

The relation between the adequacy of visual body mass estimation and weight reduction in overweight people (Body percept and weight reduction)

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Summary

Aim. To assess whether visual perception of body mass correlates with objective body mass and whether the adequacy of a body percept is connected with losing weight.

Materials and Methods. The research group consisted of 150 overweight adult women, participants of out-patient weight loss therapy. The silhouette test and the body mass assessment scale were used to measure body percept.

Results. Self-estimation of body mass measured with the silhouette test was significantly adequate ($\chi^2=64.027$; $P<0.001$). The correlation between body mass reduction and the adequacy of perceived Body Mass Index (BMI) at the beginning of the therapy, appeared both in the assessment scale ($R=0.176$; $P<0.05$) and the silhouette test ($R=0.207$; $P<0.05$). A significant difference in the effectiveness of weight loss therapy between participants perceiving their initial body mass adequately and inadequately, appeared in the assessment scale ($Z=-2.527$; $P<0.05$) and in the silhouette test ($Z=-2.152$; $P<0.05$).

Discussion. Body percept is influenced by many factors and the accuracy of body mass estimation affects the motivation to lose weight.

Conclusions. Visual methods are more accurate in estimating subjective body mass than conceptual methods. There is a relation between the adequacy of initial body percept and the effectiveness of weight loss therapy.

body percept / obesity / weight loss therapy / adequacy of perception

INTRODUCTION

Body mass is one of the main factors determining human appearance. The others are: sex, age, race or general attractiveness. The physical appearance influences attitude to oneself, life activity, relationships with other people or happiness level [1, 2]. Information on objective body mass is obtained by means of electronic scales, the current Body Mass Index (BMI) or clothing size.

As well as this, people have subjective knowledge of themselves including the knowledge of their own bodies. It is an image of one's body i.e. body percept being an internal image of shape and size [3, 4]. It is based on both objective factors and individual beliefs, attitudes, images, emotions and opinions of other people. Some researches indicate that the correlation between objective and subjective assessment of one's own attractiveness in women is very low [5].

Assessment of body weight or size proves frequently inadequate to reality, it is likely to be lowered or increased. This is the case when somebody assesses their own body based on their own mirror image. Inadequacy can be caused by a number of factors such as, for ex-

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ample: emotional state, psychological functioning or objective problems. The emotional state directly influences the attitude towards one's own body. Positive emotions increase satisfaction with the body and its parts. Negative emotions and states e.g. anxiety or depression cause one's own body to seem less attractive, healthy or beautiful [4, 6, 7]. Psychological functioning is, among others, related to cognitive structures (e.g. opinions concerning one's own appearance and body mass, attitude towards oneself), protective mechanisms (e.g. displacement or rationalisation) or psychic disorders causing distorted perception of one's own body (e.g. *dismorphophobia*) [5, 8, 9]. Moreover some authors also suggest that methods of body size assessment based on the mirror image are debatable. It results from the fact that the mirror image is smaller by half in comparison with the actual size and it is reversed [10]. The objective cause for the incorrect assessment of size or shape of one's own body may be neurological or psychiatric diseases (e.g. *autopagnosis*, *asomatognosis*, *dismorphophobia* or eating disorders) somatic diseases (e.g. long-lasting immobilisation, disability, chronic diseases).

Adequate or overestimated assessment of one's own body mass resulting in psychic discomfort seems to be the obvious reason for starting a weight loss therapy by obese people. The research shows that the obese searching for treatment, in contrast to those not interested in treatment, experience a higher level of: stress, depression, interest in body, worse subjective opinion of one's own health, lower self-respect, fewer positive emotions towards oneself as well as lower fitness level [11].

However, medical practice indicates that another frequent reason for starting weight loss therapy, apart from medical and psychological conditions, is pressure on the part of family, society or culture. The model of physical attractiveness promoted by mass media is very restrictive, especially for women. It shows young, beautiful, slim bodies [1, 2, 12]. These prerequisites cause some obese people to start fighting obesity due to social pressure; however, it is done without internal conviction that it is necessary. If this is the case, declaring the intention of body mass reduction can be in contradiction to the sense of self-efficacy. It is a subjective personal conviction

that this activity will result in success, thus will enable achievement of the intended goal [13]. The low level of self-efficacy decreases motivation to persevere with health-oriented activities e.g. slimming treatment in the obese increases the risk of failure to slim.

