



PHD THESIS

**AFFECT, COGNITION, AWARENESS AND
BEHAVIOUR IN EATING DISORDERS.**

***COMPARISON BETWEEN OBESITY AND
ANOREXIA NERVOSA***

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Theoretical Medical Sciences Program

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Introduction

Obesity is a condition in which the natural energy reserve, stored in the fatty tissue of humans is increased to a point where it is associated with certain health conditions or increased mortality. In the past in several human cultures, plumpness was associated with physical attractiveness, strength, health and fertility. In modern Western culture, the obese body is widely regarded as unattractive, and as a symbol of laziness and low social class. Apart from these physical conditions that are high risk factors for many medical illnesses, the fat-phobia and prejudice against the overweight in the western culture is such that obese people (particularly women) tend to have a severe anxiety and depression (Friedman et al., 2002). Therefore obese individuals seeking treatment for weight loss appears to be motivated by psychological aspects of obesity, rather than its physical or medical consequences (Annunziato & Lowe, 2007).

Anorexia nervosa is a condition of self initiated weight loss characterised by a profound disturbance of the body image, distorted self-perception, and obsessive fear of gaining weight and problem in the cognitive and the emotional functioning. The disorder primarily affects young girls in the western society and usually has its onset in adolescence. Hypotheses of an underlying psychological disturbance in young women with the disorder include conflicts surrounding the transition from girl to a woman (Kaplan et al., 1994) and other factors such as feeling of helplessness and difficulty in establishing autonomy. Bruch (1962) proposed that AN patients have deficits in the mental representations of their own body and their body size. Other typical characteristics of the anorexia are the need of the control over their own life and their environment (generally their families), too much focus on the achievement, introversion, withdrawal from friendships and very low self esteem (Vandereycken, 2005).

Background

Except for a few rare metabolic disorders, weight gain or weight loss over time occurs because of the balance between energy expenditure and food intake or for both reasons (Garrow, 1995). Eating is a highly *motivated* and *reinforced* behaviour that induces feelings of *gratification and pleasure* (Sigal & Adler, 1976; Bonato et al., 1983). Therefore human eating behaviour is not a passive response to salient environmental triggers or merely physiological drives providing nutrients for survival; it is about *cognitive and emotional* processes based choices (Davis et al., 2004). Executive function or cognitive control is responsible to transmit between inside world and environmental challenges and to adjust human behaviour in a flexible way to situations which require the overcoming of a strong *habitual response* or *resisting temptation* (Norman & Shallice, 1980). It seems that clinically the most relevant deficit associated with eating disorders is related to executive function or mental flexibility (Cooper & Fairburn, 1992; Tchanturia et al. 2004).

Many studies reported the frequent association with depression and anxiety with eating disorders (Bruch, 1982; Swift et al., 1986). Bruch (1962) considered the difficulty to distinguish and describe feelings (Alexithymia) as a main deficit in eating disorders related to a sense of general inadequacy and lack of control over one's life.

Eizaguirre et al. (2004) proposed that alexithymia and eating disorders both strongly relate to depression and anxiety, and alexithymia is a personality trait in some specific patients with eating disorders, whereas in most of the cases alexithymia is a secondary state due to depression and anxiety. Recently, the relationship between the cognitive functioning and emotional information processing in anorexia nervosa are getting into the focus of the new researches. However, in spite of the many proven psychological symptoms, obesity is still regarded mostly as a metabolic problem and as a risk factor in serious medical sicknesses. The results of the examinations on the cognitive-emotional processing would allow developing more appropriate psychological treatment for patients with anorexia nervosa and also with obesity in the future.

Rucker & Cash (1992) proposed that body image includes at least two main components: the perceptual body image (i.e., estimation of one's body size) and the attitudinal body image (i.e., affective, cognitive, and behavioural concerns with one's body size). Many studies proved evidences that individuals with eating disorders show disturbances on the perceptual body image by overestimating or distorting the size of their body (Gardner et al. 1987). The attitudinal aspect can be divided into two different processing levels: *explicit attitudes and implicit attitudes*. These two do not influence necessarily the individual's behaviour outcome similarly.

