

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26

Running title: Self-discrimination IAT

A novel measure to assess self-discrimination in binge eating disorder and obesity

Almut Rudolph, Ph.D.\*, Anja Hilbert, Ph.D.

The final typeset article A novel measure to assess self-discrimination in binge-eating disorder and obesity is available at <http://dx.doi.org/10.1038/ijo.2014.89>.

Integrated Research and Treatment Center AdiposityDiseases, University of Leipzig  
Medical Center, Department of Medical Psychology and Medical Sociology,  
University of Leipzig, Leipzig, Germany

\* Corresponding author. Integrated Research and Treatment Center  
AdiposityDiseases, Department of Medical Psychology and Medical Sociology,  
University of Leipzig, Philipp-Rosenthal-Strasse 27, 04103 Leipzig, Germany.  
Phone: +49 341 97-15366, Fax: +49 341 97-15359, Email:  
almut.rudolph@medizin.uni-leipzig.de.

Acknowledgements. This research was supported by grant 01EO1001 from the  
Federal Ministry of Education and Research (BMBF), Germany. The work was  
conducted at Philipps University of Marburg, Marburg, Germany.

1 Conflict of interest statement: The authors declare no conflict of interest.

2

## 1 ABSTRACT

2 Stigmatized obese individuals tend to internalize the pervasive weight stigma which  
3 might lead to self-discrimination and increased psychopathology. While explicit and  
4 implicit weight stigma can be measured using self-report questionnaires and Implicit  
5 Association Tests (IAT), respectively, the assessment of self-discrimination relied  
6 solely on self-report. The present study sought to develop an IAT measuring implicit  
7 self-discrimination (SD-IAT) in samples of obese individuals with and without binge-  
8 eating disorder (BED). Seventy-eight individuals were recruited from the community  
9 and individually matched in three groups. Obese participants with BED, obese  
10 participants without BED (OB), and a normal weight control group without eating  
11 disorder psychopathology (HC) were assessed with the SD-IAT and other measures  
12 relevant for convergent and discriminant validation. Results revealed significantly  
13 higher implicit self-discrimination in the BED group when compared to both OB and  
14 HC. Furthermore, significant correlations were found between the SD-IAT with body  
15 mass index, experiences of weight stigma, depressive symptoms, and implicit self-  
16 esteem. Finally, implicit self-discrimination predicted eating disorder  
17 psychopathology over and above group membership, and experiences of weight  
18 stigma. This study provides first evidence of the validity of the SD-IAT. Assessing  
19 implicit self-discrimination might further increase understanding of weight stigma and  
20 its significance for psychosocial functioning among vulnerable obese individuals.

21

## 22 KEY WORDS

23 weight stigma; self-discrimination; Implicit Association Test; convergent validity;  
24 discriminant validity; weight bias;

1 Obese individuals often experience weight stigma in multiple areas of life and tend to  
2 internalize the pervasive negative stereotypes and prejudice regarding their weight,  
3 leading to actual discriminative behaviors to the own person. Consequently, self-  
4 discrimination has been strongly associated with depressive symptoms, eating  
5 disorder psychopathology, lower quality of life, and poor weight loss outcomes (1-3).

6         Weight stigma can be measured through various methods. Self-report  
7 questionnaires assess deliberate accessible explicit weight stigma towards obese  
8 individuals. Additionally, indirect measures such as the Implicit Association Test  
9 (IAT) have been used to assess more automatic and not necessarily conscious  
10 implicit evaluations (4). The IAT as a computerized measure assesses the relative  
11 strength of associations between a pair of opposing attribute and target categories.  
12 In a Weight Stigma IAT (see Table 1), respondents classify target stimuli (i.e.,  
13 skinny, plump) into a thin or fat category, and attribute stimuli (i.e., smart, stupid) into  
14 a positive or negative category. Responses are typically faster if the four categories  
15 are configured in a compatible pairing (i.e. thin and positive, fat and negative) rather  
16 than an incompatible pairing (i.e. thin and negative, fat and positive). The Weight  
17 Stigma IAT has repeatedly been used to measure weight stigma in normal weight,  
18 overweight, and obese individuals (5, 6). Several studies have documented the  
19 reliability of the IAT (e.g., 7, 8), its predictive validity over and above self-reports (9,  
20 10), and its ability to distinguish disordered and healthy individuals regarding a range  
21 of psychopathology (11).