The purpose of the conducted research was to check if the body mass perceived in the mirror by the overweight people searching for treatment is adequate to reality, in other words if it is adequate to the objective body mass and if the adequacy of the perceived body mass is related to the effectiveness of weight loss therapy.

SUBJECTS AND METHODS

The research group consisted of 150 overweight women who started a complex obesity treatment. The average age was 43 years \pm 14 years, the average body mass at the beginning of the treatment was 98 \pm 16 kg, and the mean BMI was 37 \pm 6 kg/m². The majority of the women had a secondary education and were not employed. Most of them had a permanent partner and two children.

Four research methods have been applied:

1. the assessment scale (own method),
2. the silhouette test [14],
3. the objective BMI estimation and
4. the questionnaire related to chosen demographic and medical aspect, constructed especially for the study.

The assessment scale was used to assess the body weight. It was a four-point scale with the following reference points:

1. slim;
2. normal;
3. overweight;
4. obese.

The instruction suggested that a respondent should choose the term which best describes the way she perceives her body in the mirror. The participants based this choice on the subjective understanding of the particular terms. The choice of a given term meant that numerical value was assigned to each patient, this val-

ue was regarded as the subjective BMI on the applied scale.

The silhouette test in the form of the Figure Rating Scale (Stunkard, Sørensen, Schulsinger, 1983). It consists of nine female silhouettes placed next to one another according to increasing body weight. By using the method of competent judges (60 randomly chosen women, mean age 28.3 ± 9.7 yrs, W. Kendall's coefficient of conformity: 0.94127) and terminology referring to the size of body mass the following categories of silhouettes have been distinguished:

- a. slim (pictures 1 and 2);
- b. normal (pictures 3 and 4);
- c. overweight (pictures 5 and 6);
- d. obese (pictures 7, 8, 9).

Next, in accordance with WHO directives [6] respective BMI range was assigned to each picture 1<18 BMI; 2=18–19 BMI; 3=20–21 BMI; 4=22–24 BMI; 5=25–26 BMI; 6=27–29 BMI; 7=30–34 BMI; 8=35–40 BMI; 9>40 BMI. The instruction for the test suggested that the participants should choose the silhouette that would best correspond to their mirror reflection in relation to the body size. The choice of a particular picture meant that numerical value ranging from one to four was assigned to the patient, as a subjective BMI value in the silhouette test.

The objective BMI was estimated by dividing the current weight value (in kilograms) by the squared height value (in metres). According to the WHO directives objective BMI could be assigned to one of the following ranges:

- a. slim (BMI<18-19);
- b. normal (BMI=20-24);
- c. overweight (BMI=25-29);
- d. obese (BMI>30).

Patient's placement within a particular BMI range led to attribution of a specific numerical value (ranging from 1 to 4) as a value of objective BMI. Results of all the applied methods of one's own body ranged from 1 to 4 (Tab. 1).

Table 1. Categorization of body mass measures.

<i>categories (M)</i>	1	2	3	4
<i>terms of assessment scale</i>	slim	normal	over-weight	obese
<i>pictures of silhouette test</i>	1-2	3-4	5-6	7-9
<i>range of BMI</i>	<18-19	20-24	25-29	30-40<

PROCEDURE

During the first research stage 150 women starting therapy were examined. Their objective BMI was determined by means of electronic scales. Perceived BMI was determined by the described research methods. The participants estimated their subjective body mass on the basis of their mirror image. The mirror showed the whole silhouette, the participants were standing in an upright position and without outdoor clothing. The participants who succeeded in weight loss by 5%, 10% and 15% were qualified for the next stages. The final examination time amounted up to 15 months.

SPSS statistical package has been used for statistical analysis of the collected data as well as descriptive statistics, R-Spearman correlation coefficient, compatibility test χ^2 (χ^2) and Mann and Whitney test.

