioral variables, within eating disorder prevention programs, as well as on intervention programs for young people with anorexia or bulimia. These suggestions are in the line with those outlined by Stice et al. (2003) with regards to weight control programs; they stressed the importance of increasing body satisfaction in young people. Likewise, Rotenberg et al. (2004) demonstrated the difficulty of modifying aspects related to the subjective state of mind by induction, despite achieving changes in the cognitive area with regards to body image.

So, bearing in mind the high indexes of being overweight and obesity currently seen in a large number of young people in developed countries (Currie et al., 2008), the primary prevention of dissatisfaction with body image in young people is difficult to solve (Vander, 2011). Faced with this, the solution could lie in integrated models or paradigms, with an inter-behavioral and interdisciplinary philosophy (Orleans, 2004; Prochaska et al., 2008;

Pronk et al., 2004; Solomon & Kington, 2002), that includes, in a single intervention, the promotion of healthy eating habits that avoid excessive weight, the standard practice of physical exercise, the elimination of unhealthy weight control behaviors and the promotion of the self-acceptation and self-esteem starting from non-physical criteria. Following the recommendations established by Neumark-Sztainer (2009) deriving from the results of the project *Eating Among Teens* (EAT), it is important to pay attention to family comments referring to body weight and behaviors aimed at weight control carried out within this context (e.g., Neumark-Sztainer et al., 2010), it is equally important to intervene with regards to weight control and the body image of friends (e.g., Eisenberg & Neumark-Sztainer, 2010). Moreover, without overlooking the macro-systemic dimension of this subject, according to the ecological theory of Bronfenbrenner (1979), it is necessary to intervene with regards to the danger of the implicit ideas of today's society that prioritizes physical beauty as one of the main standards of personal value (e.g., Grammas & Schwartz, 2009; Levine & Murnen, 2009).

At the same time, this study also demonstrates clear indicators of the less favorable role girls play when compared with boys, in the risk of developing eating disorders. Girls, despite having a lower BMI than boys, perceive themselves as more obese; they are more unsatisfied with their body image; they diet more frequently and skip breakfast more often. All these aspects make it understandable that adolescent girls present bio-psycho-social health scores (GHS) that are lower than their male peers.

One of the clearest sex differences can be seen in the greater bi-varied relationship in girls, with the poorest score for health and dieting on the one hand, and skipping breakfast on the other. These results make sense when considering that girls carry out this type of weight control behavior with less real necessity than boys, since their BMI is better adjusted. Therefore, it is logical that these weight control behaviors lead to a greater decrease in their bio-psycho-social well-being. In the global model, the relationship between dieting and poorer GHS is weaker; however, the relationship between skipping breakfast and poorer GHS persists, both for boys and girls. This could be explained from a strictly biological point of view, due the influence of fasting on physical health, by means of variations in heart rhythm and an increase in parasympathetic activity (Pivik et al., 2006). When fasting is prolonged more than normal, a mechanism leads to a decrease in insulin and an increase in cortisol and catecholamines seeking to maintain blood sugar at an acceptable level. These metabolic changes response as fatigue that not only interferes in physical and muscular performance, but also in various cognitive aspects: lack of concentration, decrease in the capacity for locution or expression, memory, creativity and problem solving, in addition to the consequent despondency and moodiness (Gretchen, 1995; Pereira et al., 2011; Rampersaud et al., 2005).

This study also demonstrates that although there is a correlation in both sexes between perception and satisfaction with one's body image, in the case of girls, this correlation is almost triple the statistic found for boys. That is to say, the perception of obesity by girls is linked more strongly with poorer satisfaction with body image. This data explains the fact that the influence of real weight (BMI) on the satisfaction with one's body image occurs in the case of boys but not in the case of girls, in whom this influence is indirect through body perception. In addition, to fully understanding the most dangerous circle surrounding girls, this study demonstrates that the influence of body satisfaction on the behavior of dieting is

greater for girls than for boys. Therefore, we are faced with a clear position of risk for adolescent girls when compared with their male peers. In short, girls, despite having a more appropriate real weight, have a greater perception of obesity, are more unsatisfied with their body image, diet more often to lose weight and skip breakfast more frequently. Likewise, for girls, these weight control behaviors are accompanied by poorer bio-psycho-social health indicators, when compared with boys. Lastly, considering the central role of body satisfaction demonstrated in the global models, for girls—contrary to boys— body satisfaction is less influenced by their real weight, is more influenced by the self-perception and has more influence in dieting behavior. It is therefore necessary to stress the necessity of intervening in the cognitive-emotional patterns of adolescent girls with regards to their weight and body image.

