PSYCHOLOGY, HEALTH & MEDICINE, 2016
http://dx.doi.org/10.1080/13548506.2016.1159705

Taylor & Francis
Taylor & Francis Group

The adoption of physical activity and eating behaviors among persons with obesity and in the general population: the role of implicit attitudes within the Theory of Planned Behavior

Guillaume Chevance[a,b,c], Johan Caudroit[d], Ahmed J. Romain[e,f] and Julie Boiché[a]

[a]Laboratory Epsylon, Dynamics of Human Abilities and Health Behavior, University of Montpellier, Montpellier, France; [b]Department of Clinical Physiology (CERAMM), University Hospital of Montpellier, Montpellier, France; [c]Clinique du Souffle La Vallonie®, Groupe 5 Santé, Lodève, France; [d]Laboratoire sur la Vulnérabilité et L'innovation dans le Sport, University of Lyon 1, Lyon, France; [e]Department of Nutrition and Diabetes, University Hospital of Montpellier, Montpellier, France; [f]Centre de Recherche du CHU de Montréal (CRCHUM), Montréal, Canada

ABSTRACT

Obesity can be prevented by the combined adoption of a regular physical activity (PA) and healthy eating behaviors (EB). Researchers mainly focused on socio-cognitive models, such as the Theory of Planned Behavior (TPB), to identify the psychological antecedents of these behaviors. However, few studies were interested in testing the potential contribution of automatic processes in the prediction of PA and EB. Thus, the main objective of this study was to explore the specific role of implicit attitudes in the pattern of prediction of self-reported PA and EB in the TPB framework, among persons with obesity and in adults from the general population. One hundred and fifty-three adults participated to this cross-sectional study among which 59 obese persons (74% women, age: 50.6 ± 12.3 years, BMI: 36.8 ± 4.03 kg m^{-2}) and 94 people from the general population (51% women; age: 34.7 ± 8.9 years). Implicit attitudes toward PA and EB were estimated through two Implicit Association Tests. TPB variables, PA and EB were assessed by questionnaire. Regarding to the prediction of PA, a significant contribution of implicit attitudes emerged in obese people, $\beta = .25$; 95%[CI: .01, .50]; $P = .044$, beyond the TPB variables, contrary to participants from the general population. The present study suggests that implicit attitudes play a specific role among persons with obesity regarding PA. Other studies are needed to examine which kind of psychological processes are specifically associated with PA and EB among obese people.

ARTICLE HISTORY
Received 4 August 2015
Accepted 25 February 2016

KEYWORDS
Automatic processes; implicit attitudes; Theory of Planned Behavior; exercise; diet

Introduction

Rates of obesity are regularly increasing (Visscher, Heitmann, Rissanen, Lahti-Koski, & Lissner, 2015). Given the importance of PA and EB in weight management, it seems crucial to examine the psychological determinants of those behaviors for overweight persons but

CONTACT Guillaume Chevance guillaume.chevance@umontpellier.fr

also for the general population. Theories in health psychology focus on both controlled and automatic psychological processes (Strack & Deutsch, 2004). Regarding controlled processes, the Theory of Planned Behavior (TPB; Ajzen, 1991) represents a frequently used socio-cognitive framework, and systematic reviews highlighted significant association between TPB variables (i.e. explicit attitudes toward the behavior, perceived behavioral control, subjective norms, and behavioral intentions), PA and EB among obese persons (Plotnikoff, Lubans, Costigan, & McCargar, 2013) and in the general population (McEachan, Conner, Taylor, & Lawton, 2011). Regarding automatic processes, the implication of implicit attitudes in PA and EB adoption receives increasing empirical support (Sheeran, Gollwitzer, & Bargh, 2013). Past studies showed that implicit attitudes were associated to self-reported and objective PA (Calitri, Lowe, Eves, & Bennett, 2009; Conroy, Hyde, Doerksen, & Ribeiro, 2010), as well as self-report and behavioral food choice for different kinds of food (Conner, Perugini, O'Gorman, Ayres, & Prestwich, 2007; Richetin, Perugini, Prestwich, & O'Gorman, 2007). Theoretically, researchers have recently advocated for an extension of the TPB (Conner, 2015), and it seems appropriate to study implicit attitudes in this framework. However, this perspective was almost exclusively adopted in students. Thus, the aim of this study was to explore the contribution of implicit attitudes toward PA and EB beyond the TPB variables among persons with obesity and from the general population.

