



**Eating Disorders and Body Image Perception: Can the distorted body image perception of individuals at risk for developing an eating disorder affect the way they estimate the body image of others?**

Yvoni Konstantinidou

Psychology Department, University of Cyprus

Thesis Defense

Dr. Maria Karekla

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Yvoni Konstantinidou

## Abstract

### *Background and Aims*

Dissatisfaction with body image is a very common concern, mainly among females across different age groups especially in Western cultures. While a large number of studies suggest that body image dissatisfaction might be linked to distorted body perceptions and experimental studies reported discrepancies between individual's own body image and ideal body image, normative perceptions of human body sizes (e.g., the ability to correctly perceive human bodies in terms of normality) have not been investigated. For this reason, it is important, to assess whether individuals on the trajectory towards an eating disorder tend to overestimate only their own shape, or they present with distortions in their perception of others' bodies or even inanimate objects, thus examining if it is an issue of distorted perception in general or an issue specific to ones' body and weight. This study examines females at risk of developing an eating disorder to investigate whether distorted perception may be pre-existing and associated with body image dissatisfaction. This study also investigated distorted body image perceptions of individuals at high and low risk of developing an eating disorder and the role of psychological flexibility, in relation to body perception among high and low risk individuals.

### *Method*

Potential participants (N=125) completed electronically a screening questionnaire. Eligible participants (N=125; 80 low-risk and 45 high-risk) were then scheduled to come to the ACT<sub>Healthy</sub> laboratory for the experiment where they completed an object (vase) estimation task and then were asked to rate eighteen mixed male and female body figures (nine male, nine female) based on the Stunkard Figure Rating Scale (Stunkard et.al., 1983). Subsequently, they also rated their own figure against a series of figures (from very thin to very fat). At the end, they identified the object seen at the beginning from an array of different 5 vases which varied in size.

### *Results*

Overall, the findings of the present study support that there are no differences in the perception of own body estimation between individuals at high risk of developing an ED and those at low risk. Secondly, it indicates that individuals at low risk can better perceive the actual size and shape of other bodies while high-risk individuals misperceived the body shape of others. Thirdly, our results point out that both high risk and low risk individuals had an accurate perception of the shape of an object. Finally, groups differed on psychological flexibility with women at high risk for developing an eating disorders having lower psychological flexibility compared to those in the low-risk group who had higher levels of psychological flexibility.

### *Conclusions and Recommendations*

Results of the present study, support the assertion that the accuracy of body image estimations is not exclusively a defining factor of eating disorders as these estimation inaccuracies are a phenomenon also found among the general population. From the present

study's findings, a set of further questions is open up. If body image distortion is not due to any perceptual deficit and body size estimation, may be influenced by other factors. Future research it would be useful to specified those factors and the extent to which each can manipulate the body perception process but also to explore other factors that may be responsible for differences between healthy individuals and patients with ED in estimating others bodies. It is proposed that developing a greater understanding of the degree and nature of body estimation accuracy in healthy and clinical populations will provide invaluable information in our understanding of body image disturbance, and so inform intervention and prevention programs in this area.

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**Eating Disorders and Body Image Perception: Can the distorted body image perception of individuals at risk for developing an eating disorder affect the way they estimate the body image of others?**

Eating disorders (ED) are severe mental conditions that cause impairments in psychosocial functioning and/ or physical health (Schmidt et al., 2016). Patients diagnosed with anorexia nervosa (AN), bulimia nervosa (BN) and Other Specified Feeding or eating disorders (OFSED) often report suffering from an unbearable feeling of being too fat, despite having a healthy body weight or even being (severely) underweight (Crow & Eckert, 2016). This incorrect notion of one's own body size or shape is called body image disturbance (BID) and found to be a key feature in AN, BN and OFSED (Bernacchi, 2017; Caspi, et al. 2017). According to Vossbeck-Elsebusch and colleagues (2013), body image disturbances encompass distortions in cognition, affect, perception, or behaviour related to body weight or shape. Specifically, they may refer to negative thoughts or negative evaluation regarding one's own body, negative affect in response to one's own body, misperception of body related stimuli, and specific body-related behaviors (e.g., checking or avoidance) (Overas, Kapstad, Brunborg, Landro, & Lask, 2014; Caspi, et al. 2017). Perceptual distortions are considered as a type of cognitive bias, which describe systematic errors in the processing of information (i.e., information processing biases) ( Wyssen, Bryjova, Meyer, Munsch, 2016). These cognitive biases may affect different domains such as attention, perception, or memory and may foster symptoms of mental disorders, because they determine what people notice, attend to, and remember. Particularly in ED's, perceptual biases related to body weight or shape (e.g., systematic misperceptions or judgement errors) have been proposed to reinforce disturbed body image experiences (Brooks et al., 2012).

Existing literature suggests that there are differences between individuals with an ED and healthy individuals in the way they perceive their body (Martus et al., 2009; Salbach, et al, 2007; Schneider et al, 2009). A study by Schneider, Frieler, Pfeiffer, Lehmkuhl, and Salbach-Andrae (2009) examined a large sample of inpatients and outpatients with both AN and BN as well as healthy female adolescents controls. Their results showed significant differences between eating disorder patients and controls. While controls were mostly accurate without an overestimation of body parts, adolescents with an eating disorder reported on average 30% overestimation. Body size estimation was assessed with the Body Image Distortion in Children and Adolescents test (BID-CA; Schneider, Martus et al., 2009), which provided body distortion indices for the upper arm, waist, and thigh. The same body-image distortion assessment technique (BID-CA) was applied by Salbach, Klinkowski, Pfeiffer, Lehmkuhl, and Korte (2007) in 58 adolescent patients with AN who were compared to 56 high school girls without an ED diagnosis. They found similar results, of greater overestimation of body parts in patients with ED, in particular waist and thigh, compared to adolescent girls without an ED.