Explicit attitudes are usually equated with deliberative, self-reported evaluations and come from conscious judgements. Several studies reported that people with eating disorders were more dissatisfied and preoccupied with their appearance, and tend to avoid more social interactions because of their appearance than normal weight individuals (Rosen et al. 1995, Sorbara & Geliebter, 2002).

The implicit attitudes are preferences that exist outside of conscious awareness or conscious control. To date the implicit body evaluation both in anorexia and obesity have not yet been studied and poorly understood.

The continuum model of the eating disorders proposes that eating disorders can be described on a continuous spectrum from restrictive anorexia to stable obesity (Vandereycken 1982). The principal goal of the thesis is to investigate common deficits regarding cognitive, emotional functioning and body image, which are underlying the pathology of the two extreme sides of eating disorder spectrum (restriction and excessive eating).

Aims

Obesity

1. To evaluate that, like substance users, obese patients (children and adult) despite normal intelligence would show cognitive deficits specifically in tasks associated with the PFC based executive functions.
2. To examine that the level of depression, anxiety, psychological distress and negative affectivity in the obese and the control groups could be associated with *the* severity of the obesity (BMI).
3. To investigate that the possible deficits on the executive functioning in obesity is related to the negative affectivity pre-occupation (anxiety) and/or negative mood (depression).
4. To examine the emotion functioning and *alexithymia in the context of depression and* anxiety in obesity.
5. To investigate the emotional information processing particularly the treatment of facial emotion stimuli (sad, angry, and happy) on the implicit level in obesity.
6. To measure and compare the evaluation of the explicit (self-reported on perceived actual body and the ideal body) and implicit (out of direct self awareness) body shape in obesity.

Restrictive anorexia nervosa

7. To compare the cognitive profile of patients with anorexia nervosa to healthy control females on different neuropsychological tasks evaluating PFC based executive function, intelligence, memory and attention.
8. To evaluate how negative mood and anxiety influence the performance on the cognitive tasks, and how perfectionism would be linked to the performance in anorexia nervosa.
9. To assess the severity of alexithymia in the anorexia controlling for the depression and anxiety.
10. To investigate the treatment of facial emotion stimuli (sad, angry, and happy) on the implicit level in anorexia nervosa and the possible moderating effect of alexithymia and mood.
11. To examine the explicit and implicit evaluations of different body shapes are relate to each other in anorexia nervosa.

Can excessive eating and restrictive eating be the flip side of a coin?

12. The main goal of the doctorate thesis is to examine the existence of certain *common dysfunction related to* the two extreme sides of the dimension of the eating disorders (restrictive anorexia and stable obesity). Therefore we compared cognitive profile, emotion functioning (explicit and implicit) and attitudes towards body image both in obesity and anorexia.

Methods

Participants

Participants were recruited in our studies from three main age groups, children, adolescent and adult. Our aim was to investigate the common mechanisms and the possible dysfunction linked to the pathological status; therefore we selected our participants from the age-ranges which represent the most of the specific eating disorders.

Patients	Children with obesity N=12		Adults with obesity N=30		Adolescents with restrictive anorexia N=35	
	M(SD)	Range	M(SD)	Range	M(SD)	Range
Age	12.1(0.91)	11-13	48.8(11.01)	20-65	19.61 (3.42)	13-27
Weight (kg)	71.3(4.72)**	65-78	92.6(19.98)**	68-147	38.56(4.32)**	32-45
BMI	27.16(1.79)**	24-30	34.2(7.83)**	27-60	14.76 (1.31)**	13-17
Scholar years	5.21(0.21)	5-6	14.4(1.65)	9-17	10.45(3.5)	6-17
Controls	Controls N=12		Controls N=30		Controls N=35	
Age	12.44(0.51)	11-13	49.33(11.06)	20-66	20.27 (3.93)	14-27
Weight (kg)	35.58(4.01)	30-40	62.80(6.61)	52-78	54.43(4.67)	49-59
BMI	16.87(1.34)	14-19	22.84(1.70)	19-25	19.79 (1.42)	17-22
Scholar years	5.33(0.31)	5-6	14.70(1.70)	11-18	10.78(2.6)	7-17

