

Reward Responsiveness Moderates Individuals With Disordered Eating's Implicit Attitudes Toward the Caloric Value of Food

Brittany A. Mascioli and Ron Davis*
Lakehead University

ABSTRACT. The purpose of the present study was to investigate the relationship between disordered eating and implicit attitude toward the caloric value of food and, furthermore, to assess whether the personality dimension of reward responsiveness or the more specific construct of reward-based eating drive could better account for contradictory findings in the literature. University student volunteers ($N = 100$) completed an online questionnaire battery before attending a laboratory session and completing an implicit association test assessing the differential evaluation of high- and low-calorie food. A positive implicit attitude toward low-calorie food was observed in a large proportion of participants (94%). Reward responsiveness was found to moderate the relationship between disordered eating and implicit caloric-related attitude, 95% CIs [0.02, 0.07]. Among those high in reward responsiveness, disordered eating predicted a stronger positive implicit attitude toward low-calorie food. Reward-based eating drive did not moderate the association between disordered eating and implicit caloric-related attitude, 95% CIs [-0.10, 0.14]. The obtained results support the idea of approach and avoidance temperaments, characterized by sensitivity to reward and punishment, and offer evidence of an eating-related behavioural manifestation of such temperaments.

A prominent goal for individuals who engage in disordered eating behaviours is weight loss, which is often pursued through caloric restriction. The cognitive and behavioural processes that underlie disordered eating, however, remain poorly understood. One aspect that complicates research in this domain is the apparent dissociation between implicit and explicit attitudes toward food in disordered and nondisordered populations. Explicit attitudes refer to consciously accessible mental inclinations and implicit attitudes constitute remnants of past experience, inaccessible to conscious reflection, that influence positive or negative thoughts, actions, or behaviours toward a target (Nosek, Hawkins, & Frazier, 2012). Implicit and explicit attitudes are distinct constructs but may be congruent for an individual depending upon the target of the attitudes and individual differences. Conversely, explicit and implicit

attitudes toward a single target may be in conflict (Nosek et al., 2012). For example, Czyzewska and Graham (2008) observed negative implicit attitudes and positive explicit attitudes toward low-calorie food in the same group of individuals. Explicit attitudes can be influenced by a number of factors including intentions, normative attitudes, and social desirability. As such, attitudes assessed through explicit means may not accurately reflect cognitions. Further, explicit attitudes may not be predictive of behaviour, particularly in the realm of eating behaviour. Multiple lines of research suggest the utility of studying implicit processes with regard to eating behaviour. Decisions surrounding food selections are strongly influenced by implicit attitudes and other forms of automaticity, even when these attitudes contradict explicit attitudes (Cervellon, Dubé, & Knäuper, 2007; Yang et al., 2012).

SUMMER 2018

PSI CHI
JOURNAL OF
PSYCHOLOGICAL
RESEARCH

Research surrounding implicit attitudes and eating behaviour has produced mixed results. Using an affective priming task, which is a cognitive method used to measure implicit attitudes, Czyzewska and Graham (2008) found a positive implicit attitude toward high-calorie sweet food and a negative implicit attitude toward both low-calorie food and high-calorie nonsweet food. By contrast, using a unipolar implicit association test (IAT) variant that enables positive and negative implicit attitudes to be assessed separately; more specifically, Houben, Roefs, and Jansen (2010) found a negative implicit attitude toward high-calorie food relative to low-calorie food. When high- and low-calorie food were examined separately, however, a positive implicit attitude toward high-calorie food emerged (Houben et al., 2010). Using the traditional bipolar IAT, Mai, Hoffmann, Hoppert, Schwarz, and Rohm (2015) found a positive implicit attitude toward diet food including reduced-sugar and reduced-fat food items.

Implicit measures have also revealed mixed findings regarding the attitudes of individuals toward the caloric value of food in the restrained eating population. Dietary restraint, defined as the consistent and intentional limitation of food consumption, has been shown to be associated with a positive implicit attitude toward both low-calorie (Maison, Greenwald, & Bruin, 2001) and high-calorie food (Hoeftling & Strack, 2008; Houben et al., 2010). Taken together, these findings suggest that the nature of implicit attitudes toward food among individuals with disordered eating may be contingent upon a moderating variable.

The present study aimed to test two potential moderators of the relationship between disordered eating and the implicit attitude toward the caloric value of food. Reward responsiveness, characterized by one's sensitivity to rewarding stimuli, and reward-based eating drive, which describes a tendency toward uninhibited food consumption, were each assessed as putative moderators of the predictive ability of disordered eating regarding implicit attitude toward the caloric value of food (Epel et al., 2014; Van den Berg, Franken, & Muris, 2010).

One personality construct that may moderate the implicit attitude of individuals with disordered eating toward the caloric value of food is approach-avoidance motivation. This refers to the coordination of behaviour either toward rewarding stimuli or away from threatening or punishing stimuli. Two personality temperaments have been proposed on the basis of the idiosyncratic nature of sensitivity

to reward and punishment (Elliot & Thrash, 2002, 2010). Approach temperament is characterized by attentiveness to cues of potential reward and behavioural orientation toward positive stimuli. It comprises high reward responsiveness and low punishment sensitivity. Avoidance temperament is often described as the attentiveness to cues of potential threat and behavioural orientation away from negative stimuli. It is comprised of low reward responsiveness and high punishment sensitivity (Elliot & Thrash, 2002). Inconsistent findings regarding sensitivity to reward and punishment have emerged in the disordered eating population; both low (Harrison, Sternheim, O'Hara, Oldershaw, & Schmidt, 2016) and high (Glashouwer, Bloot, Veenstra, Franken, & de Jong, 2014) reward responsiveness have been observed in anorexia nervosa. One possibility to the inconsistency observed—with regard to reward responsiveness and implicit attitudes toward the caloric value of food among individuals with disordered eating—is that these two constructs covary in a systematic way in this population, thus creating two distinct personality subgroups, each comprising a unique behavioral strategy in line with the common goal of weight control. Individuals with disordered eating of approach temperament might be focused on the rewarding aspect of weight loss through caloric restriction; the attention of those of avoidance temperament may be centered on the perceived threat of weight gain through caloric indulgence.