These discoveries, which demonstrate the clear unfavorable role of girls as opposed to boys, are coherent with the findings of other researchers, who coincide in the greater concern girls have of body image (e.g., Kanaan & Afifi, 2010). As Harter (2006) summarizes, many girls worship an ideal of thinness, overestimate the preferences of boys for slender female bodies, see themselves as fatter than other girls and negatively compare themselves with the models of women on display in the media. At the same time, girls are more vulnerable to certain negative thought patterns found in depression, such as self-blame, a negative social comparison, hyper-vigilance to potential stress and brooding (that is to say, an obsession about the future consequences of their hypothetical decisions) (Andrews & Thompson, 2009; Hyde et al., 2008). These gender differences predispose girls to a greater risk of developing eating disorders, depression, self-mutilation, low self-esteem and unnecessary interventions of cosmetic surgery (Ruble et al., 2006). Therefore, following the logic suggested by Perry and Pauletti (2011), it is recommended that future research dedicates more attention to the biological, cognitive and social factors responsible for the differential sensitivity of boys and girls to specific contexts and experiences.

5. Conclusion

The variables related to weight, image and body control during adolescence show a clearly pernicious relationship pattern. This relationship pattern between the various key variables in the development of eating disorders orbits around satisfaction with body image—a variable related to the emotion associated with the subjective image of the body figure, which nevertheless has been demonstrated to be more important than other more objective variables (BMI), thus influencing behaviors that are potentially dangerous for health (such as dieting when the BMI is not high, or skipping breakfast), as well as influencing the bio-psycho-social health of the young people.

On the other hand, there is a clear position of risk in adolescent girls when compared with their male peers. In short, girls, despite having a more appropriate real weight, perceive themselves as fat more frequently, are more unsatisfied with their body image, diet to lose weight and skip breakfast more often. Additionally, for girls, these weight control behaviors are accompanied by poorer bio-psycho-social health indicators, when compared with boys. Lastly, bearing in mind the important role of body satisfaction demonstrated in the global models, for girls —contrary to boys— body satisfaction is less influenced by their real weight; receives more influence self-perception and influences the behavior of dieting more strongly.

6. Acknowledgment

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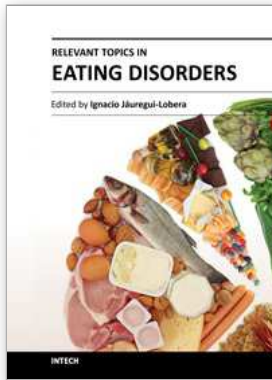
7. References

- Alexy, U., Wicher, M., & Kersting, M. (2010). Breakfast trends in children and adolescents: frequency and quality. *Public Health Nutrition*, Vol. 13, No. 11, pp. 1795-1802, ISSN 1475-2727
- Andrews, P. W., & Thompson, J. A. (2009). The bright side of being blue: Depression as an adaptation for analyzing complex problems. *Psychological Review*, Vol. 116, No. 3, pp. 620-654, ISSN 0033-295X
- Barker, E. & Galambos, N. (2003). Body Dissatisfaction of Adolescent Girls and Boys: Risk and Resource Factors. *The Journal of Early Adolescence*, Vol. 23, No. 2, pp. 141-165, ISSN 1552-5449
- Bessenoff, G. & Snow, D. (2006). Absorbing Society's Influence: Body Image Self-Discrepancy and Internalized Shame. *Sex Roles*, Vol. 54, No. 9-10, pp. 727-731, ISSN 1573-2762
- Bronfenbrenner, U. (1979). *The ecology of human behavior*, Harvard University Press, ISBN 0-674-22456-6, Cambridge, MA
- Cash, T.F. & Deagle, E.A. (1997). The nature and extent of body-image disturbances in anorexia nervosa and bulimia nervosa: A meta-analysis. *International Journal of Eating Disorders*, Vol. 22, No. 2, pp. 107-126, ISSN 1098-108X
- Cho, S., Dietrich, M., Brown, C.J., Clark, C.A. & Block, G. (2003). The effect of breakfast type on total daily energy intake and body mass index: Results from the third national health and nutrition examination survey (NHANESIII). *Journal of the American College of Nutrition*, Vol. 22, No. 4, pp. 296-302, ISSN 1541-1087
- Conley, A. & Boardman, J.D. (2007). Weight overestimation as an indicator of disordered eating behaviors among young women in the United States. *International Journal of Eating Disorders*, Vol. 40, No. 5, pp. 441-445, ISSN 1098-108X
- Currie, C., Roberts, C., Morgan, A., Smith, R., Settertobulte, W., Samdal, O., & Rasmussen, B. (2008). *Inequalities in young people's health: International report from the HBSC 2005/06 survey*, WHO Regional Office for Europe, ISBN 978-92-890-7195-6, Copenhagen, Denmark
- Eisenberg, M.E. & Neumark-Sztainer, D. (2010). Friends' dieting and disordered eating behaviors among adolescents five years later: findings from Project EAT. *Journal of Adolescent Health*, Vol. 47, No. 1, pp. 67-73, ISSN 1054-139X
- Eisenberg, M. E., Neumark-Sztainer, D., Story, M. y Perry, C. (2005). The role of social norms and friends' influences on unhealthy weight-control behaviors among adolescent girls. *Social Science and Medicine*, Vol. 60, No. 6, pp. 1165-1173, ISSN 0277-9536
- Espinoza, P., Penelo, E., & Raich, R.M. (2010). Disordered eating behaviors and body image in a longitudinal pilot study of adolescent girls: what happens 2 years later?. *Body Image*, Vol. 7, No. 1, pp. 70-73, ISSN 1740-1445