Methods

Participants

Healthy adults from the general population were recruited among tertiary sector companies' staff, and were included if they did not report any medical PA contra-indications or specific diets. Obese adults (BMI > 30 kg/m^2) were recruited trough the department of nutrition and diabetes and clinical physiology of the University Hospital of Montpellier. They were included if they were hospitalized for weight management and were covered by the national health insurance. Individuals receiving a psychiatric treatment or who were concerned by an acute hospitalization procedure were not included.

Procedure

This study was performed according to the principles of the Declaration of Helsinki and was approved by the local ethics committee. The participants first signed an informed consent and were invited to complete computerized tests and questionnaires.

Measures

Implicit attitudes

Implicit attitudes were measured through two Implicit Association Tests (IATs; Greenwald, McGhee, & Schwartz, 1998). IATs were designed following current recommendations (Greenwald, Nosek, & Banaji, 2003). The final *D-scores* were calculated by subtracting mean response time in the compatible test block to mean response time in the incompatible block, and by dividing this score by the pooled standard deviation across both blocks (Greenwald et al., 2003). These scores were comprised between –2 (unfavorable implicit attitudes) to +2 (favorable implicit attitudes), 0 being a neutral score.

Theory of Planned Behavior variables

The questionnaires assessing the TPB variables were formulated following the recommendations of Ajzen (2006). Explicit attitudes (6 items) were assessed through 7-point semantic differentiation scales (α_{PA} = .84; α_{EB} = .79). The items referring to intentions (4 items, α_{PA} = .95; α_{EB} = .80), perceived behavioral control (6 items, α_{PA} = .90; α_{EB} = .86) and social norms (6 items, α_{PA} = .95; α_{EB} = .96) were measured through a 7-point Likert scale.

Physical activity

Daily PA behavior was assessed trough the Global Physical Activity Questionnaire (Bull, Maslin, & Armstrong, 2009). The total PA score was calculated in minutes per week. Square root transformation was conducted (Bland & Altman, 1996).

Eating behavior

Regarding EB, we used the New Eating Self-Administered Questionnaire (Gusto et al., 2013) that assesses the daily consumption of various kinds of food. A score of diversity of healthy food consumption was computed: one point was attributed each time a recommendation was respected, leading to scores ranging from 0 to 13 (no versus all recommendations respected).

Results

Descriptive statistics

A total of 153 participants were recruited, including 94 participants from the general population (51%women; age: 34.7 ± 8.9 years) and 59 obese participants (74%women; age: 50.6 ± 12.3 years; BMI: 36.8 ± 4.03 kg m^{-2}). Table 1 presents the descriptive statistics and Table 2 shows the correlations between all variables.

Two independent multiple regression analyses were conducted in each sample, entering the TPB variables and implicit attitudes as independent variables, and self-reported behaviors as dependent variable. Regarding PA, the equation was statistically significant in the general population: $F(5, 88) = 9.48$; R^2adjusted = .31; $P < .001$. Perceived behavioral control $\beta = .46$; 95%CI[.26, .70]; $P < .001$ and explicit attitudes $\beta = .25$; 95%CI[.06, .45]; $P = .011$ were significant predictors. Among obese people, the equation was also statistically significant,

Table 1. Descriptive statistics for PA and EBs.

	Eating behavior		Physical activity	
	Obese	General pop	Obese	General pop
	M(SD)	*M*(SD)	*M*(SD)	*M*(SD)
TPB variables				
Explicit attitudes	5.74(.76)	5.02 (.7)	5.80(.97)	6.31(.77)
Social norms	4.98(2.01)	3.42 (1.84)	5.61(1.05)	3.71(1.97)
Perceived behavioral control	4.68(.92)	5.48(1.09)	2.38(1.03)	5.66(1.35)
Intentions	6.06(.92)	5.13(1.61)	6.06(.94)	5.78(1.58)
Implicit attitudes				
D-Score	−.04(.39)	.03(.33)	−.01(.29)	.01(.28)
Behavior				
	8.79(1.48)	8.66(1.27)	194.58(193.44)	316.97(273.86)

Abbreviations: *M* = Mean, SD = Standard Deviation.

Table 2. Pearson correlations between PA and EB variables.