Another possible moderator in the relationship between disordered eating and implicit caloric-related attitude is reward-based eating drive. This construct is narrower in scope than reward responsiveness because it pertains solely to reward-related eating behaviour. More specifically, reward-based eating drive is an absence of control over eating, lack of satiation, and a preoccupation with food (Epel et al., 2014). Together, these factors comprise a heightened responsiveness to food-related reward. This more specific aspect of reward responsiveness may explain the inconsistent results concerning implicit caloric-related attitudes among individuals with disordered eating. Further, higher reward-based eating drive could account for a more positive implicit attitude toward palatable foods whose consumption is generally experienced as rewarding and which are also typically high in caloric value.

The present study investigated the relationship between disordered eating and implicit caloric-related attitude. Given the inconsistent findings

concerning the direction of implicit attitude toward the caloric value of food among individuals with disordered eating (Hoefling & Strack, 2008; Maison et al., 2001), it was hypothesized that the nature of this relationship might depend on reward responsiveness, a personality construct that also has been found to be inconsistent in this population (Glashouwer et al., 2014; Harrison et al., 2016). A competing hypothesis was that reward-based eating drive might account for the observed differences in implicit attitude. Delineating the nature of the links between these four constructs was the purpose of this exploratory analysis. Specifically, it was assessed whether a broad dimension of personality, reward responsiveness, could account for differences in implicit caloric-related attitude among those high in disordered eating or whether observed differences were simply due to individual variation in responsiveness to food-related reward.

Method

Participants

Undergraduate student volunteers ($N = 100$, 77 women) participated in this study and received bonus points toward their final grades in eligible psychology courses. This study was approved by the Research Ethics Board at Lakehead University, and participants provided informed consent prior to their participation. Participants ranged from age 17 to 44 ($M = 20.12$, $SD = 3.66$). Regarding ethnicity, 75% of the sample identified as European Canadian/White, 7% identified as Asian, 6% identified as African Canadian/Black, and 12% identified other ethnicities including Aboriginal/First Nation, Middle Eastern, and Hispanic. In the present study, 12% of participants could be categorized according to scores obtained on the Eating Attitudes Test-26 as demonstrating overconcern regarding dieting, weight, and eating behaviours (Garner, Olmsted, Bohr, & Garfinkel, 1982). As part of a larger study, participants were required to be nonsmokers and not taking antidepressant, hypertension, or cold medication at the time of participation.

Measures

Reward Responsiveness Scale. The Reward Responsiveness Scale (RRS; Van den Berg et al., 2010) is an eight-item self-report measure of reward responsiveness, a personality construct characterized by sensitivity to reward. Half of the items derive from the well-known behavioural approach system reward scale (Carver & White, 1994), with which the RRS is highly associated, $r = .68$. In demonstration of the

discriminant validity of this measure, the RRS and the behavioural inhibition system scale by Carver and White (1994) are uncorrelated (Van den Berg, 2010). Respondents indicate the degree to which they agree with each item on a 4-point scale ranging from 1 (*strong disagreement*) to 4 (*strong agreement*). Responses are summed to produce a total score where higher values represent greater reward responsiveness. In the present study, the reliability coefficient for the RRS was in the acceptable range (Cronbach's $\alpha = .84$).

Reward-Based Eating Drive Scale. The Reward-Based Eating Drive Scale (REDS; Epel et al., 2014) is a nine-item self-report measure of reward-based eating drive. The scale is derived from two existing psychometric instruments: the Three Factor Eating Questionnaire (Stunkard & Messick, 1985), and the Binge Eating Scale (Gormally, Black, Daston, & Rardin, 1982), and also includes novel items. Respondents indicate the degree to which they agree with each item on a 5-point scale ranging from 0 (*not at all*) to 4 (*very much*). An item average is derived with higher scores representing greater reward-based eating drive. In the present study, the reliability coefficient for the REDS was in the acceptable range (Cronbach's $\alpha = .89$).

Eating Attitudes Test-26. The Eating Attitudes Test-26 (EAT-26; Garner et al., 1982) is a 26-item self-report measure of disordered eating that consists of three subscales: dieting, bulimia and food preoccupation, and oral control. Respondents indicate the frequency with which they engage in the behaviours described on a 6-point scale where responses "always," "usually," and "often" are scored as 3, 2, and 1, respectively, with the remainder of responses scored as 0. Item 26 is reverse scored. Responses are summed to produce a total score where higher values represent greater disordered eating. The EAT-26 has frequently been used in research to measure the construct of disordered eating. In the present sample, the EAT-26 correlated significantly with the Eating Disorder Examination-Questionnaire (Fairburn & Beglin, 2008), $r = .63$. In addition, the reliability coefficient for the EAT-26 was in the acceptable range (Cronbach's $\alpha = .84$).

Implicit association test. An IAT was completed by participants. The IAT measures the relative strength of association between an attribute dimension and a pair of target concepts (Greenwald, McGhee, & Schwartz, 1998). Concepts in the present study included high- and low-calorie foods. The dimension of interest was participants' evaluation of these food categories and, thus, the

IAT involved categorizing images of high- and low-calorie foods with positive and negative words. The IAT literature suggests that the categorization of a pair of concepts, along with positive and negative words, can provide inferential data about the relative implicit attitude regarding the concepts on the basis of reaction times and error rates. If the categorization of positive words with low-calorie foods occurred more quickly and with fewer errors than the categorization of high-calorie foods with positive words, it would be assumed that the participant held a relatively more positive implicit attitude toward low-calorie food in comparison with high-calorie food. Images for the IAT were obtained from the Food-pics image database (Blechert, Meule, Busch, & Ohla, 2014). Items were selected on the basis of caloric density. High-calorie items had greater than 200 calories per 100 grams and included a cookie and some cashews, for example. Low-calorie items had less than 50 calories per 100 grams and included a cucumber and some blueberries, for example¹. A subset of positive and negative words was selected for inclusion from the word lists provided by Greenwald et al. (1998). The positive words used were *happy, honest, health, love, peace, cheer, friend, and pleasure*. The negative words used included *hatred, rotten, filth, poison, sickness, evil, death, and grief*. The IAT was administered on a television screen via Inquisit v4 computer software (www.millisecond.com). The participant categorized the stimuli that were presented in the center of the screen using the “E” and “I” keys of a standard computer keyboard.

