



Automatic processes and individual differences in aggressive behavior

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ABSTRACT

In a context in which aggressive behavior has been predominantly predicted by self-reports, this paper considers how a theoretical and empirical examination of automatic and deliberative processes in information processing and decision making may contribute to our understanding of aggressive behavior. We review research devoted to distinguishing two types of aggression with regard to the level of automaticity or control they involve, a distinction similar to the one between automatic and deliberative processes. In parallel with this theoretical distinction, implicit measures appear to be a good candidate for measuring aggression and predicting aggressive behavior. Although consideration of automatic processes is essential for a better understanding of how and why people act aggressively, it should not lead to the conclusion that aggressive behavior is fully automatic. This contribution underlines that the interaction between environment and individual differences is the key element at the implicit level, as it is at the explicit level. Some future directions for studying aggression using implicit measures are drawn.

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Cognitive processes are understood to play an important role in aggression. For example, several theories of aggression include cognition as a central process (e.g., Berkowitz, 1989; Zillmann, 1988) and research by Huesmann and colleagues (e.g., Huesmann, 1988; Huesmann & Guerra, 1997) has examined the role of schemas in aggressive behavior. However, little theoretical and empirical work has focused on the role of automatic processes in aggressive behavior (with the exception of Todorov & Bargh, 2002).

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The present paper will review selected research in aggression and in social cognition to develop the argument that aggression research would benefit from consideration of the role of automatic processes. This paper will first briefly review the literature on two types of aggression defined as impulsive versus thoughtful. Then, we will see that a parallel distinction could be made about these two types of aggression to the one made in social cognition between automatic and deliberative processes. We will also review different types of implicit measures issued from the research on automaticity and describe more thoroughly the most commonly used, which is the Implicit Association Test. We will see that, contrary to other recent implicit measures, the IAT has already been used to measure aggressiveness at the implicit level and more importantly, to predict aggressive behavior.

Any behavior can supposedly be performed automatically if the environment primes the behavior. For instance, [Aarts and Dijksterhuis \(2003\)](#) showed that simply priming the concept of library made participants talk more quietly when they had a goal of visiting the library (for review, see [Bargh, 2006](#)). However, our review of empirical and theoretical work will show that this perspective is limited and that, as suggested by the interactionist view established a long time ago, the interaction between environment and individual differences is also the key at the implicit level to better prediction of any behavior, including aggression. Because we cannot talk about automaticity without referring to control processes, we will see that control mechanisms also have a moderating role on the predictive validity of implicit measures. We will finally discuss some future lines of research concerning implicit measures of aggressiveness as predictors of aggressive behavior.

1. Two types of aggression

We will focus our attention on two types of aggression, one more automatic and one more controlled. The critical difference between the two types of aggression involves the level of impulsivity versus deliberation each type of aggression involves. [Berkowitz \(1993\)](#) made this distinction in his classification of aggression as instrumental versus hostile. His cognitive-neoassociationist model ([1969, 1989, 1994](#)) suggests that aggression would be impulsive if no higher-order cognitive processes are engaged. [Caprara, Perugini, and Barbaranelli \(1994\)](#) also proposed a differentiation between two types of aggression, showing the emergence of two separate factors when looking at a variety of aggression-related personality variables. One type represented the impulsive, affective dimension of aggression; the other represented the social-cognitive, instrumental dimension of aggression. [Anderson and Bushman \(2002\)](#), in their General Aggression Model, also distinguish between ‘thoughtful action’ and ‘impulsive action.’

In a similar vein, some researchers (e.g., [Metcalfe & Mischel, 1999](#)) have suggested the existence of two interrelated memory systems, the hot and cool systems, involved in the execution of aggressive behavior. The information stored in the cool system is narrative and episodic (e.g., autobiographical events) and is associated with a neutral mood. The cool system is responsible for novelty monitoring, semantic priming, problem solving, metacognition, control processes, planning, and comprehension and is important for non-impulsive and self-controlled behaviors ([Metcalfe & Mischel, 1999](#)). Responses initiated by the cool system are narrative and reflective. The hot system stores the emotionally salient aspects of events and less elaborated memories. The hot system is important for rapid automatic responses that are more inflexible, stereotyped, and affectively primary. The two systems do not directly lead to actions or responses, but rather lead to the mobilization of a response program of approach or avoidance behavior by the hot system or to the elaboration of a response program by the cool system. Moreover, the hot and cool systems work in parallel but are not independent. For example, the activation of emotional memories would activate hot nodes and lead to readiness to aggress. But the activation of facts and metacognition would lead to more self-control and less impulsive behavior.