- Fan, Y.O., Li, Y.P., Liu, A.L., Hu, X., Ma, G., & Xu, G. (2010). Association between body mass index, weight control concerns and behaviors, and eating disorder symptoms among non-clinical Chinese adolescents. *BMC Public Health*, Vol. 10, No. 1, pp. 314-325, ISSN 1471-2458
- Gardner, R. (1996). Methodological issues in assessment of the perceptual component of body image disturbance. *British Journal of Psychology*, Vol. 87, No. 2, pp. 327-337, ISSN 2044-8295
- Grammas, D.L. & Schwartz, J.P. (2009). Internalization of messages from society and perfectionism as predictors of male body image. *Body Image*, Vol. 6, No. 1, pp. 31-36, ISSN 1740-1445
- Gretchen, M. (1995). The impact of breakfast especially ready-to-eat cereals on nutrient intake and health of children. *Nutrition Research*, Vol. 15, No. 4, pp. 595-613, ISSN 0271-5317
- Harter, S. (2006). The self, In: *Handbook of child psychology: Vol. 3. Social, emotional, and personality development*, W. Damon & R. M. Lerner (Series Eds.) & N. Eisenberg (Vol. Ed.), (6th ed.), PP. 505-570). John Wiley & Sons, ISBN 978-0-471-27287-8, Hoboken, NJ
- Hyde, J.S., Mezulis, A.H., & Abramson, L.Y. (2008). The ABCs of depression: Integrating affective, biological, and cognitive models to explain the emergence of the gender difference in depression. *Psychological Review*, Vol. 115, No. 2, pp. 291-313, ISSN 0033-295X
- Isik, B.I., Orsel, S., Akdemir, A., & Ozbay, M.H. (2005). The relationship between dieting and body image, body ideal, self-perception, and body mass index in Turkish adolescents. *International Journal of Eating Disorders*, Vol. 37, No. 2, pp. 150-155, ISSN 1098-108X
- Ivarsson, T., Svalander, P., Litlere, O., & Nevenon, L. (2006). Weight concerns, body image, depression and anxiety in Swedish adolescents. *Eating Behaviors*, Vol. 7, No. 2, pp. 161-175, ISSN 1471-0153
- Kanaan, M.N. & Afifi, R.A. (2010). Gender differences in determinants of weight-control behaviours among adolescents in Beirut. *Public Health Nutrition*, Vol. 13, No. 1, pp. 71-81, ISSN 1475-2727
- Larson, N.I., Neumark-Sztainer, D., & Story, M. (2009). Weight Control Behaviors and Dietary Intake among Adolescents and Young Adults: Longitudinal Findings from Project EAT. *Journal of the American Dietetic Association*, Vol. 109, No. 11, pp. 1869-1877, ISSN 0002-8223
- Levine, M.P. & Murnen, S.K. (2009). "Everybody Knows That Mass Media are/are not [pick one] a Cause of Eating Disorders": A Critical Review of Evidence for a Causal Link Between Media, Negative Body Image, and Disordered Eating in Females. *Journal of Social and Clinical Psychology*, Vol. 28, No. 1, pp. 9-42, ISSN 0736-7236
- Martin, M., & Gentry, J. (1997). Stuck in the Model Trap: The Effects of Beautiful Models in Ads on Female Pre-Adolescents and Adolescents. *Journal of Advertising*, Vol. 26, No. 2, pp. 19-33, ISSN 0091-3367
- McArthur, L., Holbert, D., & Peña, M. (2005). An Exploration of the attitudinal and perceptual dimensions of body image among male and female adolescents from six latin american cities. *Adolescence*, Vol. 40, No. 160, pp. 801-817, ISSN 0001-8449