Procedure

After institutional review board approval (1465300) was given, participants completed an online questionnaire battery including the RRS, REDS, and EAT-26 prior to attending a laboratory session on a separate occasion. During the laboratory session, participants first engaged in a task that involved viewing images of food stimuli, rank ordering the food stimuli by preference, and sampling the foods, as part of a separate study. Participants also engaged in an IAT that was of interest to the separate study in which the target concepts were images of natural and nonnatural foods. All participants were exposed to the same food stimuli and samples, which included images and foods that were

¹ High-calorie items included image numbers 0004, 0022, 0045, 0092, 0110, 0113, 0174, and 0488 from the Food-pics image database. Low-calorie items included image numbers 0199, 0229, 0248, 0250, 0267, 0429, 0453 and 0508 from the Food-pics image database.

variable in terms of caloric value. Participants then completed the IAT relevant to the present study in which the concepts were images of high- and low-calorie foods. This task comprised five blocks of categorization trials. Block 1 included 20 trials of categorizing concepts (high- or low-calorie). Block 2 included 20 trials of categorizing words (positive or negative). Block 3 included 20 practice and 40 test trials of categorizing concepts and words (high-calorie + positive and low-calorie + negative). Block 4 included 20 trials categorizing concepts with the reversal of the side of the screen on which the categories are located. Block 5 included 20 practice and 40 test trials of categorizing concepts and words (high-calorie + negative and low-calorie + positive). The task was counterbalanced such that half of the participants completed it as outlined above; for the remainder of participants, Blocks 1 and 4 and Blocks 3 and 5 were switched. Data from Blocks 3 and 5 were used in the analysis in accordance with the scoring algorithm outlined by Greenwald, Nosek, and Banaji (2003).

Results

Descriptive statistics of the psychometrics are presented in Table 1. The descriptive statistics of the RRS reported by Van den Berg et al. (2010) included a mean of 26.1 and a standard deviation of 3.2. These values align with the descriptive statistics obtained in the present study, which are presented in Table 1. The descriptive statistics of the REDS reported by Epel et al. (2014) included a mean of 1.88 and a standard deviation of 0.71, which are similar to the descriptive statistics obtained in the present study (see Table 1). The descriptive statistics of the EAT-26 reported by Garner et al. (1982) for a female university student sample included a mean of 9.9 and a standard deviation of 9.2. These values are similar to the descriptive statistics obtained in the present study, which are presented in Table 1. A significant and positive skew was observed for disordered eating using *Z* skewness whereby a *Z* score of ± 1.96 is considered indicative of a significant degree of skew (Field, 2013). Disordered eating, measured using the EAT-26, was subjected to the natural logarithmic transformation, producing a *Z* skewness statistic of -0.34 , and thus remedying the skew. The transformed variable *EAT-26_{ln}* was retained for subsequent analyses to represent the construct of disordered eating. A significant and positive skew was also observed for IAT. Two was added to the IAT variable to remove negative values. IAT+2 was then subjected to the natural logarithmic

transformation, producing a *Z*skewness statistic of -4.65. This log transformation rendered the skew more severe and therefore, the original IAT variable was retained for subsequent analyses.

The possible range of the IAT variable was between -2 and 2, with positive scores indicating a positive implicit attitude toward low-calorie food and negative scores indicating a positive implicit attitude toward high-calorie food. Ninety-four percent of participants obtained a positive IAT score, indicating a positive implicit attitude toward low-calorie food relative to high-calorie food.

Two moderated multiple-regression analyses were conducted using the SPSS PROCESS macro for Model 1 (Hayes, 2013). The first tested whether the regression of IAT score (Y) on disordered eating (X) was moderated by reward-based eating drive (M). The interaction was not significant (Table 2). The second investigated whether the regression of IAT score (Y) on disordered eating (X) was moderated by reward responsiveness (M). The significant interaction between reward responsiveness (RRS) and disordered eating (EAT-26ln) is displayed in Table 2. The relationship between disordered eating and implicit attitude toward the caloric value of food is contingent upon level of reward responsiveness.

Decomposing the interaction into simple slopes revealed that individuals low (-1 SD) in reward responsiveness evidenced a negative association between disordered eating and positive implicit attitude toward low-calorie food, $b = -0.15$ [$SE\ b = .07$], $t = -2.26$, $p = .026$; among those high (+1 SD) in reward responsiveness, the association was positive, $b = 0.14$ [$SE\ b = .05$], $t = 2.70$, $p = .008$ (see Figure 1).

Discussion

The majority of participants demonstrated a positive implicit attitude toward low-calorie food. The strength of the positive implicit attitude toward low-calorie food was most variable among those high in disordered eating. This variance can be explained by individual differences in reward responsiveness. Among those high in reward responsiveness, disordered eating predicted greater strength of positive implicit attitude toward low-calorie food. Among those low in reward responsiveness, disordered eating predicted lesser strength of positive implicit attitude toward low-calorie food. This finding can be understood with reference to the two personality temperaments described by Elliot and Thrash (2002) concerning

reward responsiveness and approach-avoidance motivation. Individuals of approach temperament are high in reward responsiveness; they scan their environment for cues of potential reward and engage in reward-seeking behaviours (Elliot & Thrash, 2002, 2010). Applied to disordered eating, where weight loss and caloric restriction might be

TABLE 1

Descriptive Statistics and Intercorrelations

Variables	<i>M</i>	<i>SD</i>	Cronbach's α	<i>Z</i> _{skewness}	2	3	4
1 RRS	25.36	3.50	.84	-1.89	.15	.09	.16
2 REDS	1.49	0.85	.89	0.98		.41*	-.08
3 EAT-26	8.39	7.93	.84	6.52			.02
4 IAT	0.62	0.35		-2.57			