Although dichotomy between instrumental and hostile aggression has been useful for developing theories of aggression, it appears now a bit outdated ([Bushman & Anderson, 2001](#)). Indeed, it may be more useful to consider types of aggression in terms of the level of control or automaticity they require and to consider that aggressive behavior can be driven by different processes. This alternative perspective is in line with the distinction recently developed between the two types of information processing systems.

2. Two systems of information processing

Much empirical and theoretical research in social cognition in the last few decades has been devoted to demonstrating the existence of two systems of information processing, one explicit and the other implicit. In the first, information processing is conscious, controlled and reflective; in the second, information is processed by unconscious, automatic and intuitive processes (e.g., [Epstein, 1990](#); [Gawronski & Bodenhausen, 2007](#); [Greenwald & Banaji, 1995](#); [Strack & Deutsch, 2004](#)). Dual-process models recognize the role played by both automatic/impulsive/associative and deliberative/reflective/propositional processes as determinants of behavior (e.g., [Fazio, 1990](#); [Gawronski & Bodenhausen, 2007](#); [Strack & Deutsch, 2004](#); [Wilson, Lindsey, & Schooler, 2000](#)). Although models differ concerning how automatic and deliberative processes contribute to prediction of behavior (cf., [Perugini, 2005](#)), they all distinguish these two different systems. For example, [Strack and Deutsch \(2004\)](#) postulate the existence of reflective and impulsive systems that activate the same behavioral schemata and operate in parallel. In the reflective system, behavior is assumed to be a consequence of a decision process, whereas in the impulsive system, behavior is a consequence of automatically spreading activation in an associative network. These two systems can interact in a synergistic or antagonistic fashion to determine behavior.

The parallel between the two types of aggression we described earlier and those two systems of information processing is apparent. In fact, the behaviors that [Anderson and Bushman \(2002\)](#) called thoughtful and impulsive actions could be thought of as being driven by deliberative and automatic processes respectively. This distinction between automatic and deliberative systems not only has consequences at the theoretical level, causing us to consider two types of aggression involving two different

information processing systems; but the distinction also suggests psychometric consequences for how one measures individual differences in aggressiveness. The relatively common self-report measures straightforwardly tap into the deliberative processes; tapping into automatic processes is not so simple. Nevertheless, recent developments in implicit measures offer some possibilities. Explicit self-ratings would be considered as tapping only into the propositional processes whereas implicit measures would be considered as tapping more into the associative processes (Gawronski & Bodenhausen, 2006, 2007).

3. Implicit measures: the case of the Implicit Association Test (IAT)

Several different paradigms for implicit measurement have been developed: affective priming (Fazio, Sanbonmatsu, Powell & Kardes, 1986), the Go/No go association task (Nosek & Banaji, 2001), the masked affective priming task (Friggs & Wentura, 2003), the Extrinsic Affective Simon Task (EAST, De Houwer, 2003) (for reviews, see De Houwer, 2006; Fazio & Olson, 2003). The Implicit Association Test (IAT, Greenwald, McGhee, & Schwartz, 1998) is, by far, the most commonly used paradigm for implicit measures. The IAT is theoretically based on an associative network conceptualization of a Social Knowledge Structure (SKS) in memory containing a central node 'me,' nodes representing other social objects, attributes of the 'me' and of the other social objects, and nodes representing positive and negative valence (Greenwald, Banaji, Rudman, Farnham, Nosek, & Mellot, 2002). The self-concept is defined as the association between the concept 'me' and certain attributes. The IAT self-concept is assumed to reflect the relative strength of automatic associations between the central node 'me' and attribute concepts.

Use of the IAT to measure self-related constructs offers two primary advantages. It provides direct access to people's attitudinal unconscious, which they are not able to verbalize (Greenwald et al., 2002); and the IAT reveals automatic associations for those who prefer not to express those attitudes.

The IAT measures indirectly the strength of the association between two contrasted target categories (e.g., self versus others) and two bipolar attribute categories (e.g., harmful versus harmless) via a computerized classification task. Participants classify randomly presented stimuli belonging to each category using two keys. The IAT score is the difference in the average response time between the two versions of the combined classification task (i.e., self-harmful and others-harmless versus self-harmless and others-harmful). The assumption underlying the IAT is that if two concepts are highly associated (e.g., self and harmful), the classification task will be easier (and the participants will respond more quickly) when the associated concepts share the same response key than when they require a different response key (for a more detailed description, see Greenwald et al., 1998). Among the diversity of applications, the IAT has been used to measure attitudes toward social groups (e.g., Dovidio, Kawakami, & Gaertner, 2002; Greenwald et al., 1998; Neumann & Seibt, 2001) as well as implicit self-concepts or personality dimensions (e.g., Asendorpf, Banse, & Mücke, 2002; Egloff & Schmukle, 2002; Schnabel, Banse, & Asendorpf, 2006; Steffens & Schulze-König, 2006; Teige, Schnabel, Banse, & Asendorpf, 2004; Uhlmann & Swanson, 2004).