Neuropsychological tasks

Neuropsychological tasks were used to measure different cognitive abilities (i.e.: memory, attention, mental flexibility, suppressing, shifting, problem solving capacities) and to investigate possible cognitive deficits, which are related to specific brain structures. The advantage of the neuropsychological tasks in comparison with questionnaires is that they are less culture dependent and can assess subjects from early age. In the examinations we used the following tasks:

- *Raven's Progressive Matrices (Raven et al, 1992)*
- *Digit span memory test (Wechsler, 1997)*
- *D2 attention endurance test (Birckenkamp, 1981)*
- *Hayling Sentence Completion task (Burgess & Shallice, 1997)*
- *Trail making task (Reitan, 1956, 1958)*
- *Semantic - Phonetic Verbal fluency (Milner 1964, Benton 1968)*
- *Wisconsin Card Sorting Test (Berg, 1948)*

Questionnaires

Self reported questionnaires were used to assess the participants' mood, affectivity and attitudes toward eating behaviour and body images. We have selected the following questionnaires for the studies carried out in the frame of this thesis:

- *Eating Disorder Inventory (EDI; Garner et al. 1983)*
- *20-item Toronto Alexithymia Scale (TAS20; Taylor et al. 1994)*
- *Positive Affectivity Negative Affectivity Schedule (PANAS; Watson et al. 1988)*
- *Beck Depression Inventory II (BDI; Beck, 1996)*
- *State-Trait Anxiety Inventory (STAI; Spielberger, 1983)*
- *Symptom Check List 90 -R (SCL-90; Derogatis, 1977)*
- *Body figure scale (BFS; Mouches, 1992)*

Implicit tasks

The affective priming paradigm was used to assess implicit attitudes toward body shape and the implicit treatment of facial emotional information. This paradigm is leaning on the procedure of early attention allocation and automatic reactions when affective information presents (Fazio et al., 1986, Winkielman et al., 1997). The principle of the task is to measure whether the preliminary presented emotional stimuli (prime) would modify the processing speed and accuracy of subsequent target evaluation on positive or negative valences (Hermans et al., 2001). When the affective valence of the prime is similar to that of the target stimuli (positive-positive; negative-negative) a congruence or facilitation effect occurs, which leads to faster and more accurate responses than incongruent prime-target combination (positive-negative; negative-positive). The difference in response latencies or error percentage (accuracy) between congruent and incongruent trials is called the priming effect. We applied in the thesis the modified version of the *Affective priming paradigm* (Fazio et al., 1986).

Results

Obesity

- 1. Patients with obesity performed worse on D2 attention test.** Significant group difference was found on number of correct responses in D2 test both in children ($F(1, 22) = 6.19, p < 0.03$) and adult female patients with obesity ($F(1, 58) = 4.29, p < 0.04$). As far as the WCST is concerned, **children with obesity** committed more **perseverative responses** ($F(1, 22) = 6.94, p < 0.02$) and **perseverative errors** ($F(1, 22) = 6.08, p < 0.03$) than control children. Crone et al. (2006) observed that set-switching abilities in the WCST developed during childhood and reached adult levels of performance at age 12. Based on this developmental theory, we propose that children with obesity are less matured on prefrontal cortex (PFC) based shifting abilities than their healthy peers. In adults the Hayling test revealed significantly slower performance in obesity than in controls both for the part A, B and also the B-A (Part A, $F(1, 58) = 16.43, p < 0.00$, part B $F(1, 58) = 7.86, p < 0.01$, B-A $F(1, 58) = 5.14, p < 0.03$).
- 2.** The depression (BDI, $F(1, 58) = 22.38, p < 0.00$; SCL-90-R DEP, $F(1, 58) = 12.18, p < 0.00$), state anxiety (STAI; $F(1, 58) = 10.37, p < 0.00$) and psychological distress (SCL-90/GSI, $F(1, 58) = 10.03, p < 0.00$), were significantly higher in the obese group. Severity of **depression** both assessed by BDI ($r = 0.50, p < 0.01$) and assessed by SCL 90 (sclDEP $r = 0.30, p < 0.03$) **was related positively to the BMI.**
- 3. Positive correlation was found between Positive Affectivity (PA)** and semantic **verbal fluency** task ($r = 0.26, p < 0.05$); **Digit Span backward** ($r = 0.42, p < 0.01$), while **PA negatively correlated with the TMTB** (time, $r = -0.27, p < 0.05$). However, depression, anxiety and negative affectivity did not correlate with any of the neuropsychological tasks in obesity.
- 4.** Obese patients showed significantly more difficulty on identifying emotion subscale (TAS20, $F(1, 58) = 4.57, p < 0.04$). However, the results showed that **depression and anxiety contributed to the level of the alexithymia in obesity.**
- 5.** ANOVA repeated measure revealed an interaction between targets and face primes ($F(2, 58) = 3.62, p < 0.04$) within subject. Paired t-test confirmed the differences between inhibition and facilitation effect in the **obese group for the happy face** ($t(30) = 2.11, p < 0.05$) and **for the angry face in the control group** ($t(30) = 2.40, p < 0.03$). Comparing the two groups on the facilitation and inhibition