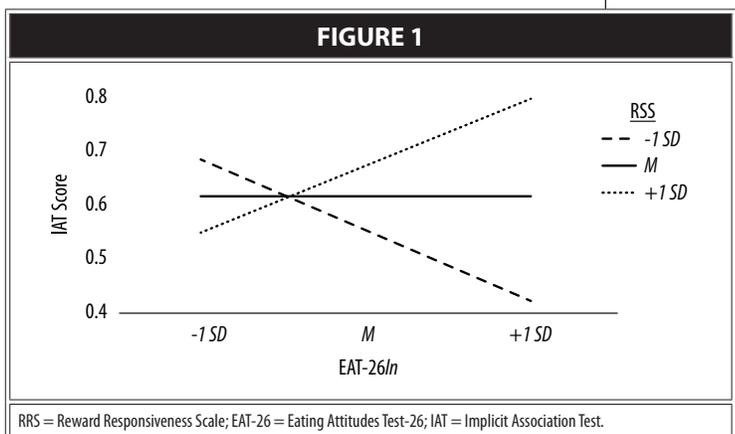
Note. *N* = 100. RRS = Reward Responsiveness Scale; REDS = Reward-Based Eating Drive Scale; EAT-26 = Eating Attitudes Test-26; IAT = Implicit Association Test. * $p < .01$.

TABLE 2

Unstandardized Regression Coefficients for Predicting IAT Implicit Attitude Toward Low-Calorie Food From EAT-26ln as Moderated by REDS and RRS

Variables	<i>b</i> [95% CI]	<i>SE b</i>	<i>t</i>	<i>p</i>
REDS				
Constant	0.72 [0.41, 1.02]	0.15	4.67	< .001
REDS	-0.08 [-0.33, 0.17]	0.13	-0.66	.513
EAT-26ln	-0.02 [-0.21, 0.17]	0.10	-0.22	.823
REDS x EAT-26ln	0.02 [-0.10, 0.14]	0.06	0.36	.720
RRS				
Constant	2.25 [1.17, 3.34]	0.55	4.12	< .001
RRS	-0.06 [-0.11, -0.02]	0.02	-3.02	.003
EAT-26ln	-1.08 [-1.72, -0.43]	0.32	-3.32	.001
RRS x EAT-26ln	0.04 [0.02, 0.07]	0.01	3.44	.001

Note. *N* = 100. REDS = Reward-Based Eating Drive Scale, $R^2 = 0.01$; RRS = Reward Responsiveness Scale, $R^2 = 0.14$; EAT-26ln = long transformed Eating Attitudes Test-26.



experienced as rewarding, this may manifest as a propensity for low-calorie food in terms of perceptions and behaviours. Previous research has demonstrated the predictive validity of the IAT in terms of actual behaviour in instances where ambivalence may exist regarding food-related attitudes. For example, De Houwer and De Bruycker (2007) found that those adhering to a vegetarian diet held more positive implicit attitudes toward vegetables relative to animal products in comparison with meat eaters. This result has since been replicated by Barnes-Holmes, Murtagh, Barnes-Holmes, and Stewart (2010).

Given the obtained result demonstrating the positive bias to low-calorie foods among individuals high in disordered eating when reward responsiveness is also high, a case can be made for divergent eating behaviour according to reward responsiveness. Specifically, it may be that individuals high in both disordered eating and reward responsiveness adopt a dieting strategy characterized by a motivation to approach low-calorie foods, thus accounting for the strong implicit bias in favour of such foods. A recent study demonstrated the superior performance of implicit attitude toward the caloric value of food in the prediction of participants' intention to buy the target foods, as compared to the predictive ability of explicit measures (Songa & Russo, 2018). This provides strength to the argument that food-related implicit attitudes can be predictive of eating behaviour and perhaps also of dieting strategy.

Individuals of avoidance temperament, by contrast, are low in reward responsiveness; they scan their environment for cues of potential threat and behave in a way that serves to minimize their chances of encountering such threat (Elliot & Thrash, 2002, 2010). Rather than the hypothesized strategy of approaching low-calorie foods adopted by individuals with disordered eating of approach temperament, individuals of avoidance temperament could, in theory, adopt a dieting strategy characterized by a motivation to avoid high-calorie foods. The direction of implicit attitude would remain positive toward low-calorie food because these two subgroups share the goal of weight loss, which is perceived as attainable through caloric restriction. The strength of the positive implicit attitude, however, would vary due to the differing loci of focus and alternative behavioural strategies. The present findings are a preliminary indicator of this possibility. Further research assessing the relation of the approach and

avoidance temperaments proposed by Elliot and Thrash (2010) in the context of disordered eating and implicit bias is required, with the inclusion of an assessment of the specific behavioural approach that is utilized in the pursuit of weight loss.

No moderating effect of reward-based eating drive was observed. This finding supports the hypothesis that the more general personality dimension of reward responsiveness, indicative of approach and avoidance temperaments, accounts for the variance in implicit caloric-related attitude results as opposed to an eating-specific reward sensitivity.

Limitations

The nonclinical sample was obtained from a university student population and, thus, generalizability to more severe eating disorder presentations is unknown. A minority of participants obtained scores on the measure of disordered eating (EAT-26) that suggest overconcern with dieting and weight (Garner et al., 1982). Given the widespread prevalence of subthreshold patterns of disordered eating beginning prior to the age at which post-secondary education is pursued (Chamay-Weber, Narring, & Michaud, 2005), these participants were retained to foster the generalizability of the obtained findings. This measure, however, cannot be used to reliably differentiate those with or without clinical levels of disordered eating. As such, a limitation of the current study is the lack of information gathered regarding the current or historical presence of clinically severe levels of eating pathology. Furthermore, because a convenience sample of university students was recruited, the representativeness of these findings with respect to gender is limited. Although disordered eating is observed with greater frequency in female populations, this issue is also apparent with men and should not be neglected in future research. This research was conducted at a university located in a northern region of Ontario, Canada, and as a result, the ethnic diversity of the participant sample is not representative of what would be observed in more metropolitan areas of Canada or the United States. The generalizability of the findings is therefore limited to a university population in this geographic region and/or a university population with a similar demographic of students.