In general research supports that female patient with an ED tend to overestimate particularly their own appearance and to some extent other female figures (Blodgett, Jones, Haugen, & Schaefer, 2015) whereas only a minimal distortion is found for non-human figures (Benninghoven et al. 2007). In their study Benninghoven et al. (2007), asked participants (62 patients with anorexia, 45 patients with bulimia and 40 female and 39 male control participants) to estimate their own body size. The results showed that body size overestimation was most distinct in the two patient groups, especially in patients with anorexia nervosa. In their study Benninghoven et al., (2007) used a computer program, the Somatomorphic Matrix SMM in order to measure body image perception of participants. The SMM appears to offer the advantage of measuring body image perception according to

separate axes for fat (Gruber, Pope, Borowiecki, & Cohane, 2000). Furthermore, Ferrer-García and Gutierrez-Maldonado (2008) showed that individuals considered at risk of developing an ED showed greater overestimation of body size in comparison to a not-at-risk group. In order to analyse body psychometric characteristics, authors used the Body Image Assessment Software (BIAS).

On the other hand, Probst et al. (1998) studied body size estimation in 100 female patients with restrictive anorexia nervosa, 20% of whom showed overestimation which suggested that body image misperception (also referred to as body image distortion) is found in people affected by anorexia as well as in non-clinical populations. A possible interpretation of their findings is that overestimators are a subgroup with a worse prognosis than the other subgroups (Probst et al, 1998). Thus, overestimation could be a prognostic factor for worse outcomes in individuals presenting ED pathologies. A few authors propose that there is rather a great variability in estimation in patients with eating disorders, i.e., over- as well as underestimation (Ricciardelli et al., 2006; Cash, Pruzinsky, 2004). Ricciardelli et al. (2006) used a digital body image computer program in order to investigate whether women and men without EDs overestimate or underestimate their body size. Results showed that both men and women tend to overestimate not only their body size but also the size of a neutral object (a vase).

Although the majority of studies (Benninghoven et al. 2007; Ferrer-Garcia and GutierrezMaldonado 2008; Roy and Meilleur 2010; Overas et al. 2014) agree that there is a difference between patients with EDs and patients without an ED, in the way they perceive their body shape, others have been unable to replicate these results (Cash, Pruzinsky, 2004; Philips 2004; McCabe, Ricciardelli, Sitaram, Mikhail, 2006; Waller & Barnes, 2002). Discrepancies across studies may be due to methodological differences, such as the type of apparatus used to measure estimation of body. A meta-analysis of 33 body size estimation



studies was conducted to investigate whether methodological differences do indeed influence outcome (Smeets, 1998). Although a difference in mean effect size was found between studies using Body Parts methods and Whole Body methods, this analysis revealed a general overestimation of body size among ED patients. Also, it is important to note that differences in estimation occur when individuals use self-reports versus computer programs (Stewart & Williamson, 2004). While a large number of studies reported discrepancies between individual's own body image and ideal body image, normative perceptions of human body sizes (e.g., the ability to correctly perceive human bodies in terms of normality) needs to be further explored. For this reason, it is important, to assess whether individuals on the trajectory towards an eating disorder tend to overestimate only their own shape, or they present with distortions in their perception of others' bodies.

### ***Psychological Flexibility and Body Image Perception in EDs***

According to Hayes et al. (2006), Psychological Flexibility (PF) is “the ability to contact the present moment fully as a conscious human being, and to change or persist in behavior when doing so serves valued ends” (p. 7). In other words, people with high levels of Psychological Flexibility have the ability to experience private events without trying to judge, evaluate, avoid, fix, down-regulate, or change them, while spontaneously engaging in value-directed activities at the same time (Hayes et al., 2006).

Psychological Flexibility (PF) seems particularly relevant for the link between disordered body perception and poor psychological outcomes (Hayes et al., 2006). According to prior research the distorted image that a person maintains about their own body is associated with their dissatisfaction with it (Cowdrey & Park, 2012; Koushiou et al., 2019). It is also argued that the inability of individuals to escape from negative thoughts about themselves may affect negatively the perception of their body (Levin et al., 2014; Masuda et

al., 2010). Further research, suggested that lower levels of PF and specifically its component of experiential avoidance are evidenced in people with active anorexia symptoms as compared to controls and people who recovered from anorexia (Davies et al., 2013; Merwin et al., 2010a). According to Koushiou,, Loutsiou and Karekla (2021), low levels of PF in teenage girls, found to be a significant mediator in the relations between body dissatisfaction, social comparisons based on physical appearance and eating pathology while it fully mediates the relationship between higher Body Mass Index values and eating (Koushiou et al., 2021). Additionally, subclinical levels of ED pathology significantly predict PF among college students (Koushiou et al, 2019), while Body-Image Inflexibility (a domain-specific type of PF focusing on body-image issues and disordered eating) serves as a mediator between ED risk factors (such as body dissatisfaction) and the severity of eating pathology among female college students (Sandoz et al., 2013, Trindade & Ferreira, 2014).

Following the above, it seems that the link between eating related-cognition and poor psychological outcomes is well established (Cooper et al., 1997; Fairburn, 2008). However, the link between Psychological Flexibility (PF) and distorted body image perception needs to be investigated. According to Hayes et al (2006), PF is inversely associated with various forms of negative psychological problems (Hayes et al., 2006), among them, the distortion in the image of the individual body. Because of its pervasive nature across diverse psychological problems this study, tries to explore in depth the role of PF by examining whether it relates to the individual's perception of its body.

### **The Present study**

In an attempt to determine whether Psychological Flexibility (PF) related to the risk of developing an eating disorder, this study compared the Psychological Flexibility levels of individuals at high risk of developing an ED with those at low-risk of developing an ED.

Bearing in mind that the research on distorted body image perception is limited, we considered important to investigate the groups of people who maintain a distorted perception of their own bodies, and to explore whether this distortion in perception is generalized in cases where these individuals judge other people's bodies. It will be important, to assess whether individuals at high risk of developing an eating disorder, tend to overestimate only their own weight, believing that they are larger than they actually are, or their perception of others' bodies is also distorted. Understanding whether people may perceive their bodies or others' bodies differently from how they really are, is important because it will help to start deciphering etiological parameters that may be related to cognitive factors which may affect perception. The present study, tries to add to the limited knowledge about the body distorted perception, by investigating women at high versus low risk of developing an ED. Specifically, this study tries to investigate whether participants at high risk of developing an ED maintain a distorted perception of their own bodies, and explore whether this distortion in perception is generalized in cases where these individuals judge other people's bodies. Furthermore, the role of psychological flexibility, in relation to body perception is examined. Specifically, this study, investigates whether psychological flexibility may be related to individuals' perception. Firstly, it is hypothesised that the perception of individuals at high risk of developing an eating disorder will be distorted not only in relation to the image of their own body but also in relation to the body of others. In other words, individuals in the high-risk condition, will be less accurate in their predictions about weight and body size. In contrast, individuals at low risk, are expected to accurately estimate and categorize not only their own body, but also the body size of others. Secondly, it is expected that women in the low-risk condition will have higher levels of psychological flexibility, whereas women at high-risk of developing an ED will have lower levels of psychological flexibility. Also, it is expected that individuals with high levels of PF will be more accurate in the perception about

their body compared to individuals with low levels of psychological flexibility. Thirdly, it is expected that individuals in the low-risk group will correctly identify the reference vase in the Object estimation task whereas those in the high-risk condition will be less accurate in their prediction for the reference vase.

