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Implicit attitudes towards meat and vegetables in vegetarians and nonvegetarians

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Previous research, in which self-report measures were used, showed that vegetarians have more negative beliefs about meat than nonvegetarians. An important limitation of this research is that it did not examine differences in spontaneous affective reactions (i.e., implicit attitudes) towards meat and other types of food. We therefore conducted a new study in which not only self-report measures were used, but also two tasks that have been developed to measure implicit attitudes: The Implicit Association Test (IAT) and a pictorial version of the Extrinsic Affective Simon Task (EAST). Both the IAT and EAST revealed that implicit attitudes towards vegetables (as compared to implicit attitudes towards meat) were more positive in vegetarians than in nonvegetarians. In line with previous findings, the self-report measures showed that, compared to nonvegetarians, vegetarians had more positive attitudes towards vegetables and more negative attitudes towards meat. The IAT and EAST measures both correlated in the expected manner with self-reported attitudes. A logistic regression showed that self-reported attitudes were an almost perfect predictor of group status (vegetarian or nonvegetarian), and that adding the IAT and EAST measures as predictors did not improve prediction of group status. The results suggest that vegetarians and nonvegetarians differ in their spontaneous affective reaction towards vegetables or meat, and provide further evidence for the validity of the IAT and EAST as measures of inter-individual differences in attitudes. Implicit attitudes could influence eating behaviour indirectly by biasing the decision to become a vegetarian or by determining how difficult it is for someone to maintain a vegetarian diet.

Une recherche antérieure, dans laquelle les mesures auto-rapportées ont été utilisées, a montré que les végétariens ont des croyances plus négatives à propos de la viande que les non végétariens. Une limite importante de cette recherche est qu'elle n'a pas examiné les différences dans les réactions affectives spontanées (c.-à-d. les attitudes implicites) envers la viande et d'autres types de nourriture. Nous avons donc mené une nouvelle étude dans laquelle non seulement des mesures auto-rapportées furent utilisées, mais aussi deux tâches qui ont été développées pour évaluer les attitudes implicites: le Test d'association implicite (TAI) et une version illustrée de la Tâche extrinsèque affective de Simon (TEAS). Ces deux mesures ont révélé que les attitudes implicites envers les légumes (comparativement aux attitudes implicites envers la viande) étaient plus positives chez les végétariens que chez les non végétariens. En accord avec les résultats antérieurs, les mesures auto-rapportées ont montré que, comparativement aux non végétariens, les végétariens avaient des attitudes plus positives envers les légumes et des attitudes plus négatives envers la viande. Le TAI et le TEAS ont tous les deux été corrélés de façon attendue avec les attitudes auto-rapportées. Une régression logistique a montré que les attitudes auto-rapportées constituaient un prédicteur presque parfait de l'appartenance au groupe (végétarien ou non végétarien) et que l'addition des mesures TAI et TEAS comme prédicteurs n'améliorait pas la prédiction. Les résultats suggèrent que les végétariens et les non végétariens diffèrent dans leurs réactions affectives spontanées envers les légumes ou la viande. De plus, ces résultats appuient la validité du TAI et du TEAS comme mesures des différences individuelles dans les attitudes. Les attitudes implicites peuvent influencer les comportements alimentaires indirectement en biaisant la décision de devenir végétarien ou en déterminant dans quelle mesure il est difficile pour quelqu'un de maintenir une diète végétarienne.