An index of sensitivity to threat or punishment was not included in the online questionnaire battery, which is a limitation of the present study. The inclusion of this type of measure would have

enabled a more robust assessment of approach and avoidance temperament.

Participants engaged in a number of food-related tasks prior to completion of the IAT. All participants were exposed to the same food images and samples, which minimizes the likelihood of the observed moderation being attributable to an artefact created by participation in food-related tasks prior to their engagement in the task of interest for the present study. In addition, all earlier tasks contained food images and samples comprising a spectrum of foods in terms of caloric value, thus reducing the risk of introducing bias in favor of either high- or low-calorie foods. Nonetheless, the potential influence of participation in the earlier tasks upon the obtained results cannot be isolated nor ruled out.

Finally, it should be noted that there are a number of criticisms of the IAT for the assessment of implicit attitudes. These include questions regarding the stability of the implicit constructs of interest and the potential confounding effect of general processing speed (Blanton & Jaccard, 2008).

Conclusions

Reward responsiveness appears to predict the strength of positive implicit attitudes toward low-calorie food in individuals with disordered eating. Those high in disordered eating and high in reward responsiveness demonstrated the strongest positive implicit attitude toward low-calorie food. By contrast, the positive implicit attitude toward low-calorie food demonstrated by those high in disordered eating and low in reward responsiveness was of the lowest strength. These findings suggest that personality variables affect the behavioural strategy adopted by individuals with disordered eating in the pursuit of their shared goal of weight loss. These differing strategies may have implications for treatment in terms of the potential impact on clinical presentation and targets of treatment. The clinical significance of these results lies in the potentially different manifestations of eating pathology among individuals with clinically severe presentations. Future research should aim to replicate the current findings in a clinical population with attention to differences in symptoms, diagnoses, and response to treatment. For example, it may be that those of high reward responsiveness tend to manifest with more restrictive symptoms of eating pathology, and those with lower reward responsiveness may be more prone to binge/purge symptoms because

of their potential orientation toward the target of avoidance.

The findings of the current study suggest that implicit bias toward the caloric value of food among individuals with disordered eating tendencies may vary according to individual differences of the personality variable reward responsiveness. Although the possibility of these individual differences influencing idiosyncratic presentations of eating pathology cannot be ruled out, this was not something that was investigated in the current study. Furthermore, the measurement of implicit bias is not routine practice in psychological assessment. Future research is recommended to assess whether the individual differences observed in the current study (a) are related to individual differences in disordered eating presentation; and (b) whether these hypothetically different presentations necessitate individually tailored intervention. Nonetheless, the current results show that a personality variable can influence a factor—implicit bias—that has previously been shown to predict eating behaviour. Given this finding, it is recommended to individuals who are working with college or university students—some who may be experiencing symptoms of disordered eating—to be sensitive to the potentially wide array of individual differences that can influence beliefs and attitudes toward food. The current findings highlight the importance of conducting a thorough psychological assessment and taking individual characteristics into account while formulating a plan for intervention. The consideration of individual characteristics, culture, and preferences is one of the three pillars of evidence-based practice in psychology (American Psychological Association, 2006).

In terms of practical significance to research, these findings may help to clarify the inconsistent results regarding the directionality of implicit attitude to the caloric value of food. Mixed findings have plagued this field of literature. Future research should ensure the inclusion of a measure of reward responsiveness in order to tease apart the effect of the variable of interest from the potential confound introduced by variability in reward sensitivity.

References

- American Psychological Association. (2006). Evidence-based practice in psychology. *American Psychologist*, *61*, 271–285. <https://doi.org/10.1037/0003-066X.61.4.271>
- Barnes-Holmes, D., Murtagh, L., Barnes-Holmes, Y., & Stewart, I. (2010). Using the implicit association test and the implicit relational assessment procedure to measure attitudes towards meat and vegetables in vegetarians and meat-eaters. *The Psychological Record*, *60*, 287–306. Retrieved from <https://link.springer.com/article/10.1007/BF03395708>