22         Whereas explicit and implicit weight stigma have been comprehensively  
23 examined, the assessment of self-discrimination relied solely on self-report (12).  
24 However, the IAT is an interesting tool as it complements self-report measures in  
25 research domains where individuals are motivated to deceive others (i.e., if the topic

1 is socially sensitive) or where they lack self-insight and even deceive themselves (4).  
2 To elucidate the influence of prevalent weight stigma on implicit self-evaluations in  
3 obese individuals, we designed an IAT measuring self-discrimination defined as  
4 automatic, and not necessarily conscious self-directed negative reactions caused by  
5 self-discrimination. The Self-Discrimination IAT comprises the target categories self  
6 vs. other, and the attribute categories discriminated vs. accepted.

7       This study was part of a larger project extensively described elsewhere (8).  
8 The sample comprised 63 female and 15 male participants recruited from the  
9 community in three groups (each  $N = 26$ ). The binge eating disorder group (BED)  
10 comprised obese participants with BED according to the Diagnostic and Statistical  
11 Manual of Mental Disorders (13) diagnosed using the Eating Disorder Examination  
12 interview (14) and a body mass index (BMI)  $\geq 30$  kg/m<sup>2</sup>. The obesity only group (OB)  
13 comprised participants with a BMI  $\geq 30$  kg/m<sup>2</sup> whereas participants in the normal  
14 weight control group (HC) had a BMI between 18.5 and 24.9 kg/m<sup>2</sup>. Exclusion  
15 criteria in OB and HC groups were episodes of binge eating or compensatory  
16 behaviors within the past six months. All groups were individually matched according  
17 to sex, age, and education, and BED and OB groups were also matched according  
18 to BMI. All participants answered the Eating Disorder Examination-Questionnaire  
19 (EDE-Q; 15) to assess specific eating disorder psychopathology within the past 28  
20 days, the Stigmatizing Situations Inventory (SSI; 16; German translation by AH,  
21 unpublished manuscript) to indicate experiences of weight stigma over the life span,  
22 and the Beck Depression Inventory (BDI; 17) to rate severity of depressive  
23 symptoms over the past week. During individual laboratory assessments,  
24 participants completed three IATs on self-discrimination, weight stigma, and self-  
25 esteem that all conformed to a canonical five-block structure (4, 10; see Figure 1 for

1 details). To control for position effects, the sequence of the IATs was  
2 counterbalanced between the participants within each group using a 3x3 Latin-  
3 square repeated measures design.

4 For the Self-Discrimination IAT (SD-IAT), AH compiled a set of adjectives  
5 representative for each category, and selected stimuli controlling for features of  
6 shared similarity (e.g., word length). Attribute categories contained four  
7 discrimination (e.g., underestimated, spurned) and acceptance (e.g., notable,  
8 respected) adjectives, target categories contained four self-related (e.g., me, myself)  
9 and other-related (e.g., they, their) stimuli. The SD-IAT index was calculated as the  
10 difference between the incompatible and the compatible pairing using the D-Index  
11 (18) with a higher score indicating stronger automatic preference for self –  
12 discriminated over self – accepted.

13 Due to matched groups, repeated measures ANOVAs were used to test  
14 between-subjects effects with post-hoc Bonferroni tests. Significant differences were  
15 found for the EDE-Q, the SSI (both BED > OB > HC; see 10 for statistics), and the  
16 BDI (BED > OB = HC; means  $\pm$  standard deviations; BED: 19.15  $\pm$  9.70; OB: 8.12  $\pm$   
17 4.91; HC: 5.08  $\pm$  5.08; [F(2,24) = 24.00,  $p < 0.001$ , partial  $\eta^2 = 0.71$ ]). Furthermore, a  
18 significant group difference emerged for the SD-IAT D-Index (BED: -0.10  $\pm$  0.36; OB:  
19 -0.34  $\pm$  0.29; HC: -0.44  $\pm$  0.24; [F(2,24) = 10.61,  $p < 0.001$ , partial  $\eta^2 = 0.30$ ]): While  
20 participants in the BED group reported higher levels of self-discrimination compared  
21 to the HC group, BED and OB as well as OB and HC groups did not differ.