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En estudios previos, en los cuales se emplearon medidas de autorreporte, se pudo observar que vegetarianos en comparación con personas no-vegetarianas reportaban mayores creencias negativas respecto de la carne. Una limitación importante en estos estudios es que en ellos no se examinaron las diferencias en relación a las reacciones afectivas espontáneas (p.e. actitudes implícitas) hacia la carne y otro tipo de alimentos. Con este motivo se llevó a cabo este estudio, en el cual se utilizaron no sólo medidas de autorreporte, sino también dos pruebas que fueron desarrolladas con el fin de evaluar las actitudes implícitas: El Test de Asociación Implícita—TAI (Implicit Association Test—IAT) y una versión pictórica del Test de Afectividad Extrínseca de Simon—TAES (Extrinsic Affective Simon Task—EAST). Tanto el TAI como el TAES revelaron que las actitudes implícitas hacia los vegetales (en comparación con las actitudes implícitas hacia la carne) fueron más positivas para los vegetarianos que para los no-vegetarianos. De manera similar que en estudios previos, se observó en la evaluación de las medidas de autorreporte, que los vegetarianos en comparación con los no-vegetarianos reportaron mayores actitudes positivas hacia los vegetales y mayores actitudes negativas hacia la carne. Tanto las mediciones del TAI como del TAES correlacionaron del modo esperado con las actitudes medidas a través de los autorreportes. Un análisis de regresión logístico mostró que las actitudes medidas a través de los autorreportes fueron un predictor casi perfecto de la pertenencia a un determinado grupo (vegetariano o no-vegetariano). Por otro lado, la adición de las puntajes del TAI y del TAES como predictores adicionales no elevaron la capacidad predictiva respecto de la pertenencia a un determinado grupo. Los resultados de este estudio sugieren que los vegetarianos y no-vegetarianos difieren en relación a su reacción afectiva espontánea hacia los vegetales o carnes y nos proporciona evidencia adicional respecto de la validez del TAI y del TAES, como instrumentos que miden las diferencias interindividuales en el campo de las actitudes. Las actitudes implícitas pueden influenciar indirectamente la conducta alimenticia, en la medida que ellas pueden sesgar la decisión de volverse vegetariano o debido que ellas hacen notorias las dificultades asociadas con el mantenimiento de una dieta vegetariana.

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Vegetarianism can be defined as the practice of abstaining from the consumption of (certain) animal products (Povey, Wellens, & Conner, 2001). Since the mid-1980s, it has become increasingly popular in Western society (e.g., Dietz, Frisch, Kalof, Stern, & Guagnano, 1995). In response to this increased popularity, psychologists have started studying the beliefs and attitudes associated with vegetarianism. For instance, several studies have shown that vegetarians have more negative beliefs about eating meat than nonvegetarians (e.g., Kenyon & Barker, 1998; Povey et al., 2001). Results such as these suggest that beliefs and attitudes play an important role in becoming or staying a vegetarian. The existing evidence is, however, limited in that it stems only from the use of direct measures such as questionnaires or (semi-)structured interviews. As was indicated by Povey et al. (2001, p 25), this is an important limitation for several reasons. Most importantly, direct measures might not be well suited to register the spontaneous, automatic affective reactions that can influence (eating) behaviour.

In an attempt to overcome these limitations, we examined implicit attitudes towards meat and vegetables in vegetarians and nonvegetarians. Implicit attitudes can be defined as attitudes that are activated automatically, that is, when little time or processing resources are available, when participants are unaware of the stimuli that activate the attitude, or when they do not have the intention to retrieve the attitude (see Moors & De Houwer, 2006). We used variants of the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998) and Extrinsic Affective Simon Task (EAST; De Houwer, 2003) to capture these implicit attitudes. It has been argued that the IAT and EAST can capture implicit attitudes in that attitudes influence the outcome of these tasks in an automatic manner (e.g., quickly and independent of goals; see De Houwer & Moors, 2007).

In our version of the IAT, on each trial we presented the picture of one of the following: a meat product (e.g., a steak), a vegetable (e.g., beans), a positive object or event (e.g., a smiling baby), or a negative object or event (e.g., a crying baby). Participants categorized each picture as belonging to one of these four categories by pressing one of two keys. In the MEAT + POSITIVE IAT task, they pressed the first key for meat and positive pictures and the second key for vegetable and negative pictures. Participants also performed a VEGETABLE + POSITIVE task in which they pressed the first key for vegetable and positive pictures and the other key for meat and negative pictures. We then calculated an IAT effect score by comparing performance in the two tasks. The differences between performance in the two tasks can be interpreted as an index of attitudes towards meat relative to attitudes

towards vegetables. For instance, the faster people are in the MEAT + POSITIVE task than in the VEGETABLE + POSITIVE task, the more they like meat over vegetables.