## Methods

### Participants

The sample of the study consisted of 125 Cypriot and Greek women aged 18 to 25 years old ( $M= 21.63SD= 2.09$ ), who were judged to be at increased risk of developing an eating disorder ( $N=45$ ) and women at low risk of developing an eating disorder ( $N=80$ ). Participants were classified into high risk vs. low risk according to their scores on the Weight Concern Scale (WCS) questionnaire. Based on the literature, those who score equal or greater to 47 on the WCS are deemed to be at high-risk for developing an ED within the next 4 years (Killen et al., 1994; Lipson et al., 2017). In contrast, those who score under 47 are classified in the low-risk category. All participants were invited to the laboratory to complete the experimental part of the study. Exclusion criteria were: males under eighteen or over 25 years old and individuals who fulfil the criteria for Eds diagnosis (based on eating disordered diagnostic scale).

### 2.2 Procedure

Participants were recruited through psychology and other courses at the University of Cyprus via invitations to participate in research. Extra course credit was provided if offered by their professors.

First, potential participants completed a screening questionnaire electronically on Google Forms (<https://forms.gle/rYqNQD34y8tfLXC38>). Eligible participants were then scheduled to come to the *ACThealthy* laboratory for the experiment. Upon arrival at the

laboratory, each participant was greeted by a researcher who informed them about the study and asked them to complete an informed consent in a quiet room (Appendix 1). Then, participants were completed the following tasks: At the beginning an object estimation task was provided. Participants were first shown a reference vase (Figure 1) and were asked to memorise its size and shape and then proceeded to the other study tasks. At the end of the other tasks, they were asked to identify the vase seen at the beginning from an array of different 5 vases which varied in size (Figure 4). Then, they asked to rate eighteen mixed male and female body figures (nine male, nine female) based on the Stunkard Figure Rating Scale (Stunkard et al., 1983) through a PowerPoint presentation (Figure 2). In the third task participants had to choose from a series of figures (from very thin to very fat) the figure that they look more like their own body shape (Figure 3). Finally, the researcher measured their height and weight.

### 2.3 Measures & Apparatus

Screening questionnaires included:

The **Weight Concerns Scale** (WCS, Killen et al., 1994; Greek version: Papageorgiou et al., in preparation). WCS is a five statement self-report scale which detects the risk for developing an ED in the next four years. WCS was used in order to identify individuals at high risk for developing an ED. Scores above 47 are indicative of an increased risk of developing an eating disorder within the next 4 years (Lipson et al., 2017).

**Psy-flex** (Original English version: Gloster et al., 2022; Greek version: Paraskeva-Siamata, Spyridou, Gloster, & Karekla, 2018) is a short (10 item in its Greek version) self-report state and context sensitive measure of psychological flexibility assessing all facets of the construct of PF (Item examples are: “I determine what’s important for me and decide how I want to invest my energy”; I can look at hindering thoughts from a distance without having

them control me; I face myself/others with tolerance, benevolence and compassion; I engage thoroughly in things that are important, useful, or meaningful to me; If need be, I can let unpleasant thoughts and experiences happen without having to get rid of them immediately) for the past seven days. Items are rated on a scale from 1 = very rarely to 5 = very often and summed. Higher scores represent higher psychological flexibility. The Psy-flex was evaluated across four diverse clinical and non-clinical samples and supported a one factor solution and good psychometric properties (reliability: Raykov estimation range .78-.97; convergent, divergent, and incremental validity; Gloster et al., 2022). Cronbach's alpha for this sample was .81.

Figures and object estimation measures:

An **Object estimation task** using vase figures was created for the purposes of this study to match the shape of the figures used in the Figure estimation task (Figure 1,4) in order to investigate whether participants' perception is distorted in cases of non-anthropomorphic objects (i.e., regarding shape and size of the object).

Other body figures: Participants were provided with eighteen mixed male and female body figures (nine male, nine female) based on the Stunkard Figure Rating Scale (Stunkard et.al.,1983) through a PowerPoint presentation (Figure 2). Next to each figure there was listed six body size categories (extremely underweight, underweight, average, overweight, extremely overweight, obese) and participants were asked to circle the category that they believed matched to the figure.

Own figure estimation: Participants were presented with a nine female body figures scale and they had to mark the figure which they think looks more like their own body type (Figure 3). To assess body size perception about their own figure, a schematic figure rating based on the Stunkard Figure Rating Scale (Stunkard et.al.,1983) was used. The Stunkard

Scale has been increasingly implemented to evaluate body image perception and body dissatisfaction in different populations (Bays, Bazata, Fox , Grandy, Gavin, 2009; Conti, Ferreira, de Carvalho, Kotait, Paulino, Costa, et al., 2013; Ribeiro, Giampietro, Barbieri, Pacheco, Queiroz, Ceneviva, 2013). To assess body image perception, participants are asked to indicate the silhouette of the Stunkard scale, which mostly resembles their current body figure (Figure 3). Indicated silhouettes may also be classified into weight categories from underweight to obese and can then be compared with current BMI (Lynch, Liu, Wei, Spring, Kiefe, Greenland, 2009). The rating scale consists of silhouette drawings of female bodies ranging from very thin to very large. Based on measured height and weight ( $\text{BMI} = \text{kg/m}^2$  where kg is a person's weight in kilograms and  $\text{m}^2$  is their height in metres squared), weight status of the participants classified as underweight, normal weight, overweight or obese according to the Stunkard's BMI cutoffs was determined (Stunkard et.al., 1983). Figures 1 and 2 refer to an underweight status (BMI from 15 to 18.9.); figure number 3 and 4 refer to normal weight (BMI from 19 to 24.9) figures 5, 6 and 7 refer to overweight status (BMI from 25 to 29.9) and figures 8 and 9, refer to obesity (BMI from 30 to 39) (Figure 3).