RESULTS

The average objective BMI of the participants examined at the beginning of the slimming treatment reached the value $M=3.91 \pm 0.30$ which indicates obesity. The average perceived BMI reached $M=3.41 \pm 0.55$ (overweight) in the assessment scale and $M=3.82 \pm 0.44$ (obesity) in the silhouette test.

The correlation between the perceived BMI and the objective BMI has been observed in the assessment scale ($R=0.33$; $P<0.001$) and in the silhouette test ($R=0.43$; $P<0.001$).

In order to determine if the BMI perceived is adequate to objective BMI, in other words if it is compatible with it, the χ^2 compliance test has been used. Self-evaluation of body mass measured by the scale marking showed a tendency

toward inadequacy (incompatibility with the objective BMI). However, the difference between self-evaluation and objective BMI was not statistically significant. Self-evaluation measured by the silhouette test proved relevantly adequate i.e. compatible with the objective BMI ($\chi^2=64.03$; $P<0.001$) (Tab. 2).

Table 2. Adequacy of perceived BMI to objective BMI.

Method	Number of estimations		Test*	
	adequate	inadequate	χ^2	P
assessment scale	71	79	0,43	n.s.
silhouette test	124	26	64,03	<0.001
n=150				

From among the 150 participants who started the weight loss program, 113 participants (75.33%) qualified for the second research stage (5% reduction of the initial body weight), 80 participants (53.33%) for the third stage (10% reduction) and 49 participants (32.66%) for the fourth stage (15% reduction).

Low but relevant and positive correlation was observed between the amount of body mass reduction in the weight loss treatment and the adequacy of the BMI perceived to the value of objective BMI at the beginning of the treatment. The relationship between those variables was observed both in the assessment scale ($R=0.18$; $P<0.05$) and the silhouette test ($R=0.21$; $P<0.05$).

The conducted Mann-Whitney test showed a difference in the body mass reduction in the patients who, at the beginning of treatment, perceived their body mass adequately to reality (according to the objective BMI) and those with inadequate perception. Significant difference was observed in the assessment scale ($Z=-2.53$; $P<0.05$) and in the silhouette test ($Z=-2.15$; $P<0.05$) (Tab. 3).

Table 3. Lost kilograms depending on initial body mass estimation.

Method	Number of estimations	n	Test	
			Z	p
assessment scale	inadequate	79	-2.15	<0.05
	adequate	71		
silhouette test	inadequate	26	-2.53	<0.05
	adequate	124		

In the participants who adequately assessed their initial body mass on the basis of their mirror image the body mass reduction was significantly higher than those with inadequate body mass perception (usually slimmer than in reality). Mean reduction of body mass in the participants who adequately assessed their initial body mass in the assessment scale was 2.45 kg (0.91 BMI) higher than those inadequately assessed. In the participants who adequately assessed in the silhouette test mean reduction of body mass was 4.3 kg (1.69 BMI) higher in comparison to inadequately assessed.

DISCUSSION

Initial objective body mass of all the participants indicated obesity. Adequacy of the subjective body mass assessment to the objective assessment depended on the applied research method. The assessment based on the semantic code of processing information i.e. using labels defining body size (the assessment scale) encouraged underestimation, which means that the participants described their body as slimmer than in reality and most frequently referred to it as overweight rather than obese. Probably it is caused by different interpretation of the applied terms and attempt to avoid identification with those denoting negative meaning. In the western culture the obesity is associated with negative features such as: laziness, lack of control or lack of care for oneself [15, 16].

The visual code of processing information i.e. comparison of one's own body with the drawn silhouettes (the silhouette test) encouraged higher adequacy of the assessment, which means that the participants more frequently chose the silhouettes whose BMI indicated obesity. The sight of particular silhouettes probably stimulated clear assessment of one's own body mass similar to the weight indicated by electronic scales or clothing size.