An inherent limitation of the IAT is that it only allows for relative statements about attitudes (e.g., De Houwer, 2002). In our IAT, for instance, performance can be influenced by both attitudes towards meat and attitudes towards vegetables. Hence, if we find a different IAT effect for vegetarians and nonvegetarians, it is not clear whether this is due to a difference in attitudes towards meat and/or to a difference in attitudes towards vegetables. The EAST that we used did allow us to examine this issue. In the EAST, participants saw square pictures with a yellow frame around them and oblong (portrait or landscape) pictures without a frame. The task was different for each type of picture. When the picture was square and had a frame around it, participants were asked to press the right key for positive pictures and the left key for negative pictures. The aim of these trials was to associate the right key with positive valence and the left key with negative valence. When the picture was oblong and did not have a frame around it, participants were instructed to pay attention to the form and to press the right key for portrait pictures and the left key for landscape pictures. Importantly, the oblong pictures were pictures of meat or vegetables. Hence, for each class of pictures (meat or vegetable), we could calculate an EAST effect by comparing trials on which the key associated with positive valence had to be pressed (i.e., the right key) with trials on which the key associated with negative valence (i.e., the left key) had to be pressed. This difference should provide an index of the attitude towards that class of pictures. Another reason for including the EAST in addition to the IAT is that if both measures point to the same conclusion, it is unlikely that the results are somehow biased by specific properties of the measure. Finally, we chose a variant of the EAST in which pictures were presented because previous research suggested that this variant provides a superior measure of inter-individual differences in attitudes (e.g., Huijding & de Jong, 2005).

METHOD

Participants

Participants were 47 vegetarians and 49 nonvegetarians, most of them students at Ghent University. They were recruited via a vegetarian organization (Ethical Vegetarian Alternative), by a snowball procedure, in the hallways of the university building, and via a website on which students can subscribe for research participation. The majority of the participants were nonpaid volunteers ($n = 73$); the other participants received €5 for their participation ($n = 23$). Due to a programming error, the reaction time data of six vegetarians and four nonvegetarians had to be discarded. About half of the vegetarians said that they did not eat meat, fish, or crustaceans, whereas the others in the vegetarian group reported that they did not eat meat but did eat fish or crustaceans. In a strict sense, the latter participants are not vegetarians (but see Povey et al., 2001), but because we focused on attitudes towards meat and vegetables rather than fish, we did regard those participants as vegetarians. All nonvegetarians reported that they ate both red and white meat.

Measures and procedure

Before filling in an informed consent form, participants were told that the experiment consisted of three tasks on a personal computer and a short questionnaire. For about half of the participants, the IAT was presented first. The other half received the EAST first. After the EAST and the IAT, participants conducted a computerized rating task. Finally, they filled in a paper-and-pencil questionnaire. Participants completed the experiment individually or in groups of up to five people. All computer tasks were programmed in Inquisit 1.33 and were presented on Pentium PCs or laptops with 15" screens set at a resolution of 1024×768 pixels.

Implicit Association Test. Attribute stimuli in the IAT were positively and negatively valenced pictures taken from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1997; IAPS numbers 2070, 2345, 7580, 8120, 8190, 2800, 3168, 3181, 3300, 9340). Target stimuli were pictures of meat and vegetables taken from the Internet. Meat stimuli were pictures of steak, hamburger, dried sausages, pâté, and bacon. Vegetable stimuli were pictures of cabbages, carrots, beans, broccoli, and peas. Each picture was sized to 400×400 pixels. All stimuli were presented on a white background.

Instructions informed participants that images would appear one by one on the computer screen. They were asked to press the left key (A) or the right key (P) of an AZERTY keyboard depending

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on the category (positive, negative, meat, vegetable) of the picture. The key assignments would vary across different phases, but the category labels printed at the left and right upper corner of the screen would indicate the correct key assignment during a particular phase. Participants were instructed to respond as quickly as possible without making too many errors.