Figure. 1. The reference vase used in the Object estimation task.

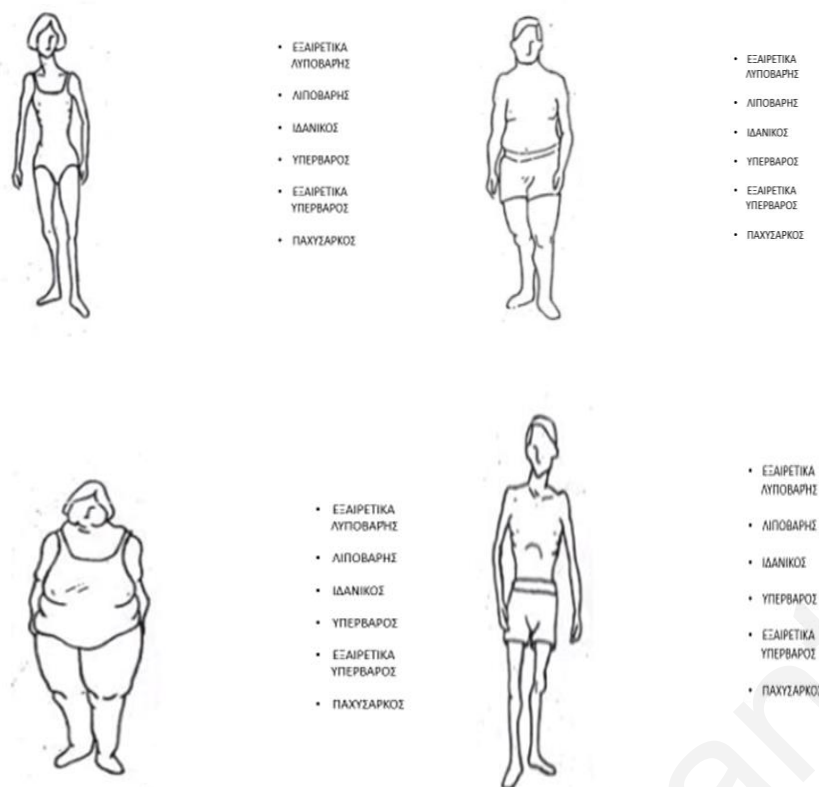


Figure 2. Examples from the slides of the Power – Point presentation with the eighteen mixed male and female body figures (nine male, nine female) based on the Stunkard Figure Rating Scale (Stunkard et al., 1983).

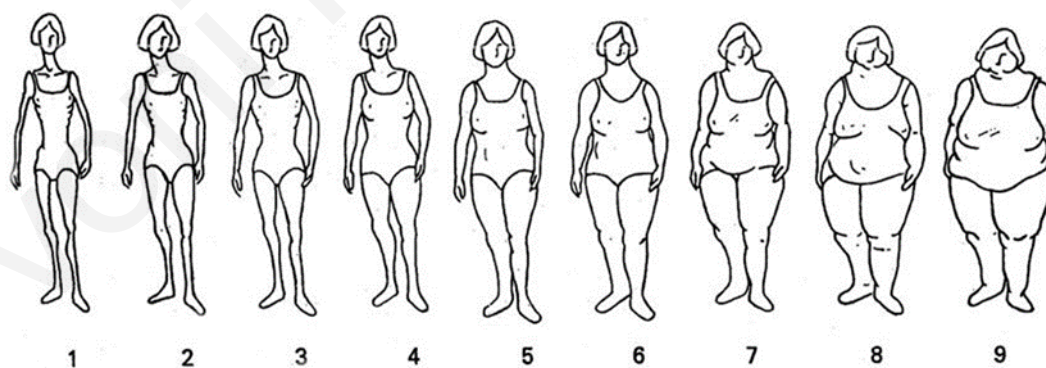


Figure 3. Nine female silhouettes of the Figure Rating Scale (Stunkard et al., 1983).



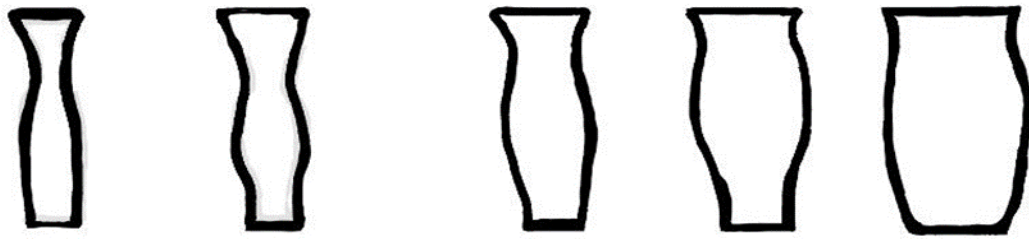


Figure 5. Vase figures used in the Object estimation task. Shapes of the vases designed based on the body figures used in the Figure Estimation task.

### Statistical Analysis

In order to compare the two risk groups (IVs; high risk and low risk) on the dependent variables (DVs: correct estimation of others' bodies, accuracy of self-figure estimation, accuracy of object estimation, psychological flexibility) independent samples t-tests were conducted. To investigate possible significant relationships between the dependent variables (DVs: correct estimation of others' bodies, accuracy of self-figure estimation, accuracy of object estimation, psychological flexibility), with the risk group as a control variable a Partial correlation was used. Participants' answers were used to explore 1) whether people at high risk of developing an ED maintain a distorted perception of their own bodies, and explore whether this distortion in perception is generalized in cases where these individuals judge other people's bodies, 2) whether psychological flexibility may be related to individuals' perception, 3) the perception of low and high -risk individuals in case where they need to perceive the shape of an object.

Preliminary analyses conducted to test assumptions of normality, where both the Kolmogorov-Smirnov and the Shapiro-Wilk tests used. The Shapiro-Wilk Test is more appropriate for small sample sizes (< 50 samples) but can also handle sample sizes as large as 2000. For this reason, we used the Shapiro-Wilk test as our numerical means of assessing normality. To decide whether parametric or non-parametric tests will be used, both the

Kolmogorov-Smirnov and the Shapiro-Wilk tests for normality of factors were used. Due to the relatively large sample (125 responses) and using the Central Limit theorem we could consider that the sampling distribution of the sample means of the variables approximately follows the normal distribution. Thus, parametric tests will be used for the purposes of this study.