Higher accuracy of the assessment achieved in the silhouette test than in the assessment scale was probably caused by anxiety experienced by the patients that is related with their social assessment. Using the terms defining their body mass size, the participants could more easily defend their assessment by referring to the fact that

other participants are more obese and the term obese refers just to them. The silhouette test is less flexible for interpretation. Comparison of one's own mirror reflection to a particular picture is much clearer. Underestimation in this case may result from lack of objectivity or too high self-assessment, which in Polish culture is negatively perceived because of traditional values provided by religion and nurture. They advise women especially the features like modesty, honesty, merits detract or self-criticism [17]. Due to more adequate body mass evaluation, the silhouette test is one of the most frequently used methods in one's own body percept [18, 19, 20].

The data obtained in the research suggest a positive correlation between adequacy of one's own body assessment and the degree of body mass reduction during the weight loss programme. This shows that the more adequate was subjective assessment of one's own body seen in the mirror, the better results of the weight loss therapy were. Furthermore, the difference in the number of lost kilograms between the patients with adequate and inadequate assessment was significant. This result has important clinical implications concerning obesity treatment. It suggests that psychological aspects are necessary, especially the body image issue. Mental image of one's own body could influence the motivation for changes. Taking into consideration cultural beauty standards [12] and medical standard indicators [21] adequate assessment of one's own body as slim as well as underestimation of body size by an overweight person encourages a positive evaluation of one's own physical appearance and positive self-assessment. In the case of overweight, however, it can significantly decrease motivation to start and persevere with the weight loss therapy. A person's relief that his or her weight is lower and that she/he is slimmer than others perceive it, encourages self-satisfaction and lower control in dieting behaviour. But also the person who excessively overestimates his or her body mass can have low energy for loss of weight. Negative body image is connected with negative self-assessment, low self-esteem and self-efficacy, so the hope and belief in positive change could be very low too.

The research has shown, that mood effects whether positive or negative, both involve a disinhibition of eating control [22] and that even re-

strained dieters consumed significantly less in a negative mood state than when in a positive mood state [23]. On the other hand, the awareness of being overweight or only conviction that someone is overweight causes negative emotions and in some cases even emotional or behavioural disorders [24, 25]. Nevertheless, it may also encourage this person to look for remedies e.g. to start and persevere with a weight loss therapy.

Relating the data obtained in the research to clinical practice, it can be assumed that examining body percept seems to be advisable in overweight patients. If the inadequacy in one's own body mass assessment occurs, therapeutic work seems to be essential, which would aim at bridging the gap between subjective and objective body mass assessment. The obtained data suggest that it might be a factor increasing effectiveness of an undertaken weight loss therapy. But one needs to remember that the confrontation with facts concerning one's own body mass and appearance could be difficult and evoke many negative emotions, even a psychological crisis. It is necessary to provide a patient with some kind of emotional support, the possibility of emotional expression and the assistance in reconstruction of self-image.

The basic therapeutic directives in this area refer to patients' confrontation with their image in the mirror, photos or video films as well as comparison of size and weight of one's own body with appearance of other people. The purpose of the therapy is objectification of patient's appearance perception. For most overweight patients these activities are unpleasant, they cause negative emotions and destructive opinions in relation to themselves and therefore they are avoided. It partly decreases the stress related to the overweight, but, at the same time it decreases awareness of one's own physical appearance. A possible consequence of this is uncontrolled dieting behaviour (mainly overeating) according to the saying: 'I see no problem so there's no problem. There's no problem so I can eat as much as I wish.' In this case a secondary effect occurs, which is lack of motivation to start and persevere in leading a constructive lifestyle including, among other things stabilization of body weight at a level conducive to good physical functioning as well as psychic satisfaction.

This paper focuses on the relationship between objective and subjective body mass assessment (weight and size). Limitations are related to the applied research methods that are not validated. Potential research should concentrate on the application of a more complex methodology, in particular research methods with defined reliability and accuracy.

CONCLUSION

In the presented study it was proved that the assessing subjective body mass with the use of visual methods is more accurate (adequate to the objective body mass) than by means of conceptual methods. Besides, a relationship was observed between adequacy of the perceived body mass at the beginning of the slimming treatment and extent of initial body mass reduction in the course of therapy. The more adequate was the subjective assessment of one's own body seen in the mirror, the better results of the weight loss therapy were.

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