The IAT started with an attribute practice phase of 40 trials during which each of the five positive and five negative stimuli was presented four times. This was followed by a target practice phase of 40 trials in which each target stimulus was presented four times. These two tasks were then combined in two test blocks of 40 trials each. During each test block, each target and attribute stimulus was presented twice. In a fourth phase, participants received a second target practice block of 40 trials, but now with reversed key assignments for the target categories. Finally, the two test blocks of Phase 3 were repeated, but now with the reversed key assignments for target categories. The order of the trials was determined randomly for each block and participant separately. On each trial, the stimulus was presented in the centre of the screen until a response was registered. If the response was incorrect, a red X appeared in the middle of the screen for 400 ms. The next trial started 400 ms after the correct response was registered or the red X disappeared.

Before each block, instructions were given about the upcoming task. All participants pressed the left key for negative words and the right key for positive words in all phases of the task. In Phases 2 and 3, all participants pressed the left key for vegetables and the right key for meat. In Phases 4 and 5, participants received the opposite key assignment for the target categories. We did not counterbalance the stimulus–response assignments because we were interested primarily in inter-individual differences. Given the lack of counterbalancing, we refrained from testing or interpreting the absolute magnitude or direction of IAT effects.

Extrinsic Affective Simon Task. We used the same pictorial stimuli as in the IAT. Analogous to Huijding and de Jong (2005), each target picture was presented in five sizes, the longest sides measuring 440, 420, 400, 380, or 360 pixels. The short sides were 15% shorter than the longest side. Attribute stimuli were negatively and positively valenced square pictures of 400 × 400 pixels, including a yellow border 8 pixels wide, which was added to enhance discriminability of target and attribute pictures.

Participants were told that square and oblong pictures would appear on the computer screen, one by one, and that their task was to press the negative (A) or the positive key (P) depending on the valence or form of the pictures. For square pictures, all participants were asked to press the left key for negative pictures and the right key for positive pictures. For oblong pictures, they were instructed to press the left key for landscape pictures and the right key for portrait pictures. Because of the lack of counterbalancing, we again refrained from interpreting the overall magnitude and direction of the EAST effects. We asked participants to respond as quickly as possible without making too many errors.

The EAST started with an attribute practice phase that consisted of 40 trials, during which each attribute picture was presented four times. This was followed by a target practice block of 40 trials during which the target stimuli were each presented twice in portrait format and twice in landscape format. Next, there were three mixed test blocks consisting of 60 trials. In each test block, the 10 square attribute pictures were presented twice. The 10 target stimuli were each presented twice in portrait format and twice in landscape format. Each test block started with two randomly selected additional attribute trials.

Stimuli were presented in a random order that was determined separately for each block and participant. Instructions about the upcoming task were presented between each block. Each trial started with a fixation cross that was presented at the screen centre for 400 ms. This was followed by the stimulus, which stayed on the screen until a response was given. If participants made an incorrect response, a red X appeared on the screen for 400 ms. The next stimulus appeared 1200 ms after a correct response or after the red X disappeared from the screen.

Rating measures. Participants rated the meat and vegetable stimuli that were used in the IAT and the EAST on a 9-point Likert scale, ranging from 1 (*not tasty at all*) to 9 (*very tasty*). Participants then completed a questionnaire assessing attitudes towards vegetables (5 items) and meat (25 items). The questions regarding meat were adapted from Berndsen and Van der Pligt (2004). All items were presented as statements that needed to be rated on a 9-point Likert scale ranging from 1 (*totally disagree*) to 9 (*totally agree*). The questionnaire also contained some general demographical items, and assessed dietary behaviour in order to identify participants as vegetarians or nonvegetarians.

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RESULTS

Implicit Association Test

Following the guidelines of Greenwald, Nosek, and Banaji (2003), we calculated for each participant a D600 IAT score in such a way that a positive score signified a preference of vegetables over meat. For ease of interpretation, the mean untransformed reaction times and percentage of errors are presented in Table 1. The data of three participants were excluded from the analyses because of an unusually high (i.e., more than 3 *SD* above the mean of the total group) mean reaction time, percentage of errors, or number of reaction times longer than 3000 ms. However, the same conclusions were reached when we used other IAT scoring algorithms or when the data of the three outlier participants were included in the analyses.