effects we have found significant group differences for the facilitation effect of the happy face ($t(60) = 2.30, p < 0.03$), and for the inhibition effect of the sad face ($t(60) = 2.50, p < 0.02$) and of the angry face ($t(60) = 2.02, p < 0.05$). Depression had an influence on the treatment speed of all type of the primes in general ($F(2, 58) = 4.32, p < 0.02$), while **alexithymia contributed to the interaction** between prime and targets **within groups** but not between groups.

6. There was a significant difference between the two groups for body image perception ($F(1, 55) = 36.44, p < 0.00$), participants from the **obese group underestimated their own body shape**. The **body figure underestimation** (discrepancy between perceived and real BMI) **correlated with the severity of the depression** in the obese group ($r = 0.51, p < 0.01$). As far as implicit body evaluation concerned, paired t-test revealed significant differences only in the obese group for the negative and the positive target valences anticipated by underweight (obese, $t(30) = 2.59, p < 0.02$), ideal silhouettes (obese, $t(30) = 3.70, p < 0.01$) and overweight silhouette ($t(30) = 2.84, p < 0.01$). The **overweight body figure was not evaluated negatively** by any of the groups. However, **patients with obesity evaluated overweight body figure as the most positive** among the four body shapes (underweight, ideal, overweight and obese) presented in the task.

Anorexia nervosa

7. A **significant difference was found between the anorexic and the control groups** on global attention ($F(1, 56) = 8.42, p > 0.01$) and correct responses ($F(1, 56) = 5.37, p > 0.03$) **in the D2 attention test**. In contrary to our expectation **no differences were found between anorexic group and control on perseveration and verbal fluency**, therefore executive function deficit in anorexia nervosa could not be demonstrated in this examination.
8. The patients with anorexia nervosa reported **significantly more depression** (BDI; $F(1, 65) = 44.73, p < 0.00$; scIDEP, $F(1, 60) = 16.22, p < 0.00$), both **state** (STAI-STATE $F(1, 65) = 19.54, p < 0.00$) and **trait anxiety** (STAI-TRAIT, $F(1, 65) = 8.67, p < 0.01$, SCL-90-R ANX $F(1, 60) = 9.28, p < 0.01$). In the AN group, **higher trait anxiety predicted more perseveration in the WCST** (perseverative responses and perseverative errors; $r = 0.65, p < 0.03$). **Depression and perfectionism did not contribute to the cognitive performance**. These results suggest that perseveration is linked to the level of anxiety, and anxiety can be the cause of the stubborn, routine driven type of behavioural outcome in anorexia nervosa.
9. The findings revealed **more alexithymia** ($F(1, 65) = 7.48, p < 0.01$) in the **anorexic group**, the anorexic group scored significantly higher on each subscale of the TAS20. **Depression, anxiety** separately as covariant **was highly associated with the level of alexithymia** in the groups.
10. There was a significant **interaction between primes and target valences** ($F(2, 67) = 12.35, p < 0.00$), it means that the faces expressing different emotions influence the reaction times on the responses for the target words. **There was no significant difference between inhibition and facilitation for the happy face** in the patient group. However, we have found **significant differences in inhibition and facilitation effect for the sad face** ($t(35) = 3.12, p < 0.01$) and **the angry face** ($t(35) = 3.28, p < 0.01$) **in the anorexic group**. In the **control group there were significant differences for the happy face** ($t(35) = 2.65, p < 0.02$) and **the sad face** ($t(35) = 2.24, p < 0.03$) but **not for the angry face**. T-test confirmed the **group differences only for the happy face** ($t(70) = 1.86, p < 0.05$). It means that anorexic group was prone to treat less the happy face than the control group. Pearson correlation revealed negative relationship between the treatment speed of the