- Blanton, H., & Jaccard, J. (2008). Unconscious racism: A concept in pursuit of a measure. *The Annual Review of Sociology, 34*, 277–297. <https://doi.org/10.1146/annurev.soc.33.040406.131632>
- Blechert, J., Meule, A., Busch, N. A., & Ohla, K. (2014). Food-pics: An image database for experimental research on eating and appetite. *Frontiers in Psychology, 5*, 1–10. <https://doi.org/10.3389/fpsyg.2014.00617>
- Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS Scales. *Journal of Personality and Social Psychology, 67*, 319–333. <https://doi.org/10.1037/0022-3514.67.2.319>
- Cervellon, M., Dubé, L., & Knauper, B. (2007). Implicit and explicit influences on spontaneous and deliberate food choices. *Advances in Consumer Research, 34*, 104–109. Retrieved from http://www.acrwebsite.org/volumes/v34/500636_101397_v1.pdf
- Chamay-Weber, C., Narring, F., & Michaud, P. (2005). Partial eating disorders among adolescents: A review. *Journal of Adolescent Health, 37*, 417–427. <https://doi.org/10.1016/j.jadohealth.2004.09.014>
- Czyzewska, M., & Graham, R. (2008). Implicit and explicit attitudes to high- and low-calorie food in females with different BMI status. *Eating Behaviors, 9*, 303–312. <https://doi.org/10.1016/j.eatbeh.2007.10.008>
- De Houwer, J., & De Bruycker, E. (2007). Implicit attitudes towards meat and vegetables in vegetarians and nonvegetarians. *International Journal of Psychology, 42*, 158–165. <https://doi.org/10.1080/00207590601067060>
- Elliot, A. J., & Thrash, T. M. (2002). Approach–avoidance motivation in personality: Approach and avoidance temperaments and goals. *Journal of Personality and Social Psychology, 82*, 804–818. <https://doi.org/10.1037/0022-3514.82.5.804>
- Elliot, A. J., & Thrash, T. M. (2010). Approach and avoidance temperament as basic dimensions of personality. *Journal of Personality, 78*, 865–906. <https://doi.org/10.1111/j.1467-6494.2010.00636.x>
- Epel, E. S., Tomiyama, A. J., Mason, A. E., Laraia, B. A., Hartman, W., Ready, K., . . . Kessler, D. (2014). The Reward-Based Eating Drive Scale: A self-report index of reward-based eating. *PLoS One, 9*, e101350. <https://doi.org/10.1371/journal.pone.0101350>
- Fairburn, C. G., & Beglin, S. J. (2008). Eating Disorder Examination Questionnaire (6.0). In C. G. Fairburn, *Cognitive behavior therapy and eating disorders* (pp. 309–313). New York, NY: Guilford Press.
- Field, A. (2013). *Discovering statistics using IBM SPSS Statistics*. London, England: Sage Publications Ltd.
- Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The Eating Attitudes Test: Psychometric features and clinical correlates. *Psychological Medicine, 12*, 871–878. <https://doi.org/10.1017/S0033291700049163>
- Glashouwer, K. A., Bloot, L., Veenstra, E. M., Franken, I. H. A., & de Jong, P. (2014). Heightened sensitivity to punishment and reward in anorexia nervosa. *Appetite, 75*, 97–102. <https://doi.org/10.1016/j.appet.2013.12.019>
- Gormally, J., Black S., Daston S., Rardin D. (1982). The assessment of binge eating severity among obese persons. *Addictive Behaviors, 7*, 47–55. [https://doi.org/10.1016/0306-4603\(82\)90024-7](https://doi.org/10.1016/0306-4603(82)90024-7)
- Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology, 74*, 1464–1480. <http://dx.doi.org/10.1037/0022-3514.74.6.1464>
- Greenwald, A. G., Nosek, B. A., & Banaji, M. R. (2003). Understanding and using the implicit association test: I. An improved scoring algorithm. *Journal of Personality and Social Psychology, 85*, 197–216. <https://doi.org/10.1037/0022-3514.85.2.197>
- Harrison, A., Sternheim, L., O'Hara, C., Oldershaw, A., & Schmidt, U. (2016). Do reward and punishment sensitivity change after treatment for anorexia nervosa? *Personality and Individual Differences, 96*, 40–46. <https://doi.org/10.1016/j.paid.2016.02.051>
- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: Guilford Press.
- Hoefling, A., & Strack, F. (2008). The tempting effect of forbidden foods. High calorie content evokes conflicting implicit and explicit evaluations in restrained eaters. *Appetite, 51*, 681–689. <https://doi.org/10.1016/j.appet.2008.06.004>
- Houben, K., Roefs, A., & Jansen, A. (2010). Guilty pleasures. Implicit preferences for high calorie food in restrained eating. *Appetite, 55*, 18–24. <https://doi.org/10.1016/j.appet.2010.03.003>
- Mai, R., Hoffmann, S., Hoppert, K., Schwarz, P., & Rohm, H. (2015). The spirit is willing, but the flesh is weak: The moderating effect of implicit associations on healthy eating behaviors. *Food Quality and Preference, 39*, 62–72. <http://dx.doi.org/10.1016/j.foodqual.2014.06.014>
- Maison, D., Greenwald, A. G., & Bruin, R. (2001). The implicit association test as a measure of implicit consumer attitudes. *Polish Psychological Bulletin, 32*, 1–9. <https://doi.org/10.1066/S10012010002>
- Nosek, B. A., Hawkins, C. B., & Frazier, R. S. (2012). Implicit social cognition. In S. T. Fiske & C. N. Macrae (Eds.), *The SAGE handbook of social cognition* (pp. 31–53) London, England: Sage Publications. <http://dx.doi.org/10.4135/9781446247631.n3>
- Songa, G., & Russo, V. (2018). IAT, consumer behaviour and the moderating role of decision-making style: An empirical study on food products. *Food Quality and Preference, 64*, 205–220. <https://doi.org/10.1016/j.foodqual.201709.006>
- Stunkard A. J., & Messick S. (1985). The three-factor eating questionnaire to measure dietary restraint, disinhibition and hunger. *Journal of Psychosomatic Research, 29*, 71–83. [http://dx.doi.org/10.1016/0022-3999\(85\)90010-8](http://dx.doi.org/10.1016/0022-3999(85)90010-8)
- Van den Berg, I., Franken, I. H. A., Muris, P. (2010). A new scale for measuring reward responsiveness. *Frontiers in Psychology, 1*, 239. <https://doi.org/10.3389/fpsyg.2010.00239>
- Yang, H., Carmon, Z., Kahn, B., Malani, A., Schwartz, J., Volpp, K., & Wansink, B. (2012). The hot-cold decision triangle: A framework for healthier choices. *Marketing Letters, 23*, 457–472. <https://doi.org/10.1007/s11002-012-9179-0>

Author Note. Brittany A. Mascioli, Department of Psychology, Lakehead University; Ron Davis, Department of Psychology, Lakehead University.

Special thanks to *Psi Chi Journal* reviewers for their support.

Correspondence concerning this article should be addressed to Brittany A. Mascioli, Department of Psychology, Lakehead University, 995 Oliver Road, Thunder Bay, Ontario, Canada, P7B 5E1. E-mail: Bmasciol@lakeheadu.ca



BALL STATE UNIVERSITY

Teachers College
Department of Educational
Psychology

Find your **career.**

Eight graduate degree programs and four certificates in **Educational Psychology**

PhD in Educational Psychology

Engage in the science of learning. Prepare for a career where you can use your knowledge of human learning and development to help shape the school environment and public policy. Core program areas include learning, motivation, and research design.

MS or MA in Educational Psychology*

Broaden your ability to apply psychological principles to a variety of professional contexts or prepare for your future doctorate in social science.

MS in Quantitative Psychology*

Do you like numbers, statistics, and social science? Prepare for a career in research, assessment, and data analysis. Develop proficiency in advanced statistical techniques, measurement theory, and data analytics.

PhD in School Psychology (five-year program)

Prepare for a career as a licensed psychologist. Gain competencies in health service psychology to work in schools, private practice, or hospital settings. Accredited by the American Psychological Association (APA)** and approved by the National Association of School Psychologists (NASP). Scientist-practitioner model with advocacy elements. Specializations available.