We assessed the reliability of the IAT score by calculating for each participant a score based on the first half of the trials in each task and a score based on the second half of the trials in each task. We then calculated the split-half reliability by correlating these two scores and applying a Spearman-Brown correction. Using this procedure, the split-half reliability was .81.

An ANOVA of the D600 IAT scores with group (vegetarian or nonvegetarian) and task order (IAT first or EAST first) only revealed a main effect of group, $F(1, 78) = 41.14$, $p < .001$, Cohen's $d = 1.45$, showing more positive attitudes for vegetables relative to meat in vegetarians than in nonvegetarians, all other Fs < 1.68.

TABLE 1
Mean untransformed reaction times and percentage of errors during the IAT as a function of IAT task and group

	IAT task			
	Meat + Positive		*Vegetable + Positive*	
Group	*M*	*SD*	*M*	*SD*
Vegetarians				
Reaction time	765	176	612	112
Percentage of errors	2.91	2.58	2.93	2.54
Nonvegetarians				
Reaction time	654	142	672	117
Percentage of errors	2.85	2.71	5.04	3.70

EAST

Analogous to Schmukle and Egloff (2006), we computed for each participant a relative D600 EAST score in such a way that an increase in the score signified an increase in the attitude towards vegetables relative to the attitude towards meat. In order to assess separately implicit attitudes towards meat and implicit attitudes towards vegetables, we calculated a D600 EAST score for meat on the basis of trials with a meat picture and a D600 EAST score for vegetables on the basis of trials with a vegetable picture. In both cases, a positive score signified a positive attitude towards the object. For ease of interpretation, we present only the untransformed mean reaction times and percentage of errors in Table 2. The D600 scores were analysed using ANOVAs with group (vegetarian or non vegetarian) and task order (IAT first or EAST first) as variables. Five participants were regarded as outliers because they had an unusually high (more than 3 *SD* above the mean of the total group) mean reaction time, percentage of errors, or number of reaction times longer that 3000 ms. Using other EAST scoring algorithms or including the data of the five outliers did not change the conclusions. Split-half reliability (calculated in the same way as for the IAT score) was .62, .63, and .64 for the relative, meat, and vegetable D600 EAST score, respectively.

The ANOVA of the relative D600 EAST score revealed a main effect of group, $F(1, 77) = 5.57$, $p < .05$, $d = 0.52$, showing that vegetarians had a stronger preference for vegetables over meat than nonvegetarians. Neither the main effect of task order, nor the interaction, $F(1, 77) = 2.45$, was significant. The ANOVA of the D600 EAST score for meat revealed only a marginally significant main effect of group, $F(1, 77) = 3.07$, $p = .08$, $d = 0.47$, all other Fs < 1. Nonvegetarians tended to

TABLE 2
Mean untransformed reaction times and percentage of errors during the EAST as a function of stimulus, response, and group

	Response			
	Positive		*Negative*	
Group	*M*	*SD*	*M*	*SD*
	Meat			
Vegetarians				
Reaction time	798	142	792	169
Percentage of errors	10.00	10.09	3.69	4.70
Nonvegetarians				
Reaction time	738	175	751	201
Percentage of errors	6.97	8.16	6.67	7.57
	Vegetarians			
Vegetarians				
Reaction time	741	156	822	193
Percentage of errors	5.32	7.00	7.57	6.97
Nonvegetarians				
Reaction time	708	186	745	212
Percentage of errors	5.23	5.90	5.45	5.09

have a more positive attitude towards meat than vegetarians. Finally, the ANOVA of the D600 EAST score for vegetables also showed a marginally significant main effect of group, $F(1, 77) = 3.05$, $p = .08$, $d = 0.38$. This time, however, the interaction with task order was significant, $F(1, 77) = 6.28$, $p < .01$. Subsequent analyses showed that when the IAT came first, vegetarians ($n = 19$) had a more positive EAST effect (mean EAST effect in ms = 93, $SD = 86$) than nonvegetarians ($n = 18$, $M = 3$, $SD = 118$), $F(1, 35) = 7.85$, $p < .01$. When the EAST came first, the EAST effect for vegetarians ($n = 18$, $M = 67$, $SD = 114$), and nonvegetarians ($n = 26$, $M = 61$, $SD = 103$) did not differ, $F < 1$.