- Mullie, P., Clary, P., de Ridder, D., Deriemaeker, P., Duvigneaud, N., Hebbelinck, M., Grivegnée, A.R., & Autier, P. (2006). Breakfast frequency and fruit and vegetable consumption in Belgian adolescents: A cross-sectional study. *Nutrition & Food Science*, Vol. 36, No. 5, pp. 315-326, ISSN 0034-6659
- Neumark-Sztainer, D., Bauer, K.W., Friend, S., Hannan, P.J., Story, M., & Berge, J.M. (2010). Family weight talk and dieting: how much do they matter for body dissatisfaction and disordered eating behaviors in adolescent girls? *Journal of Adolescent Health*, Vol. 47, No. 3, pp. 270-276, ISSN 1054-139X
- Neumark-Sztainer, D., Wall, M., Haines, J., Story, M., & Eisenberg, M.E. (2007). Why does dieting predict weight gain in adolescents? Findings from project EAT-II: A 5-year longitudinal study. *Journal of the American Dietetic Association*, Vol. 107, No. 3, pp. 448-455, ISSN 0002-8223
- Neumark-Sztainer, D. (2009). Preventing obesity and eating disorders in adolescents: What can health care providers do? *Journal of Adolescent Health*, Vol. 44, No. 3, pp. 206-213, ISSN 1054-139X
- Neumark-Sztainer, D., Story, M., Falkner, N., Beuhring, T., & Resnick, M. (1999). Sociodemographic and Personal Characteristics of Adolescents Engaged in Weight Loss and Weight/Muscle Gain Behaviors: Who Is Doing What?. *Preventive Medicine*, Vol. 28, No. 1, pp. 40-50, ISSN 0091-7435
- Niemeier, H., Raynor, H., Lloyd-Richardson, E., Rogers, M., & Wing, R. (2006). Fast Food Consumption and Breakfast Skipping: Predictors of Weight Gain from Adolescence to Adulthood in a Nationally Representative Sample. *Journal of Adolescent Health*, Vol. 39, No. 6, pp. 842-849, ISSN 1054-139X
- Orleans, C.T. (2004). Addressing multiple behavioral health risks in primary care. Broadening the focus of health behavior change research and practice. *American Journal of Preventive Medicine*, Vol. 27, No. 1, pp. 1-3, ISSN 0749-3797
- Pereira, M.A., Erickson, E., McKee, P., Schrankler, K., Raatz, S., Lytle, L., & Pellegrini, A. (2011). Breakfast Frequency and Quality May Affect Glycemia and Appetite in Adults and Children. *Journal of Nutrition*, Vol. 141, No. 1, pp. 163-168, ISSN 1541-6100
- Perry, D.G. & Pauletti, R.E. (2011). Gender and Adolescent Development. *Journal of Research on Adolescence*, Vol. 21, No. 1, pp. 61-74, ISSN 1532-7795
- Pivik, R.T., Dykman, R.A., Tennal, K., & Gu, Y. (2006). Skipping breakfast: Gender effects on resting heart rate measures in preadolescents. *Physiology & Behavior*, Vol. 89, No. 2, pp. 270-280, ISSN 0031-9384
- Prochaska, J.J., Spring, B., & Nigg, C.R. (2008). Multiple health behavior change research: An introduction and overview. *Preventive Medicine*, Vol. 46, No. 3, pp. 181-188, ISSN 0091-7435
- Pronk, N.P., Peek, C.J., & Goldstein, M.G. (2004). Addressing multiple behavioral risk factors in primary care. A synthesis of current knowledge and stakeholder dialogue sessions. *American Journal of Preventive Medicine*, Vol. 27, No. 1, pp. 4-17, ISSN 0749-3797
- Rampersaud, G.C., Pereira, M.A., Girard, B.L., Adams, J., & Metz, J.D. (2005). Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. *Journal of the American Dietetic Association*, Vol. 105, No. 5, pp. 743-760, ISSN 0002-8223