MA/EdS in School Psychology (three-year program)

Be immersed in community engaged, real-world field experiences and intervention opportunities in our scientist-practitioner-advocate program. Leads to licensure as a school psychologist. Approved by NASP and the National Council for Accreditation of Teacher Education (NCATE).

MA in School Counseling (two-year program)

Be a leader and advocate for educational equity for all students in PK-12 schools. Leads to licensure as a school counselor. Accredited by the Council for



Accreditation of Counseling and Related Educational Programs (CACREP) and nationally recognized by The Education Trust as a Transforming School Counseling program.

Certificates

High Ability/Gifted Studies,* Human Development and Learning,* Identity and Leadership Development for Counselors,* Neuropsychology*

Graduate assistantships and tuition waivers are available.

bsu.edu/edpsy

*Online programs are available.

**Questions related to the PhD in school psychology's accreditation status should be directed to the Office of Program Consultation and Accreditation, American Psychological Association, 750 First St. NE, Washington, D.C. 20002; (202) 336-5979; apaaccred@apa.org; or apa.org/ed/accreditation.

SUMMER 2018

PSI CHI
JOURNAL OF
PSYCHOLOGICAL
RESEARCH

Ball State University practices equal opportunity in education and employment and is strongly and actively committed to diversity within its community. Ball State wants its programs and services to be accessible to all people. For information about access and accommodations, please call the Office of Disability Services at 765-285-5293; go through Relay Indiana for deaf or hard-of-hearing individuals (relayindiana.com or 877-446-8772); or visit bsu.edu/disabilityservices. 582418-18 mc



**THE COLLEGE OF
CLINICAL PSYCHOLOGY**
AT ARGOSY UNIVERSITY

Argosy University is a
non-profit institution.

"MY JOB IS NOT JUST TO TEACH, BUT ALSO TO HELP STUDENTS SEE THEIR INNER STRENGTHS."

At the College of Clinical Psychology at Argosy University, we believe in a practitioner-scholar model of training. Our programs offer a rigorous curriculum grounded in theory and research, while also offering real-world experience. What's more, all our PsyD programs have received accreditation from the American Psychological Association (APA), certifying that they meet the industry's standards.

Learn more at clinical.argosy.edu/psichi

Arizona School of Professional Psychology at Argosy University

American School of Professional Psychology at
Argosy University | *Southern California*

American School of Professional Psychology at
Argosy University | *San Francisco Bay Area*

Florida School of Professional Psychology at Argosy University

Georgia School of Professional Psychology at Argosy University

Hawai'i School of Professional Psychology at Argosy University

Illinois School of Professional Psychology at
Argosy University | *Chicago*

Illinois School of Professional Psychology at
Argosy University | *Schaumburg*

Minnesota School of Professional Psychology at
Argosy University

American School of Professional Psychology at
Argosy University | *Northern Virginia*

DR. NAHID AZIZ

Associate Professor at the American School of Professional
Psychology at Argosy University | *Northern Virginia*

*Dr. Aziz is committed to mentorship,
training, and addressing issues relevant
to the ethnic and racial diversity.*



*The Doctor of Psychology in Clinical Psychology Program at Argosy University, Atlanta, Chicago, Hawaii, Orange County, Phoenix, San Francisco Bay Area, Schaumburg, Tampa, Twin Cities and Northern Virginia is accredited by the Commission on Accreditation of the American Psychological Association (APA). Questions related to the program's accredited status should be directed to the Commission on Accreditation; Office of Program Consultation and Accreditation, American Psychological Association, 750 1st Street, NE, Washington DC 20002 Phone: (202) 336-5979 / E-mail: apaacred@apa.org / Web: www.apa.org/ed/accreditation

Argosy University is accredited by the WASC Senior College and University Commission (985 Atlantic Ave., Suite 100, Alameda, CA 94501, wscuc.org). Programs, credential levels, technology, and scheduling options are subject to change. Not all online programs are available to residents of all U.S. states. Administrative office: Argosy University, 601 South Lewis Street, Orange, CA 92868 ©2018 Argosy University. All rights reserved. Our email address is materialsreview@argosy.edu

SUMMER 2018

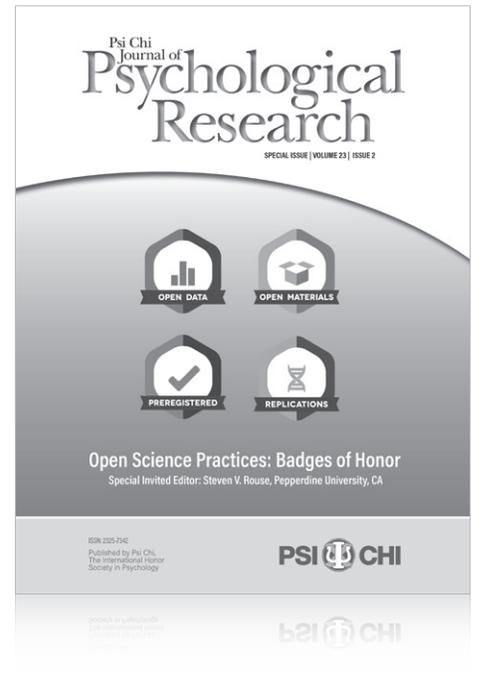
PSI CHI
JOURNAL OF
PSYCHOLOGICAL
RESEARCH

See and Share *Psi Chi Journal's* First-Ever Special Issue

www.psichi.org/page/232JNSpecialIssue18

Learn about “replication crisis” and how earning **Open Science Badges** can reinforce your research practices. Led by Special Invited Editor Dr. Steven V. Rouse, this unique, free issue features a variety of articles awarded with badges for sharing Open Data, Open Materials, Preregistering their research, and conducting Replication studies.

Authors of all future *Psi Chi Journal* articles are encouraged to participate in our ongoing badges program, which was created by members of the Open Science Collaboration. Any badges received will be prominently displayed on the first page of published *Psi Chi Journal* articles, as shown throughout the new special issue.