## Results

### Demographic characteristics of participants and comparisons between the risk groups on the dependent variables.

Basic descriptive statistics for the three independent variables of this study: weight, height, and age, between the risk groups and the total are presented in Table 1. Participants had a mean weight of 57.51 Kg (low risk = 55.67 and high risk = 60.78), a mean height of 165.74 cm (low risk = 166.88 and high risk = 163.71) and a mean age of 21.63 years (low risk = 21.54 and high risk = 21.80). Basic descriptive statistics for the four dependent variables of this study are presented on Table 1. The mean percentage of correct estimation of others' bodies was equal to 59% (low risk = 67% and high risk = 44%). The mean percentage of accuracy of estimate of self-figure was equal to 67% (low risk = 71% and high risk = 60%), whereas the mean percentage of accuracy of object estimation was equal to 90% (low risk = 98% and high risk = 78%). Lastly, the mean psychological flexibility was equal to 23.50 (low risk = 24.00 and high risk = 22.00).

If we wish to label the strength of the association, for absolute values of  $r$ , 0-0.19 is regarded as very weak, 0.2-0.39 as weak, 0.40-0.59 as moderated, 0.6-0.79 as strong and 0.8-1 as very strong correlation, but these are rather arbitrary limits, and the context of the results should be considered (Evans, 1996).

*Table 1: Descriptive statistics for the demographic characteristics of participants and the dependent variables used in this study, between risk groups.*

	Low risk		High risk		Total	
	(N=80)		(N=45)		(N=125)	
	Mean	SD	Mean	SD	Mean	SD
Weight (kg)	55.67	5.71	60.78	12.48	57.51	9.06
Height (cm)	166.88	5.95	163.71	5.01	165.74	5.81
Age (years)	21.54	2.04	21.80	2.19	21.63	2.09
Correct estimation of others' bodies	0.67	0.09	0.44	0.10	0.59	0.15
Accuracy of self-figure estimation	0.71	0.46	0.60	0.50	0.67	0.47
Accuracy of object estimation	0.98	0.16	0.78	0.42	0.90	0.30
Psychological flexibility	24.48	2.79	21.78	3.94	23.50	3.49

Table 2 presents the preliminary analyses conducted to ensure no violation of assumptions. For the variable's accuracy of self-figure estimation, accuracy of object estimation and correct estimation of others' bodies assumptions of normality via the use of the Kolmogorov-Smirnov test were violated. There was no violation of the assumptions of normality for psychological flexibility via the use of the Kolmogorov-Smirnov test at a 5% level of significance.

*Table 2: Tests of Normality for the dependent variables of this study.*

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Correct estimation of others' bodies	0.124	125	<0.001	.958	125	.001
Accuracy of self-figure estimation	0.429	125	<0.001	.592	125	<0.001
Accuracy of object estimation	0.531	125	<0.001	.334	125	<0.001
Psychological flexibility	0.074	125	0.090	.979	125	.048

a. Lilliefors Significance Correction

### Comparison between risk groups and dependent variables

Independent samples t-tests were conducted to compare the two risk groups on the dependent variables (correct estimation of others' bodies, accuracy of self-figure estimation, accuracy of object estimation, psychological flexibility). Findings are presented in Table 3.

*Table 3: Two independent samples t-test, for the dependent variables of this study, between risk categories.*

	Low risk		High risk		t	df	P
	(N=80)		(N=45)				
	Mean	SD	Mean	SD			
Correct estimation of others' bodies	0.67	0.09	0.44	0.10	13.41	123	<b>&lt;.001</b>
Accuracy of self-figure estimation	0.71	0.46	0.60	0.50	1.25	85.07	.213
Accuracy of object estimation	0.98	0.16	0.78	0.42	3.03	51.01	<b>.004</b>
Psychological flexibility	24.48	2.79	21.78	3.94	4.06	69.34	<b>&lt;.001</b>

There was a statistically significant difference in the mean percentage of correct estimation of others' bodies between low risk ( $M = 0.67$ ,  $SD = 0.09$ ) and high risk ( $M = 0.44$ ,  $SD=0.10$ ;  $t(123) = 13.408$ ,  $p < .001$ , two-tailed), where participants within the low-risk group presented with statistically significantly higher percentage of correct estimation of others' bodies than those in the high-risk group. Furthermore, there was a statistically significant difference in the percentage of accuracy of object estimation between low risk ( $M = 0.98$ ,  $SD = 0.16$ ) and high risk ( $M = 0.78$ ,  $SD=0.42$ ;  $t(51.008) = 3.030$ ,  $p < .01$ , two-tailed), where participants in the low-risk group presented with a statistically significant higher percentage of correct estimation of accuracy of an object than those in the high-risk group. Additionally, there was a statistically significant difference in mean psychological flexibility between low risk ( $M = 24.48$ ,  $SD=2.79$ ) and high risk ( $M=21.78$ ,  $SD=3.94$ ;  $t(69.339)=4.058$ ,  $p < .001$ , two-tailed), where low risk participants had statistically higher psychological flexibility than high risk

participants. However, there were no statistically significant differences of Accuracy of self-figure estimation between individuals at low risk ( $M = 0.71$ ,  $SD = 0.46$ ) versus high risk ( $M = 0.60$ ,  $SD = 0.50$ ;  $t(85.07) = 1.25$ ,  $p > .05$ ).

#### Relationship between Psychological Flexibility, self-estimation and estimation of others' bodies.

The Pearson product-moment correlation coefficient was used, to investigate the relationships between the dependent variables (Table 4). There was a weak (Evans,1996). positive significant linear correlation between the psychological flexibility and the correct estimation of others' bodies ( $r = .265$ ,  $n = 125$ ,  $p < .01$ ). Furthermore, there was a statistically significant weak (Evans,1996) positive linear correlation between the psychological flexibility and the accuracy of self-figure estimation ( $r = .244$ ,  $n = 125$ ,  $p < .01$ ). There was no statistically significant linear correlation between psychological flexibility and Accuracy of object estimation ( $r = .094$ ,  $n = 125$ ,  $p > .05$ ). These findings suggest that higher levels of psychological flexibility, are associated with higher correct estimation of others' bodies and higher accuracy of estimate for ones self-figure.