Rating measures

We estimated the explicit attitude towards vegetables and meat by averaging all picture and questionnaire ratings with regard to vegetables (10 items, Cronbach's alpha = .88) and meat (30 items, Cronbach's alpha = .96). These estimates were analysed using an ANOVA with attitude object (meat or vegetable) as a within-subjects variable and group (vegetarian or nonvegetarian) as a between-subjects variable. Seven vegetarians and one nonvegetarian did not complete all ratings. Their data were not taken into account, leaving the rating data of 40 vegetarians and 48 nonvegetarians. The ANOVA revealed a main effect of attitude object, $F(1,86) = 127.86$, $p < .001$, a main effect of group, $F(1, 86) = 42.87$, and an interaction between both variables, $F(1,86) = 153.54$, $p < .001$. Ratings for meat were more negative for vegetarians ($M = 3.04$. $SD = 0.89$) than for nonvegetarians ($M = 5.90$; $SD = 0.89$), $t(83) = 15.04$, $p < .001$. Ratings for vegetables, on the other hand, were more positive for vegetarians ($M = 7.03$, $SD = 0.62$) than for nonvegetarians ($M = 5.72$, $SD = 1.27$), $t(83) = 5.97$, $p < .001$.

Correlations between reaction time and rating measures

Table 3 gives an overview of the correlations between the different measures. Apart from the measures discussed above, we also involved a relative rating measure that was created by subtracting the average rating for meat items from the average rating for vegetable items. Both the IAT and the relative EAST score correlated significantly and in the expected manner with the rating measures. The EAST score for meat also correlated in the expected manner with ratings, whereas the correlations involving the EAST score for vegetables were marginally significant at best. In addition to the correlations listed in Table 3, we also found that the IAT correlated significantly with the relative EAST score, $r = .28$, $p < .05$, and the EAST score for meat, $r = -.37$, $p < .01$, but not with the EAST score for vegetables, $r = .04$.

TABLE 3
Correlations between reaction time and rating measures

	IAT	*EAST relative*	*EAST meat*	*EAST vegetable*
Aggregate rating meat	− .59**	− .42**	.36**	− .22#
Aggregate rating vegetable	.53**	.27*	− .29**	.12
Aggregate rating relative	.62**	.39**	− .36**	.20#

For all IAT and relative scores, higher scores indicate a more positive attitude towards vegetables than toward meat. For all nonrelative scores, higher scores indicate a more positive attitude.
# $p<.10$; * $p<.05$; ** $p<.01$.

Prediction of group status

We performed a hierarchical logistic regression in which the relative rating measure was entered as a predictor of group status (vegetarian or nonvegetarian) in a first step. The relative rating measure proved to be a strong predictor of group status, $B = 2.29$, $p < .001$, allowing for 93% correct classifications. When the IAT and relative EAST measure were entered in the second step, the model still correctly predicted 93% of the participants, and neither the IAT, $B = 0.19$, nor the relative EAST measure, $B = -3.34$, had incremental predictive validity.

DISCUSSION

We demonstrated for the first time that vegetarians and nonvegetarians differ not only in their self-reported attitudes towards meat and vegetables, but also in their implicit attitudes towards these objects, that is, in the spontaneous, automatic affective reactions that these objects evoke. Both an IAT and an EAST measure revealed that vegetarians liked vegetables over meat to a greater extent than nonvegetarians. The fact that we observed this effect in two different implicit measures strengthens the conclusion that the differences in implicit attitudes are genuine.