positive emotions and the psychological distress, while psychological distress was positively linked to the treatment of the anger in the anorexic group. **Alexithymia influenced negatively the treatment speed of the negative emotions (anger, sadness) in the anorexic group.**

11. AN group reported **significantly more disturbances on almost all the dimension of the explicit eating attitudes** (EDI, $F(1, 65) = 18.11, p < 0.00$). Explicitly the **anorexic group judged the ideal body figure to be much less positive** ($F[1, 67] = 12.03, p < 0.01$; AN: $M = 4.63, SD \pm 1.62$; control: $M = 5.82, SD \pm 1.21$), and the **overweight body figure to be much more negative** ($F[1, 67] = 23.32, p < 0.01$; AN: $M = 1.16, SD \pm 0.52$; control: $M = 2.22, SD \pm 1.24$) than control. Considering the implicit body evaluation, the priming effect was computed from the facilitation and inhibition effect for each silhouette in the two groups. There was a significantly larger priming effect of the **underweight body shape in the control group** than in the AN group ($t[65] = 2.33; p < 0.03$). In contrast with controls, in the AN group the priming effect for the overweight body prime was relatively large; however the difference between the two groups was not significant ($t[65] = 1.72; p < 0.09$). **Depression and anxiety contributed only to the explicit body evaluation in the control group** but not in the anorexic group. However, the **depression had no influence on how participants judged implicitly the figures.**

Flip side of the same coin?

12. Results of the neuropsychological tasks show **attentional deficit and distractibility** in obese children, obese adults and anorexic adolescents assessed by the D2 attention endurance test. In obesity we have found perseveration, deficit on the shifting and inhibition capacity, while in anorexia nervosa perseveration did not present.

We have found **different treatment of emotional information in obesity and anorexia**. Beside, the level of depression was elevated in both patient groups; it seems that **obese patients** had a difficulty to treat implicitly **negative emotions** (sadness), while **anorexic patients** had the difficulty to treat **happy faces** compared to controls.

We have found that implicit and explicit body shape evaluation was similar mostly in the anorexic group, while in the obese group there was a big difference on the overweight body figure. The **obese group evaluated positively the overweight body on the implicit level. The anorexic group did not evaluate positively the underweight body shape as we expected either implicitly or explicitly**. Based on these findings we suggest that underweight body preference is not a key issue in anorexia. While in obesity there is an attitudinal discrepancy between the explicit, socially exposed “ideal body” and the internal (implicit) body shape preference.

Discussion

Cognitive functioning

We have found that only the **attentional problem (distractibility) was a common dysfunction** in obesity and anorexia nervosa. Cognitive deficits found in the patients can be discussed based on two research models:

One aspect consists of the theories focusing mostly on the brain neurotransmitter mechanism (dopamine, noradrenaline) underlying the normal and pathological eating behaviours. PET study (Wang et al., 2001) has proven the involvement of brain dopamine (DA) in normal and pathological food intake in humans in the PFC. Catechol-O-methyltransferase (COMT) enzyme that metabolises the released DA mostly in the PFC, and one of its genetic polymorphism is associated with PFC DA activity and have this COMT polymorphism was related to performance on the Wisconsin card sorting test (WCST) of set-shifting (Egan et al., 2001). These findings suggest that sub-optimal performance on the tests assessing the PFC based executive function can be associated with modified brain dopamine turnover in the PFC area in obesity.