Additionally, there was a weak positive significant linear correlation between the accuracy of object estimation and the correct estimation of others' bodies ( $r = .267$ ,  $n = 125$ ,  $p < .01$ ) and a statistically significant weak (Evans,1996) positive linear correlation between the accuracy of object estimation and the accuracy of self-figure estimation ( $r = .177$ ,  $n = 125$ ,  $p < .05$ ). These findings suggest that accuracy of object estimation, is positively related to correct estimation of others' bodies and accuracy of self-figure estimation.

Table 4: Correlation matrix between the variables of this study (n=125).

	Psychological flexibility	Correct estimation of others' bodies	Accuracy of self - figure estimation	Accuracy of object estimation
Psychological flexibility	1	.27**	.24**	.09
Correct estimation of others' bodies		1	.10	.27**
Accuracy of self- figure estimation			1	.18*
Accuracy of object estimation				1

\*\* . Correlation is significant at the 0.01 level (2-tailed). \* . Correlation is significant at the 0.05 level (2-tailed).

Pearson product-moment correlation coefficient were also run to investigate the relationships between the dependent variables, separately for low risk (n=80) vs. high risk (n=45) participants (Table 5). Interestingly, the above associations between the dependent variables were not found when the groups were examined separately.

Table 5: Correlations between the dependent variables separately for low (n=80) and high risk (n=45 groups).

Low Risk	Psychological flexibility	Correct estimation of others' bodies	Accuracy of self- figure estimation	Accuracy of object estimation
Psychological flexibility	1	-.07	.18	-.12
Correct estimation of others' bodies		1	-.03	.17
Accuracy of self -figure estimation			1	.08
Accuracy of object estimation				1
High Risk	Psychological flexibility	Correct estimation of others' bodies	Accuracy of self- figure estimation	Accuracy of object estimation
Psychological flexibility	1	-.01	.27	.01
Correct estimation of others' bodies		1	.08	-.04
Accuracy of self- figure estimation			1	.22
Accuracy of object estimation				1

\*\* . Correlation is significant at the 0.01 level (2-tailed). \* . Correlation is significant at the 0.05 level (2-tailed).

### Relationships between the dependent variables, with the risk group as a control variable

Lastly, partial correlation was used to investigate possible significant relationships between the dependent variables, with the risk group as a control variable (Table 6). It can be observed that after removing the effect of the risk group, there is no statistically significant correlation between any combination of the dependent variables, at a 5% level of significance.

*Table 6: Partial correlation matrix between the variables of this study (n=125) where risk group is the control variable.*

Control=Risk Group	Psychological flexibility	Correct estimation of others' bodies	Accuracy of self-figure estimation	Accuracy of object estimation
Psychological flexibility	1.000	-.04	.22	-.03
Correct estimation of others' bodies		1.00	.02	.03
Accuracy of self-figure estimation			1.000	.15
Accuracy of object estimation				1

\*\* . Correlation is significant at the 0.01 level (2-tailed). \* . Correlation is significant at the 0.05 level (2-tailed).

## **Discussion**

The primary purpose of this study was to explore differences in perception between women at high risk of developing an ED and women at low risk of developing an ED. Bearing in mind that the problem of distorted body image is increasing, especially among young women, and that the research on distorted perception in patients with ED is limited, it is important to try to enrich the literature with new data that will bridge the gap. Specifically, this study examines whether women at high risk of developing eating disorders maintain a distorted body perception about their own body and explore whether this distortion in perception is generalized in cases where these individuals judge other people's bodies. This study compared women at high- risk of developing an ED and women at low- risk of developing an ED. The aim was to assess whether individuals at high risk of developing an

eating disorder, tend to overestimate their own body figure, believing for example that they are larger than they actually are, or whether their perception of others' bodies is also distorted. Notably, our results suggested that there were no differences between the two groups regarding the perception of their own body. Measures produced in this study pointed out that women in both groups tend to perceive their own body shape incorrectly.

Interestingly, women in the low-risk group perceive others' body shape more accurately than women in the high-risk group. Nonetheless, another interesting is that the low-risk group had higher percentage of correct estimation of accuracy of object estimation than those within the high-risk group. As hypothesized, the low risk of developing an ED group presented with higher levels of psychological flexibility than those in the high-risk condition. However, our results suggested that level of psychological flexibility did not relate to the perception of individuals about their body.

A number of researchers reported differences in the way ED patients and healthy individuals perceive their own body shape (e.g., Salbach et al., 2007; Schneider et al., 2009; Martus et al., 2009; Roy and Meilleur 2010; Overas et al. 2014). However, our findings contrast the findings of some previous studies, which found that women with ED tend to misperceive their body shape, whereas women without any ED related issues perceive their bodies as they really are. According to Schneider et al, (2009) who examined a large sample of inpatients and outpatients with both AN and BN as well as "healthy" female adolescents found significant differences between patients with eating disorders and controls.

Specifically, while controls were mostly accurate with an overestimation of the body parts, adolescents with an eating disorder report on average 30% overestimation of their body. In line with Schneider et al, (2009), Salbach et al., (2007) found that girls with an AN presented greater overestimation of their body parts, in particular waist and thigh, compared to the healthy group. In their experiment Salbach et al., (2007) compared teenage patients with AN



to “healthy” teenage girls. It is important to highlight that both of the aforementioned studies assessed body size estimation with the Body Image Distortion in Children and Adolescents test (BID-CA; Schneider, Martus et al., 2009) whereas we used self – rated measures and questionnaires. The method of assessment may thus justify the agreement in the previous authors’ results. Also, it is important to note that although there were differences between healthy participants and those with an eating disorder in their body image perception, “healthy” individuals presented a distorted image of specific parts of their body. To some extent this converges with our own results. Although in our study we did not specifically examine participants' perceptions of specific parts of their body, the results showed a distortion of body image in participants at low-risk. The discrepancy between our findings and those of the previous researchers may be due to the use of different methods and procedures performed for the specific experiment. In our research, a more traditional method of estimating body size was used. Specifically, in our experiment the estimation of the body shape of each participant was done by using a formula for calculating the Body Mass Index (BMI). Furthermore, our sample consisted of individuals who did not have a clinical diagnosis of an eating disorder. Participants were individuals who were judged to have a high or low risk of developing an eating disorder in the future based on their scores on the WCS.