Learn more about the badges at www.psichi.org/page/journal_Badges
View *Psi Chi Journal* submission guidelines at www.psichi.org/?page=JN_Submissions

Special Issue Call for Abstracts: Education, Research, and Practice for a Diverse World

Today, consider submitting an abstract for a potential empirical manuscript to be published in *Psi Chi Journal's* next special issue. This special issue welcomes articles that examine the effects and advancement of diversity and inclusion in classrooms, educational materials, and technology.

- Abstracts are due **September 15**.
- Selected manuscripts are due **October 15**.
- Publication for the issue is anticipated for **Summer 2019**.

A vast amount of psychological research has indicated the importance of embracing diversity-affirming stances with regard to racial and ethnic diversity, sexual and gender diversity, religious diversity, disability status, SES and social class, refugee and immigrant status, among many others. This special issue is in direct support of the new 2018–19 Psi Chi theme of “Leveraging Technology to Advance Diversity and Inclusion.”

We look forward to reviewing your abstracts!
Submit your abstracts to
Debi.Brannan@psichi.org.

SUMMER 2018

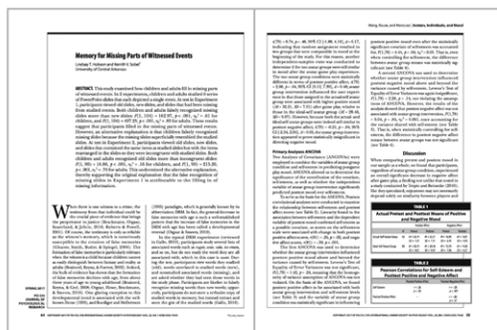
PSI CHI
JOURNAL OF
PSYCHOLOGICAL
RESEARCH

PSI CHI Advertising Contract: *Psi Chi Journal*

CLIENT INFORMATION	
Advertiser	
Contact Name	
Address Street or P.O. Box	
City State Zip Country	
Phone (daytime)	E-mail
Submitted by	
Authorized Signature	

Please read our Privacy Policy at <https://www.psichi.org/general/custom.asp?page=PrivacyPolicy>

DIGITAL PUBLICATION			
Issue			
<input type="checkbox"/> Spring _____ (deadline Jan 31) online Feb 22	<input type="checkbox"/> Summer _____ (deadline April 15) online May 17	<input type="checkbox"/> Fall _____ (deadline Sept 3) online Sept 28	<input type="checkbox"/> Winter _____ (deadline Nov 15) online Dec 14
Size/Dimensions			
<input type="checkbox"/> Full page (no bleed) 6 5/8" x 9 1/4"	Cost: \$400 Black & White only	<input type="checkbox"/> Half page (horizontal) 6 5/8" x 4 1/2"	Cost: \$275 Black & White only



OUR JOURNAL

Advertising in *Psi Chi Journal* allows you to connect with established psychology researchers and mentors, as well as undergraduates and graduate students striving to build a career in one of the many areas of research. People regularly visit our journal online to

- view current and past issues,
- submit their research for publication,
- learn about reviewing for *Psi Chi Journal*, and
- share invited editorials as teaching tools in the classroom.

All issues and advertisements are permanently free online to both members and nonmembers alike. During the 2017–18 fiscal year, psichi.org received almost **1.5 million page views**, ensuring that high-achieving students and professionals will see your content for years to come.

To further enhance the visibility of our journal, latest issues and calls for submissions are regularly featured in *Psi Chi Digest* e-mails (**177,000+ subscribers**) and on our four social media platforms.

- Facebook (22,500+ followers)
- Twitter (4,700+ followers)
- LinkedIn (10,200+ followers)
- Instagram (1,000+ followers)

Articles are also indexed in PsycINFO, EBSCO, and Crossref databases—essential tools that researchers use to search for millions of psychology-related articles. This makes *Psi Chi Journal* a key place to communicate your message with our Professional Organization's **three quarters of a million lifetime members** and far beyond.

AD SPECIFICATIONS

Digital format: PDF, EPS, and TIFF
Resolution : 300 dpi | B&W line art—1,200 dpi
Black & white ads (no RGB or 4-color process)
PDF settings: Press quality, embed all fonts

DEADLINE/BILLING

Payment due upon receipt of invoice.

CONTACT

Submit contract by e-mail to
Susan Iles
Advertising Sales
Psi Chi Central Office
E-mail: susan.iles@psichi.org
Phone: 423-771-9964

See past issues of *Psi Chi Journal of Psychological Research* at http://www.psichi.org/?journal_past



All advertisements must be scholarly and professional in nature, and *Psi Chi* reserves the right to reject (or cancel) any ads that are not in the best interest of the Organization or consistent with the Society's mission.



SUMMER 2018

PSI CHI
JOURNAL OF
PSYCHOLOGICAL
RESEARCH

ADV-JN-DG (7-2018)

Publish Your Research in *Psi Chi Journal*

Undergraduate, graduate, and faculty submissions are welcome year round. Only the first author is required to be a Psi Chi member. All submissions are free. Reasons to submit include

- a unique, doctoral-level, peer-review process
- indexing in PsycINFO, EBSCO, and Crossref databases
- free access of all articles at psichi.org
- our efficient online submissions portal

View Submission Guidelines and submit your research at www.psichi.org/?page=JN_Submissions

Become a Journal Reviewer

Doctoral-level faculty in psychology and related fields who are passionate about educating others on conducting and reporting quality empirical research are invited become reviewers for *Psi Chi Journal*. Our editorial team is uniquely dedicated to mentorship and promoting professional development of our authors—Please join us!

To become a reviewer, visit www.psichi.org/page/JN_BecomeARviewer

Resources for Student Research

Looking for solid examples of student manuscripts and educational editorials about conducting psychological research? Download as many free articles to share in your classrooms as you would like.

Search past issues, or articles by subject area or author at www.psichi.org/?journal_past

Add Our Journal to Your Library

Ask your librarian to store *Psi Chi Journal* issues in a database at your local institution. Librarians may also e-mail to request notifications when new issues are released.

Contact PsiChiJournal@psichi.org for more information.



Register an account:
<http://pcj.msubmit.net/cgi-bin/main.plex>