Other aspect is based on the question of the human motivation and reinforcing behaviours as eating is a highly motivated behaviour (Sigal & Adler, 1976). In his Reinforcement Sensitivity Theory of personality, Gray (1987) described two main systems, the Behavioural Approach System (BAS) and the Behavioural Inhibition System (BIS). The BAS is sensitive to appetitive stimuli and activates approaching behaviours (go and buy cookies) in response to cues for reward (nice cookies) or non-punishment (nobody can see me now). The BIS is sensitive to aversive stimuli, punishment (my weight) and the omission/termination of reward (cookies did not taste good) leading to behavioural inhibition (refuse to buy that cookies). BIS can be associated with psychological distress and comes together with anxiety and heightened information processing (Corr, 2002). Flexible goal-directed behaviour requires adaptive cognitive control by which human performance is optimised in different environmental challenges (Ridderinkhof et al., 2004). Reward/non punishment or punishment/omission of reward is used to regulate behaviour. Our results suggest that obesity can be associated with the higher sensitivity to reward and inhibition problem in obesity, which is underlying higher BAS activation. These finding is reinforcing the hypothesis of Hernandez and Hoebel (1988) supports the addictive nature of obesity. While in anorexia it seems that anxiety caused perseveration reflects rather on the higher BIS activation which is driven by the fear of punishment. Trait anxiety, manifesting in the persistence with habitude and a staunch resistance to change (Vitousek et al. 1998) are considered to represent parts of one underlying construct that drives anorexic behaviour.

Emotional functioning

We have found altered treatment of emotional information in obesity and anorexia. However, the hypothesis about the **similar dysfunction in the treatment of the negative emotions in obesity and anorexia nervosa was not confirmed**. Our results revealed that obese patients had the problem to treat negative emotions specifically the sadness, while anorexic patients had a problem to treat the positive emotions like happiness. Our findings proved that obese patients are more sensitive to the positive emotions and the same time they ignore the negative emotions. This result suggests higher BAS activation and the role of the reward sensitivity in obesity as it was described in the previous point. It seems that obese patients are prone to seek for

positive rewarding situations, while they ignore the future negative consequences. Explaining it in the other way they have problem to recognise the negative or punishing environmental cues, which are necessary in order to one could regulate his/her behaviour in a proper way. As eating behaviour is not just physiological need but also emotional-cognitive processes based choice, obese people would make choice based on mostly its rewarding values. In contrary to the obese patients, anorexic patients are more sensitive to negative emotions specifically those one which represent possible threats such as anger. Our results showed that psychological distress influenced positively the sensitivity to negative emotions. It seems that anorexia nervosa have more common mechanism with the anxiety disorders than obesity regarding treatment of the negative emotions.

Body evaluation

The last hypothesis was focused on the body shape evaluation explicit vs. implicit in obesity and anorexia nervosa. The explicit evaluation of body shapes in the obese group and the control group was identical. The distortions of the body figure recognition on the body figure scale in the obese group suggest that obese people have a need to fulfil the environmental expectations. While patients with anorexia nervosa judged the normal and overweight body figures differently from the control people. Regarding implicit evaluation there was a different between obese, anorexic and control groups. Obese patients evaluated implicitly more positive the overweight body figures than controls. Implicit measures are used to assess someone's evaluation or preference toward an object independently from the possible influence of the social expectation and the subject's own desire to fit for the environmental exigencies. It seems that independently from the social pressure on the slim ideal obese patients would prefer the overweight feminine type of body shape. However, fat phobia presents in anorexia nervosa even in the implicit body figure evaluations in comparison to control participants. According to the theory of Vartanian (2005) patients with anorexia nervosa are internalized the societal standards concerning slim type of body shape and the importance of the physical appearance.. This fact could explain why patients with anorexia are blind to the drawbacks of their underweight status and they are not aware of the future consequences of the diseases. Therefore, patients generally refuse the collaboration with their doctors or even with their families. Our findings confirmed partially this theory, beside both explicit and implicit evaluations of the body figures were similar, anorexic group did not judge positively the underweight body figure. In contrary to the anorexic patients, most probably obese patients have a problem internalizing the social standards and exigencies concerning slim beauty ideal and they refuse the idea of physical appearance as the unique source of the social success. However, at the same time they show difficulty coping with these social exigencies either which can be the cause of their depression status.