In addition, Benninghoven et al. (2007), found that body size overestimation was most distinct in patients with an ED and particularly about their own appearance and to some extent other female figures. Only a minimal distortion was found for non-human figures (Benninghoven et al. 2007). In their study Benninghoven et al (2007), used a computer program, the Somatomorphic Matrix SMM (Gruber, Pope, Borowiecki, & Cohane, 2000), in order to measure body image perception of the participants. Findings of our research are partly in agreement with the above. Women at high risk of developing an ED appeared to present a distorted perception not only of their own body figure but also of the bodies of

others. It also appeared that the perception of individuals in the high-risk group was distorted in cases where they had to perceive the size of an inanimate object. Overall, results of this study, suggest that women at high-risk of developing an ED and healthy women both misperceive the size of their own body. In other words, healthy women were not found to have a better/ more accurate perception of their body shape than women at high-risk. Nevertheless, the results of this study demonstrated that participants in both groups were more accurate in estimating an objects' shape than they were in estimating their own body shape, suggesting that other factors than perception were involved in body image distortion. These findings are consistent with other studies that have employed inanimate objects, where participants accurately estimated the size of inanimate objects but were inaccurate in their estimation of their own size (Cash & Green, 1986; Gardner & Moncrieff, 1988; Szmanski & Seime, 1995, Benninghoven et al 2007).

On the other hand, our results come in line with McCabe and colleagues (2006) who found that healthy individuals reported higher level of estimation inaccuracy in relation to their own body compared to the neutral object, supporting the specific nature of ED cognitive bias. In their research authors used a video-computerized technique to compare the degree of accuracy of adults estimating personal body parts versus a neutral object (McCabe, 2006). Our conclusions regarding the perception of women at low and high-risk groups for their own body, come in line with Probst et al (1998); Waller & Barnes, (2002); Cash, Pruzinsky (2004); Philips (2004); McCabe, Ricciardelli, Sitaram, Mikhail (2006), who have not found any differences between clinical and non-clinical sample in their perception about their own body. According to the finding of our research, women in the high-risk group and women in the low-risk group, both tend to misperceive the shape of their own body. As it proposed by Probst et al. (1998) body image misperception (also referred to as body image distortion) are found in people affected by an ED as well as in non-clinical populations. Using a video

distortion method on a life-size screen together with a silhouette technique, as well as a range of questionnaires. Under the same scope, Smeets et al. (1997) used a video distortion method and applied the BAQ. Their results showed no differences in perceptual sensitivity between the ED patients and the control group. Using a video distortion method Fernandez et al. (1999) tried to test the accuracy of body size estimation and to assess the ideal body image between 41 eating disorder patients and 34 female controls. Their results showed no difference in estimation of actual body sizes in ED patients and healthy participants. In addition, Baluch et al. (1997) used a similar methodology as in our study, where they assessed body image using male and female body drawings ranging from very thin to very fat. Results showed that patients with an ED seemed to misperceived the body shape of other figures. Results of this study, support their results as individuals at high- risk of developing an ED misperceived the body of others whereas individuals at low- risk can better perceive the actual size of other bodies.

Bearing in mind the aforementioned research and our results discrepancies across studies may be due to methodological differences, such as the type of apparatus used to measure estimates of body size or/and interpersonal differences (Stewart & Williamson, 2004). However, a number of other explanations can also be given to account for these differences. According to the cognitive model of Williamson, Stewart, White, and YorkCrowe's (2004) body image disturbances in ED is produced by a person's unconscious misinterpretation of self-relevant events or information. Misperceptions are caused by the use of select pieces of information within the environment that support one's false beliefs coupled with the ignorance of evidence refuting the belief (Williamson et al., 2006). The Williamson et al.'s (2006) model hypothesizes that there are additional individual characteristics that place people at risk for body image distortions. These characteristics are: perfectionism, fear of fatness, over concern with body size/shape, and an internalization of

thin ideal shape presented by the media. Second, this model suggests that body self- schema and the resulting cognitive bias are activated by ambiguous stimuli, body or food related information, or tasks requiring self- reflection such as research questionnaires on body image. Body image distortion is produced by the following biases in the following areas: (a) attention, (b) selective memory, (c) selective interpretation, (d) body size estimation, and (e) extreme drive for thinness. Cognitive biases and negative thoughts induce negative emotion toward body image and appearance, which in turn, trigger behaviors to alter the shape and form of the body in order to be in line with that image and support the cognitive biases, thereby creating a positive feedback loop (Williamson et al., 2006). Cognitive biases (attentional and selective memory bias) associated with the eating disorders are quite typically self-referential (as opposed to other referenced) and apply to eating habits and body shape (McCabe et al., 2004; Williamson et al., 2006). Previous research also supports the hypothesis that body image distortion and cognitive bias are elicited by body or eating related stimuli (e.g., after eating a meal or wearing a bathing suit or tight clothing) (Unterhalter et al., 2007). Research is beginning to demonstrate that body image distortions are cognitive misinterpretations of personally relevant information related to body shape and size. There is also evidence of attentional bias in individuals with high concern for body image (who are dissatisfied with their body) (Waller et al., 2002). Using subliminal verbal cues (participants were exposed to flashed words such as 'fat', or 'thin') Waller and Barnes (2002) compared female with high or low scores on the Eating Disorder Inventory in terms of their body estimation and satisfaction. They found that females scoring high on eating disorder symptoms and exposed to fat-related information showed a deterioration of their body image compared to the comparison group. Janelle and colleagues (2009) used a visual gaze tracking system to demonstrate that females highly dissatisfied with their body image tended to avoid looking at the most dissatisfied body areas. Cognitive biases have also been found in

individuals with weight concerns regardless of the presence of clinical symptoms of eating disorders (Schwartz, Brownell, 2004). Furthermore, Mountford, Haase, and Waller (2006) demonstrated that false cognitions about body checking which consisted of “repetitive, often time consuming and compulsive behaviors, performed to inspect, hide, obtain reassurance about, or fix a perceived defect” predicted disordered eating behaviors, body image dissatisfaction and severity of ED symptoms (eating, weight and shape concerns). There is evidence that body image concerns can lead to negative body image perceptions. For example, there is some evidence that body checking and body image exposure (to themselves or ideal body image) can produce negative emotions. Research findings also show that body image schema and negative emotions are labile, that is, triggered by a particular stimuli or situations (Cash 2004) and that these cues tend to change as individuals develop throughout the lifespan (Cash et al., 2004; Tiggeman, 2004; Miller, 2002).