22 Pearson correlations revealed relations of the SD-IAT with BMI ( $r_{\text{SD-IAT\_BMI}} =$   
23 0.43,  $p < 0.001$ ), experiences of weight stigma ( $r_{\text{SD-IAT\_SSI}} = 0.47$ ,  $p < 0.001$ ), severity  
24 of depressive symptoms ( $r_{\text{SD-IAT\_BDI}} = 0.53$ ,  $p < 0.001$ ), and eating disorder  
25 psychopathology ( $r_{\text{SD-IAT\_EDE-Q}} = 0.21$ ,  $p = 0.07$ ), although the latter fell short of

1 significance. Thus, participants with higher levels of implicit self-discrimination had a  
2 higher BMI, reported more experiences of weight stigma, and more depressive  
3 symptoms. The SD-IAT was not associated with a Weight Stigma-IAT (WS-IAT;  $r_{SD-IAT\_WS-IAT} = -0.16$ ,  $p = 0.16$ ). However, the SD-IAT was negatively associated with a  
4 Self-Esteem IAT (SE-IAT;  $r_{SD-IAT\_SE-IAT} = -0.39$ ,  $p < 0.001$ ): Participants with higher  
5 levels of implicit self-discrimination had significant lower implicit self-esteem.  
6

7 Finally, a stepwise multiple regression analysis was run to determine whether  
8 and to what extent implicit self-discrimination (SD-IAT) predicted eating disorder  
9 psychopathology (EDE-Q) over and above group membership (dummy coded with  
10 HC as reference group), and self-reported experiences of weight stigma (SSI).  
11 Group membership was a significant predictor of eating disorder psychopathology  
12 when controlled for depressive symptoms (BDI). Interestingly, while weight stigma  
13 did not change the overall amount of variance explained, the implicit self-  
14 discrimination added another small-sized but significant amount of variance (see  
15 Table 2 for statistics).

16 We have presented a novel measure of implicit self-discrimination, the SD-  
17 IAT, and provided first evidence of implicit self-discrimination in obese individuals  
18 with BED. This result is in line with previous studies reporting both decreased but not  
19 negative implicit self-evaluations (11) and highest levels of explicit weight stigma in  
20 obese individuals with BED compared to obese individuals without BED (19).

21 Regarding convergent validity, implicit self-discrimination was associated with  
22 experiences of weight stigma as obese individuals tend to internalize this stigma (1).  
23 Further, the SD-IAT was correlated with a Self-Esteem IAT but not with a Weight  
24 Stigma IAT. From an exploratory perspective, we believe that the former measures

1 corresponded conceptually, in that they reflected the same target (i.e., specific  
2 implicit associations with the self), and thus, achieved greater convergent validity (8).

3       Regarding discriminant validity, implicit self-discrimination was associated with  
4 BMI and depressive symptoms. Additionally, obese individuals with BED showed  
5 higher levels of implicit self-discrimination compared to normal weight individuals  
6 which is consistent with previous findings suggesting that obese individuals with BED  
7 have higher psychopathology compared to obese individuals without BED (20).  
8 Finally, we found that implicit self-discrimination was independently predictive of  
9 eating disorder psychology over and above weight status and experiences of weight  
10 stigma. Thus, we demonstrated that implicit self-discrimination might be a factor that  
11 is associated with psychopathology in obesity.

12       As a limitation, OB and HC groups did not differ in implicit self-discrimination  
13 which might lead to the assumption that the SD-IAT does not measure self-  
14 discrimination as a consequence of experiences of weight stigma. However, we  
15 believe that stigmatized obese individuals without BED are less vulnerable to the  
16 negative effects of weight stigma than obese individuals with BED (see 20), and  
17 therefore, show lower levels of implicit self-discrimination. In line with this argument,  
18 OB and HC groups did not differ in general psychopathology, and explicit and implicit  
19 self-esteem (10). Nevertheless, further research is needed to distinguish between  
20 self-discrimination due to weight stigma and mental health issues.