Regression analyses showed that the explicit rating measures of attitudes towards vegetables and meat were an almost perfect predictor of whether someone was a vegetarian or nonvegetarian. The implicit measures did not improve

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prediction of group status. This does not mean, however, that the observed differences in implicit attitudes between vegetarians and nonvegetarians are of little importance. It might indeed be the case that the decision to no longer eat meat is based primarily on controlled, effortful reasoning[1]. However, implicit attitudes could still be important, for instance, by influencing controlled reasoning (and thus indirectly the decision to become a vegetarian) or by determining how difficult it is for someone to maintain a vegetarian diet.

Whereas the present IAT inherently allows only for conclusions regarding the attitude towards vegetables relative to the attitude towards meat, the EAST results suggest that, compared to nonvegetarians, vegetarians have both a more negative implicit attitude towards meat and a more positive implicit attitude towards vegetables. However, some caution is needed in drawing these conclusions because they are based on marginally significant effects. Moreover, vegetarians and nonvegetarians differed in their EAST score for vegetables only when the EAST was administrated after the IAT. The fact that task order did not influence the difference in the EAST score for meat suggests that implicit attitudes towards meat might be more important in differentiating between vegetarians and nonvegetarians. This conclusion is also in line with the observation that only the EAST score for meat but not the EAST score for vegetables correlated significantly with the rating measures. Finally, the IAT score correlated only with the EAST score for meat and not with the EAST score for vegetables. This suggests that the IAT score was influenced most by implicit attitudes towards meat.

As suggested by an anonymous reviewer, the fact that group differences for the EAST score for vegetables depended on the order of the EAST and IAT could be due to the impact of the IAT on EAST performance. The IAT always ended with the VEGETABLES + POSITIVE task. Previous research has shown that performing an IAT task can influence the subsequent accessibility of the attitudes that are measured (Klauer & Mierke, 2005). Hence, if the IAT (and thus the VEGETABLES + POSITIVE task) preceded the EAST, this could have made more accessible the positive attitudes that vegetarians had towards vegetables and/or make less accessible the negative attitudes that nonvegetarians had towards vegetables.

The present data also provide new evidence for the validity of the IAT and EAST as measures of inter-individual differences in attitudes. IAT and EAST measures of attitudes towards food differed in a meaningful manner between groups who, on a priori grounds, can be expected to differ with regard to their implicit attitudes towards food. Likewise, inter-individual differences in IAT and EAST scores correlated significantly with inter-individual differences in self-report rating measures. The latter finding is in line with a recent observation by Nosek (2005) that implicit and self-report measures of attitudes towards food items tend to be strongly correlated. Nosek presented several arguments for why such high correlations can be expected in this particular case.

Although the present results thus suggest that (a pictorial version of) the EAST can provide a useful measure of inter-individual differences in attitudes, a number of caveats are in place. First, one needs to bear in mind that previous studies raised doubts about the reliability and validity of inter-individual differences in EAST effects when words are used as stimuli (e.g., De Houwer & De Bruycker, in press) or when the EAST is used to measure personality traits (e.g., Schmukle & Egloff, 2006). Second, even in the present study, the IAT seemed to perform better as a measure of inter-individual differences than the EAST. In fact, when we performed an ANOVA with type of score (D600 IAT or relative D600 EAST) and group (vegetarian or nonvegetarian) as variables, we found an interaction between both variables, $F(1, 75) = 19.73$, $p < .001$, showing that the IAT score differentiated more strongly between the two groups than the EAST. Likewise, the reliability of the IAT was somewhat higher than that of the EAST. Nevertheless, it is important that attempts are continued to develop and improve measures such as the EAST because these measures could overcome inherent limitations of the IAT and can be used to verify findings with the IAT.

[1]It is interesting to note that the relative EAST score allowed for a better classification of nonvegetarians (79% correct) than vegetarians (50% correct). This is in line with the idea that the decision to stop eating meat is based primarily on controlled processes. Such an asymmetry in predictions was not observed for the rating measure (93% correct for both groups) or the IAT (72% of vegetarians and 70% of nonvegetarians). We thank Marco Perugini for suggesting these analyses.

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