Following the above, an increasing body of evidence suggests that Psychological Flexibility (PF) is inversely associated with various forms of negative psychological problems (Hayes et al., 2006), among them, the distortion in the image of the individual body (e.g., Bond & Bunce, 2003; Chapman, Gratz, & Brown, 2006; Chawla & Ostafin, 2007; Greco et al., 2005). Because of its pervasive nature across diverse psychological problems this study, tries to explore in depth the role of PF by examining whether it relates to the individual's perception of its body. Our research has revealed inconsistent results with regard to the relationship between PF and the accuracy of estimating body size. Specifically, findings of the current study suggested that individuals at low risk of developing an ED have higher levels of PF, whereas those at high risk of developing an ED showed lower levels of PF. Our results agreed with Duarte et al., (2016) who found that teenage girls with AN had lower level of PF and inflexible adherence to eating rules. However, findings of this study show no relation between PF and perception. By interpreting these results, the perception

does not seem to be directly affected by negative thoughts or the inability of the individual to cope with them.

As psychologists, we still have a long way to go before fully understanding how and why non clinical and clinical population perceive and judge their body and the body of others. It is important to understand that individuals differ from each other and that individual differences can cause validity issues. Also, further research is necessary to be done in order to map the idea of distorted body perception and the role of PF in body image perception. From the present study's findings, a set of further questions open up. It seems that the way in which individuals perceive their body and the body of others affected by different factors. It would be useful future research to explore those factors and specify the extent to which each can manipulate the body perception process but also to explore other factors that may be responsible for differences between healthy individuals and patients with ED in estimating others bodies. Furthermore, by examining people at risk and not with a diagnosis our results have a preventive role as it can be applied from early intervention and treatment.

### **Limitations and Recommendations for Future Research**

The results of this study need to be cautiously interpreted for various reasons. The findings are limited by the small sample size, the limited range of predictor variables, and the limited age range of respondents. Clearly, the findings from this study need to be replicated with a larger sample before we can draw strong conclusions. A broader range of respondents also need to be included, so that we can determine the generalizability of the findings to other age and cultural groups. It is important for future studies to recruit both male and female participants to explore differences in perception between genders. Moreover, it would be advisable to drop the existing notion of "body image" because of its overemphasis on the visual perception of the body, leading to a narrow-minded research operationalization in body

estimation tasks. We therefore prefer the broader concept of body experience, including physiological, affective, and cognitive components. It is extremely likely that other variables, such as neuroticism (Tylka, 2004), social perfectionism (Brannan & Petrie, 2008; Tylka, 2004), and ED-specific psychiatric symptoms (Bohn et al., 2008), are associated with or influence general psychological ill-health and emotional reaction in stressful interpersonal settings. To date, the development and refinement of appropriate method for capturing the functional link among these events is challenging. A potential alternative method may be the repeated behavioral assessment of well-defined psychologically flexible coping behavior, disordered eating-related cognition, and negative behavioral outcomes in the context of analogue experiment and perhaps treatment intervention. Although the application of such behavioral measurement seems challenging, the effort should be warranted.

Despite these limitations, the findings of the study revealed that both low- risk and high- risk individuals demonstrate estimation inaccuracies in their body image. Thus, support the assertion that the accuracy of body image estimations is not exclusively a defining factor of eating disorders (Hsu, 1982), as these estimation inaccuracies are a phenomenon also found among the general population. It is proposed that developing a greater understanding of the degree and nature of body estimation accuracy in the normal population will provide invaluable information in our understanding of body image disturbance, and so inform intervention and prevention programs in this area. The present investigation also suggests that it is beneficial to consider not only disordered body perception, but also psychological flexibility in understanding psychological health among women. The investigation of psychological flexibility for understanding psychological suffering, perhaps including ED spectrum issues, can be fruitful.

## Conclusion

Overall, this study supports that there are no differences between individuals at high risk of developing an ED and those at low risk in the perception of their own body. Secondly, it indicates that individuals at low risk can better perceive the actual size and shape of other bodies while high-risk individuals misperceived the body shape of others. Thirdly, our results point out that individuals at low risk can correctly perceive the shape of an object whereas individuals at high risk were less accurate in their perceptions. Last but not least, concerning the role of PF our findings suggest that levels of psychological flexibility related to the risk group to which the individual belongs. In other words, women at high risk for developing eating disorders appeared to have lower psychological flexibility while those in the low-risk group had higher levels of psychological flexibility. According to the results of the present study, high levels of psychological flexibility were not found to be related to more accurate perception of one's own body. That may explain that the distortion in perception may be influenced by other factors besides negative thoughts or bad experiences. With all of the above in mind, a person's perception of its own body can be influenced by various factors such as: the standards of the society, culture, character, gender, social media, psychological state, mood and many other factors that need to be investigated in future researches (Brannan & Petrie, 2008; Tylka, 2004). Even if our findings do not support all of our hypothesis, they are equally important to be considered as they contribute to the existing literature and they provide some important observations to the already available findings. It is important to fully understand the results of this research, in relation to the findings of other studies that either support them or not. In this way future research, might avoid the same mistakes and try some new, more informative methodologies that they could bring more accurate results.



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## Appendix 1

**Έντυπο Συγκατάθεσης**

Δίδετε συγκατάθεση για τον εαυτό σας ή για κάποιον άλλο άτομο; \*

Your answer

Εάν πιο πάνω απαντήσατε για κάποιον άλλο, τότε δώστε λεπτομέρειες και το όνομα του. \*

Your answer

Συμπληρώσατε τα έντυπα συγκατάθεσης εσείς προσωπικά; \*

Ναι

Όχι

Τους τελευταίους 12 μήνες έχετε συμμετάσχει σε οποιοδήποτε άλλο ερευνητικό πρόγραμμα; \*

Ναι

Όχι

Διαβάσατε και καταλάβατε τις πληροφορίες για εθελοντές; \*

Ναι

Όχι

Καταλαβαίνετε ότι μπορείτε να αποσυρθείτε από το πρόγραμμα όποτε θέλετε; \*

Ναι

Όχι

Καταλαβαίνετε ότι εάν αποσυρθείτε, δεν είναι αναγκαίο να δώσετε οποιαδήποτε εξηγήσεις για την απόφαση που πήρατε; \*

Ναι

Όχι

[Back](#) [Next](#) [Clear form](#)