Flip side?

We have found **different psychological mechanisms in the pathology of restrictive anorexia nervosa and stable obesity**. The continuum model proposed the existence of a linear spectrum based on eating behaviour (from the restriction to overeating), and from body weight (from underweight to obese). Our results suggest that restrictive anorexia nervosa has several common features with anxiety disorder or affective disorders, while obesity most probably can be associated with addictive pathologies.

Novelty in the study

However, eating disorders (anorexia or bulimia) nowadays are well defined psychiatric illnesses in the DSM-IV; obesity is still considered mostly as a “calorie intake” problem. In this thesis we examined obesity from a new aspect by investigating neuropsychological and affective factors (e.g. attitudes, mood, affectivity), which might play a role in the pathology. Furthermore, until now the emotional functioning in eating disorders were measured mostly with questionnaires and cognitive tasks. In our study we assessed the first time the implicit treatments of facial emotions applying the priming paradigm in anorexic and obese patients groups. Finally, to date no implicit task using body figures as a prime was conducted with eating disorder patients. It is the first time when the implicit evaluations of the body figures were measured with affective priming in obesity and anorexia nervosa.

Therapeutic proposals

The current clinical treatments of the eating disorders included the anorexia nervosa and the obesity are mostly focusing on the external control of the behaviour (quality and quantity of the food consumed, weight loss or gain) of these patients. Our results revealed complex characteristics involving cognitive functions, emotions and body image which are associated with the pathology of the eating disorders. Based on our results we propose that emotional (alexithymia, reward and punishment sensitivity in emotion processing) and cognitive (attention, cognitive control) processes together play a role in the development of eating disorders and manifesting in the body weight disturbances. In the future it would be useful to investigate and develop such a complex treatment, which takes into account primary the cognitive and emotional processes together.

- **In the treatment of the obesity** it should probably be integrated the problem of the cognitive control and the treatment of the negative emotions. It would be necessary to improve obese people internal control and the sensitisation of negative feelings which might be linked to punishment. Other important component could be to bring into surface the implicit positive evaluation of the feminine body shape in obese patients and help them to realise a healthy body image together with a self acceptance. Decreasing the differences between implicit (internal preference) and explicit (social pressure) body evaluation could help to treat the sever depression in obesity too.
- **In the treatment of the anorexia** it would be useful to focus on the high need of cognitive control by reducing the anxiety (for example using techniques such as relaxation, imagination, yoga, meditation). It could be important to drive anorexic patients toward positive feelings and improve their sensitivity to reward. We suggest that negative evaluation on body shapes and high body dissatisfaction are associated with the lack of the treatment of positive situation and over-focusing on negative (specifically hostile) situation.

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Articles related to the thesis:

- Cserjési R, Luminet O, Molnár D, Lénárd L (2007). Is there any relationship between obesity and mental flexibility in children? *Appetite* 49 675-678. IF: 1.7
- Cserjési R, Luminet O, Lénárd L. (2007). Reliability and factor validity of the Hungarian translation of the Toronto Alexithymia Scale in Undergraduate student samples. *Magyar Pszichológiai Szemle* 62/3.
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- Cserjési R, Luminet O, Vermeulen N, Maréchal C, Nef F, Simon Y, Lénárd L. Explicit Versus Implicit Body Image Evaluations in Anorexia Nervosa. *Under revision in Psychiatry Research* IF:2.3
- Cserjési R, Lénárd L, Luminet O. Executive functioning and egocentric mental rotation in Anorexia Nervosa. Do negative attitudes and mood moderate cognitive capacities? *Submitted*
- Cserjési R, Luminet O, Vermeulen N, Poncelet AS, Lénárd L. Do obese females really want to lose weight? Explicit and implicit attitudes towards body shape in obesity. *To be submitted*
- Cserjési R, Vermeulen N, Luminet O, Maréchal C, Nef F, Simon Y, Lénárd L. Alexithymia and the treatment of facial emotional stimuli in Eating Disorders. *To be submitted*

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