- Rotenberg, K.J., Taylor, D., & Davis, R. (2004). Selective mood- induced body image disparagement and enhancement effects: Are they due to cognitive priming or subjective mood? *International Journal of Eating Disorders*, Vol. 35, No. 3, pp. 317-332, ISSN 1098-108X
- Ruble, D. N., Martin, C. L., & Berenbaum, S. A. (2006). Gender development, In: *Handbook of child psychology: Vol. 3. Social, emotional and personality development*, W. Damon & R. M. Lerner (Series Eds.) & N. Eisenberg (Vol. Ed.), (6th ed.), pp. 858-932. John Wiley & Sons, ISBN 978-0-471-27287-8, Hoboken, NJ
- Solomon, S. & Kington, R. (2002). National efforts to promote behavior-change research: Views from the Office of Behavioral and Social Sciences Research. *Health Education Research*, Vol. 17, No. 5, pp. 495-499, ISSN 1465-3648
- Stice, E., Trost, A., & Chase, A. (2003). Healthy weight control and dissonance-based eating disorder prevention programs: Results from a controlled trial. *International Journal of Eating Disorders*, Vol. 33, No. 1, pp. 10-21, ISSN 1098-108X
- Timlin, M.T., Pereira, M.A., Story, M., & Neumark-Sztainer, D. (2008). Breakfast eating and weight change in a 5-year prospective analysis of adolescents: Project EAT (eating among teens). *Pediatrics*, Vol. 121, No. 3, pp. 638-645, ISSN 0031-4005
- Vander, J.S. (2011). Unhealthy weight control behaviors among adolescents. *Journal of Health Psychology*. Retrieved from <<http://hpq.sagepub.com/content/early/2011/06/06/1359105311409787.abstract>>
- Vereecken, C., Dupuy, M., Rasmussen, M., Kelly, C., Nansel, T. R., Al Sabbah, H., Baldassari D, Jordan MD, Maes L, Niclasen BV, Ahluwalia N; HBSC Eating & Dieting Focus Group. (2009). Breakfast consumption and its socio-demographic and lifestyle correlates in schoolchildren in 41 countries participating in the HBSC study. *International Journal of Public Health*, Vol. 54, No. 2, pp. 180-190, ISSN 1661-8564
- Woodruff, S.J., Hanning, R.M., Lambraki, I., Storey, K.E., & McCargas, L. (2008). Healthy Eating Index-C is compromised among adolescents with body weight concerns, weight loss dieting, and meal skipping. *Body Image*, Vol. 5, No. 4, pp. 404-408. ISSN 1740-1445
- World Health Organization (1948). *WHO Constitution*. Geneva: World Health Organization.
- Wu, T.Y., Rose, S.E., & Bancroft, J.M. (2006). Gender Differences in Health Risk Behaviors and Physical Activity Among Middle School. *Journal of School Nursing*, Vol. 22, No. 1, pp. 25-31, ISSN 1546-8364



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Eating disorders are common, frequently severe, and often devastating pathologies. Biological, psychological, and social factors are usually involved in these disorders in both the aetiopathogeny and the course of disease. The interaction among these factors might better explain the problem of the development of each particular eating disorder, its specific expression, and the course and outcome. This book includes different studies about the core concepts of eating disorders, from general topics to some different modalities of treatment. Epidemiology, the key variables in the development of eating disorders, the role of some psychosocial factors, as well as the role of some biological influences, some clinical and therapeutic issues from both psychosocial and biological points of view, and the nutritional evaluation and nutritional treatment, are clearly presented by the authors of the corresponding chapters. Professionals such as psychologists, nurses, doctors, and nutritionists, among others, may be interested in this book.

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University Campus STeP Ri
Slavka Krautzeka 83/A
51000 Rijeka, Croatia
Phone: +385 (51) 770 447
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InTech China

Unit 405, Office Block, Hotel Equatorial Shanghai
No.65, Yan An Road (West), Shanghai, 200040, China
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821

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