	1	2	3	4	5	6	7	8	9	10	11	12
1. ATT PA	–	.12	**.38**	**.45**	.01	**.32**	**.47**	.17	**.32**	**.32**	**.26**	.18
2. SN AP	.06	–	.08	**.31**	.05	–.02	**.21**	**.68**	.05	**.39**	–.05	.10
3. PBC PA	**.56**	.09	–	**.68**	.02	**.45**	**.23**	.11	**.46**	**.28**	.08	.16
4. INT PA	**.40**	.13	**.68**	–	.03	**.29**	**.29**	.13	**.37**	**.45**	.13	.12
5. D PA	–.08	–.12	.08	–.12	–	.14	–.02	–.03	.05	.08	**.21**	.13
6. PA	**.35**	–.06	**.26**	.24	.24	–	**.26**	.13	**.29**	**.21**	.16	**.26**
7. ATT EB	.11	.04	.05	**.29**	–.16	.05	–	.14	**.59**	**.57**	.06	.16
8. SN EB	–.01	**.83**	–.08	.01	–.16	–.08	.12	–	.06	**.42**	–.12	**.22**
9. PBC EB	**.37**	.01	**.57**	**.49**	.05	.19	**.40**	.09	–	**.59**	.04	.14
10. INT EB	**.26**	**.33**	**.49**	**.78**	–.06	.21	**.45**	**.32**	**.69**	–	.04	**.34**
11. D EB	–.08	–.21	–.01	–.14	.20	**.26**	–.06	–.17	.06	–.09	–	.04
12. EB	.20	–.03	**.33**	**.33**	–.17	.07	.13	–.11	.24	.25	.10	–

Abbreviations: ATT = attitudes, SN = Social Norms, PBC = Perceived Behavioral Control, INT = intention, D = *D*-score for Implicit Attitudes.

Note. The correlations concerning obese persons are rated in the bottom and at the top for people from the general population.

Bold text = significant correlation ($p < .05$).

$F(5, 53) = 4.05$; R^2adjusted = .21; $P = .03$, and the two significant predictors were explicit attitudes $\beta = .38$; 95%CI[.09, .66]; $P = .011$, and implicit attitudes $\beta = .25$; 95%CI[.01, .50]; $P = .044$. Regarding EB, the regression model was significant for the general population, $F(5, 88) = 2.76$; R^2adjusted = .08; $P = .022$, intentions being a significant predictor $\beta = .38$; 95%CI[.09, .67]; $P = .011$. Among obese people, the regression model was not significant $F(5, 53)=1.38$; R^2adjusted = .03; $P = .25$.

Discussion

The aim of this study was to explore the specific contribution of implicit attitudes toward PA and EB in the TPB framework. Our results revealed a significant association of implicit attitudes with PA among obese people, but not in the general population. This suggests that among obese persons, PA may rely more on automatic processes compared to the general population. This may be explained by differences in self-regulation between normal-weight and obese person, which would imply that behaviors among obese people more strongly depend on automatic processes (Nederkoorn, Houben, Hofmann, Roefs, & Jansen, 2010; Sutin, Ferrucci, Zonderman, & Terracciano, 2011). Regarding EB, our results were not significant for obese persons and slightly significant for people from the general population, intentions being the only significant predictor. This could be due to the questionnaire used, which provided a score reflecting both quantitative and qualitative aspects of EB. On the contrary, TPB variables and implicit attitudes exclusively concerned qualitative dimensions of EB, which could represent a potential source of discordance. Experimental studies targeting both controlled and automatic processes in PA and EB are now needed. To date, such initiatives remain scarce and are limited to the general population (Cheval, Sarrazin, Isoard-Gautheur, Radel, & Friese, 2015; Hollands, Prestwich, & Marteau, 2011). Also, this study presents some limitations. First PA and EB were measured with self-reported tools which may be accompanied by bias of memory and overestimation. The cross-sectional design also limits the scope of the results. Because the study concerned habitual behaviors, it would be important to replicate the results using a prospective design. A final limitation concerns the absence of anthropometric data for the participants from the general population. Such

information would enable researchers to provide a more thorough analysis of the predictive pattern of PA and EB according to weight status. In conclusion, this study highlights the significant contribution of implicit attitudes beyond the TPB variables in the prediction of self-reported PA among obese persons.

Acknowledgements

The authors wish to thank Profs. Antoine Avignon and Jacques Mercier from the University Hospital of Montpellier for their help regarding the inclusion of obese persons, and Axel Arsac from the University of Montpellier regarding the recruitment of people from general population. We also thank Dr Caroline Vagnot for her help on the development of computerized tests.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

Ajzen, I. (1991). Theories of cognitive self-regulation. The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179–211. Retrieved from http://doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I. (2006). Constructing a TPB questionnaire: Conceptual and methodological considerations. Retrieved from http://www.people.umass.edu/aizen/pdf/tpb.measurement.pdf

Bland, J. M., & Altman, D. G. (1996). Transforming data. *BMJ (Clinical Research Ed.), 312*, 770.