21       Assessing implicit self-discrimination and its psychosocial correlates might  
22 help to understand weight stigma and its significance for psychosocial functioning in  
23 obese individuals. We provided first evidence that the assessment of implicit self-  
24 discrimination using an IAT procedure has potential value. The relation between  
25 implicit self-discrimination and mental health of obese individuals added to previous



1 results on experiences of weight stigma and negative self-evaluation being  
2 associated with development and maintenance of BED. Thus, implicit self-  
3 discrimination might be useful in explaining why some individuals are at greater risk  
4 than others to suffer from the harmful consequences of weight stigma. Future  
5 investigations should link implicit self-discrimination and experiences of weight  
6 stigma to investigate protective factors that prevent obese individuals from self-  
7 stigmatization. Finally, further research is warranted to explore the preliminary  
8 results on the validity of the SD-IAT (e.g., on prognostic validity) to complement  
9 psychometric evaluation of the SD-IAT.

10

## 1 REFERENCES

- 2 1. Carels RA, Wott CB, Young KM, Gumble A, Koball A, Oehlhof MW. Implicit,  
3 explicit, and internalized weight bias and psychosocial maladjustment among  
4 treatment-seeking adults. *Eat Behav* 2010; **11**:180-5.
- 5 2. Roberto CA, Sysko R, Bush J, Pearl R, Puhl RM, Schvey NA *et al*. Clinical  
6 correlates of the weight bias internalization scale in a sample of obese adolescents  
7 seeking bariatric surgery. *Obesity* 2012;**20**:533-9.
- 8 3. Hilbert A, Braehler E, Haeuser W, Zenger M. Weight bias internalization, core  
9 self-evaluation, and health in overweight and obese persons. *Obesity* 2013; e-pub  
10 ahead of print 9 July 2013; doi:10.1002/oby.20561
- 11 4. Greenwald AG, McGhee DE, Schwartz JL. Measuring individual differences in  
12 implicit cognition: the implicit association test. *J Pers Soc Psychol* 1998;**74**:1464-80.
- 13 5. Wang SS, Brownell KD, Wadden TA. The influence of the stigma of obesity on  
14 overweight individuals. *Int J Obes Relat Metab Disord* 2004; **28**:1333-7.
- 15 6. Puhl RM, Heuer CA. The stigma of obesity: a review and update. *Obesity*  
16 2009; **17**:941-64.
- 17 7. Greenwald AG, Farnham SD. Using the implicit association test to measure  
18 self-esteem and self-concept. *J Pers Soc Psychol* 2000; **79**:1022-38.
- 19 8. Rudolph A, Schröder-Abé M, Schütz A, Gregg AP, Sedikides C. Through a  
20 Glass, Less Darkly? *Eur J Psychol Assess* 2008; **24**:273-81.
- 21 9. Rudolph A, Schröder-Abé M, Riketta M, Schütz A. Easier when done than  
22 said! Implicit self-esteem predicts observed or spontaneous behavior, but not self-  
23 reported or controlled behavior. *J Psychol* 2010; **218**:12-9.
- 24 10. Brauhardt A, Rudolph A, Hilbert A. Implicit cognitive processes in binge-eating  
25 disorder and obesity. *J Behav Ther Exp Psy* 2014; **45**:285-90.
- 26 11. Roefs A, Huijding J, Smulders FT, MacLeod CM, de Jong PJ, Wiers RW, *et al*.  
27 Implicit measures of association in psychopathology research. *Psychol Bull*  
28 2011;**137**:149-93.
- 29 12. Durso LE, Latner JD. Understanding self-directed stigma: development of the  
30 weight bias internalization scale. *Obesity* 2008; **16**:S80-6.
- 31 13. American Psychiatric Association, Diagnostic and statistical manual of mental  
32 health disorders: DSM-5, 5th edn, American Psychiatric Publishing: Washington DC,  
33 2013.
- 34 14. Hilbert A, Tuschen-Caffier B, Ohms M. Eating Disorder Examination:  
35 Deutschsprachige Version des strukturierten Essstörungeninterviews. *Diagnostica*  
36 2004; **50**:98-106.
- 37 15. Hilbert A, Tuschen-Caffier B, Karwautz A, Niederhofer H, Munsch S. Eating  
38 Disorder Examination-Questionnaire: Evaluation der deutschsprachigen  
39 Übersetzung. *Diagnostica* 2007; **53**:144-54.
- 40 16. Myers A, Rosen JC. Obesity stigmatization and coping: relation to mental  
41 health symptoms, body image, and self-esteem. *Int J Obes Relat Metab Disord*  
42 1999; **23**:221-30.
- 43 17. Hautzinger M, JKeller F, Kuehner C. Beck Depressions-Inventar: Revision  
44 (BDI-II). 2nd edition ed. Frankfurt: Pearson; 2006.
- 45 18. Greenwald AG, Nosek BA, Banaji MR. Understanding and using the Implicit  
46 Association Test: I. An improved scoring algorithm. *J Pers Soc Psychol* 2003;  
47 **85**:197-216.