Bull, F. C., Maslin, T. S., & Armstrong, T. (2009). Global physical activity questionnaire (GPAQ): Nine country reliability and validity study. *Journal of Physical Activity & Health, 6*, 790–804.

Calitri, R., Lowe, R., Eves, F. F., & Bennett, P. (2009). Associations between visual attention, implicit and explicit attitude and behaviour for physical activity. *Psychology & Health, 24*, 1105–1123. Retrieved from http://doi.org/10.1080/08870440802245306

Cheval, B., Sarrazin, P., Isoard-Gautheur, S., Radel, R., & Friese, M. (2015). Reflective and impulsive processes explain (in)effectiveness of messages promoting physical activity: A randomized controlled trial. *Health Psychology, 34*, 10–19. Retrieved from http://doi.org/10.1037/hea0000102

Conner, M. (2015). Extending not retiring the theory of planned behaviour: A commentary on Sniehotta, Presseau and Araújo-Soares. *Health Psychology Review, 9*, 141–145. Retrieved from http://doi.org/10.1080/17437199.2014.899060

Conner, M. T., Perugini, M., O'Gorman, R., Ayres, K., & Prestwich, A. (2007). Relations between implicit and explicit measures of attitudes and measures of behavior: Evidence of moderation by individual difference variables. *Personality & Social Psychology Bulletin, 33*, 1727–1740. Retrieved from http://doi.org/10.1177/0146167207309194

Conroy, D. E., Hyde, A. L., Doerksen, S. E., & Ribeiro, N. F. (2010). Implicit attitudes and explicit motivation prospectively predict physical activity. *Annals of Behavioral Medicine, 39*, 112–118. Retrieved from http://doi.org/10.1007/s12160-010-9161-0

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology, 74*, 1464–1480.

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.

Gusto, G., Vol, S., Bedouet, M., Leglu, C., Decou, P., Beslin, É., & Tichet, J. (2013). Reproductibilité et validation satisfaisantes d'un auto-questionnaire pour évaluer l'atteinte des repères du Programme National Nutrition Santé. *La Presse Médicale, 42*, e245–e258. Retrieved from http://doi.org/10.1016/j.lpm.2013.01.051

Hollands, G. J., Prestwich, A., & Marteau, T. M. (2011). Using aversive images to enhance healthy food choices and implicit attitudes: An experimental test of evaluative conditioning. *Health Psychology, 30*, 195–203. Retrieved from http://doi.org/10.1037/a0022261

McEachan, R. R. C., Conner, M., Taylor, N. J., & Lawton, R. J. (2011). Prospective prediction of health-related behaviours with the theory of planned behaviour: A meta-analysis. *Health Psychology Review, 5*, 97–144. Retrieved from http://doi.org/10.1080/17437199.2010.521684

Nederkoorn, C., Houben, K., Hofmann, W., Roefs, A., & Jansen, A. (2010). Control yourself or just eat what you like? Weight gain over a year is predicted by an interactive effect of response inhibition and implicit preference for snack foods. *Health Psychology, 29*, 389–393. Retrieved from http://doi.org/10.1037/a0019921

Plotnikoff, R. C., Lubans, D. R., Costigan, S. A., & McCargar, L. (2013). A test of the theory of planned behavior to predict physical activity in an overweight/obese population sample of adolescents from Alberta, Canada. *Health Education & Behavior, 40*, 415–425. Retrieved from http://doi.org/10.1177/1090198112455642

Richetin, J., Perugini, M., Prestwich, A., & O'Gorman, R. (2007). The IAT as a predictor of food choice: The case of fruits versus snacks. *International Journal of Psychology, 42*, 166–173. Retrieved from http://doi.org/10.1080/00207590601067078

Sheeran, P., Gollwitzer, P. M., & Bargh, J. A. (2013). Nonconscious processes and health. *Health Psychology, 32*, 460–473.

Strack, F., & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review, 8*, 220–247. Retrieved from http://doi.org/10.1207/s15327957pspr0803_1

Sutin, A. R., Ferrucci, L., Zonderman, A. B., & Terracciano, A. (2011). Personality and obesity across the adult life span. *Journal of Personality and Social Psychology, 101*, 579–592. Retrieved from http://doi.org/10.1037/a0024286

Visscher, T. L. S., Heitmann, B. L., Rissanen, A., Lahti-Koski, M., & Lissner, L. (2015). A break in the obesity epidemic? Explained by biases or misinterpretation of the data? *International Journal of Obesity 39*, 189–198. Retrieved from http://doi.org/10.1038/ijo.2014.98