- 1 19. Ashmore JA, Friedman KE, Reichmann SK, Musante GJ. Weight-based  
 2 stigmatization, psychological distress, & binge eating behavior among obese  
 3 treatment-seeking adults. *Eat Behav* 2008; **9**:203-9.  
 4 20. Wonderlich SA, Gordon KH, Mitchell JE, Crosby RD, Engel SG. The validity  
 5 and clinical utility of binge eating disorder. *Int J Eat Disord* 2009; **42**:687-705.

6  
 7 **Table 1. Structural and categorical features of the Implicit Association Tests**  
 8 **(IAT) used in this study**

Block	Task (Trials)	Self-Discrimination IAT		Weight Stigma IAT	
		<i>Left Key</i>	<i>Right Key</i>	<i>Left Key</i>	<i>Right Key</i>
1	Single attribute discrimination (20)	Discriminated	Accepted	Positive	Negative
2	Single target discrimination (20)	Self	Other	Thin	Fat
3	Initial combined task – compatible pairing (60)	Discriminated + Self	Accepted + Other	Positive + Thin	Negative + Fat
4	Reversed target discrimination (40)	Other	Self	Fat	Thin
5	Reversed combined task – incompatible pairing (60)	Discriminated + Other	Accepted + Self	Positive + Fat	Negative + Thin

9

10

11 **Table 2. Prediction of global eating disorder psychopathology by dummy**  
 12 **coded group membership, experiences of weight bias, and implicit self-**  
 13 **discrimination (controlling for depressive symptoms)**

	<i>B</i>	<i>SE (B)</i>	$\beta$	<i>t</i>	$\Delta R^2$	F for $\Delta R^2$
Step 1						
Constant	0.63	0.19		3.32**		
Dummy HC-BED	0.99	0.32	0.41	3.06*		
Dummy HC-OB	0.54	0.25	0.22	2.13*	0.43	18.36**
BDI	0.05	0.02	0.37	3.16*		
Step 2						
Constant	0.63	0.19		3.23*		
Dummy HC-BED	0.94	0.36	0.38	2.57*		
Dummy HC-OB	0.49	0.29	0.20	1.69	0.00	0.12
BDI	0.05	0.02	0.36	2.93*		

SSI	0.06	0.17	0.04	0.34		
Step 3						
Constant	0.14	0.27		0.50		
Dummy HC-BED	0.96	0.35	0.40	2.74*		
Dummy HC-OB	0.46	0.28	0.19	1.65		
BDI	0.06	0.02	0.45	3.63*	0.05	6.24*
SSI	0.16	0.17	0.11	0.91		
SD-IAT	-0.92	0.37	-0.26	-2.50*		

1 *Note.*  $N = 78$ .  $B$  = unstandardized coefficient;  $SE$  = standard error;  $\beta$  = standardized  
2 coefficient;  $T = t$  statistic; BDI = Beck Depression Inventory; SSI = Stigmatizing Situations  
3 Inventory; SD-IAT = Self Discrimination Implicit Association Test. \*\*  $p < 0.001$ , \*  $p < 0.05$ .  
4