Numerous studies have shown the reliability of the IAT in various domains (around .80 for internal consistency and .60 for test-retest stability) as well as good construct and predictive validity (e.g., Dasgupta & Greenwald, 2001; Greenwald & Farnham, 2000). Greenwald, Poehlman, Uhlmann, and Banaji's (in press) meta-analysis demonstrated the predictive validity of the IAT for different criteria such as nonverbal behaviors, impression formation, prejudice, voting, consumer behavior (e.g., Dasgupta & Greenwald, 2001; Greenwald & Farnham, 2000; Greenwald et al., in press; Richetin, Perugini, Adjali, & Hurling, 2007), as well as personality concepts such as shyness and anxiety (Asendorpf et al., 2002; Egloff & Schmukle, 2002; for a discussion on the use of implicit measures in personality, see Banse & Greenwald, 2007). Moreover the IAT appears to also have incremental validity over and above explicit measures (e.g., Egloff & Schmukle, 2002; Richetin, Perugini, Prestwich, & O'Gorman, 2007; Schnabel et al., 2006).

4. The IAT for assessing aggressiveness and predicting aggressive behavior: few answers, many questions

The IAT or other implicit measures are useful for assessing aggressiveness for three primary reasons. First, as we saw before, explicit measures such as self-reports tap only into processes involved in the explicit information processing mode. Second, the IAT has been demonstrated to have incremental validity over and above explicit measures. And finally, aggressive behavior is typically socially undesirable and reports of such are therefore subject to social desirability biases, so the predictive validity of explicit measures for aggressive behavior is questionable. Implicit measures may help to improve the prediction of aggressive behavior. So far, the only recent implicit measure that has been successfully used to assess aggressiveness and predict aggressive behavior is the IAT. Therefore, the focus will be only on the IAT.

The network conception of the Social Knowledge Structure as a basis of the IAT recalls Berkowitz's cognitive-neoassociationist model where negative affect becomes cognitively associated with negative thoughts, emotions and reflexive behavior. A negative experience would be linked to aggressive thoughts and/or behavior and the more this association is activated, the stronger it would become (Fazio, 1990; Ratcliff & McKoon, 1997).

Banse and Fischer (2002) investigated the predictive validity of implicit and explicit measures of aggressiveness for the behavior of ice hockey players and volleyball players. They used an explicit measure of aggressiveness and two IATs with two different types of items, consisting of traits words (e.g., 'provocative,' 'agreeable') or interaction words (e.g., 'fight' and 'talk') respectively, to operationalize Aggressive versus Peaceful categories. They showed that only the IAT interaction words, but not the IAT-trait words or the explicit measure, predicted the number of matches with penalties for ice hockey and volleyball players.

Gray, MacCulloch, Smith, Morris, and Snowden (2003) demonstrated by using the IAT that psychopathic murderers showed a weaker association between unpleasant and violent words (compare to the association between pleasant and peaceful words) than non-psychopathic murderers. Other studies also have demonstrated the ability of the IAT to predict aggressive behavior (Bluemke

& Zumbach, submitted for publication, 2007; Gollwitzer, Banse, Eisenbach, & Naumann, 2007). However, Schnabel et al. (2006) found that an IAT anger measure did not predict angry behavior whereas the explicit measure did. They used an IAT to connect target (me versus others) and attribute (angry versus self-controlled) categories and explicit measures to predict independent judges' ratings of videotaped participants during an anger-inducing computer crash.

Taken together, these studies do not clearly establish whether IATs for aggressiveness or anger predict aggressive or angry behavior. However, they suggest that procedural details, such as the type of stimuli and category labels used for the IAT seem to have a non-negligible effect on the predictive validity of the measure. In fact, because the IAT measures the strength of associations between concepts that are stored in memory, the way the concepts are activated could have an influence on which type of association is assessed. Focusing on the attribute category, Olson and Fazio (2004) showed that a personalized IAT using 'I like' versus 'I don't like' as attribute category labels outperformed a traditional IAT using 'Pleasant'/'Not pleasant,' arguing that the former refers to personal evaluation whereas the latter refers to normative evaluation.

Gray et al.'s (2003) study in which they used the pleasant/unpleasant attribute categories might have shown results only because they compared psychopathic murderers and non-psychopathic murderers in terms of IAT performance. The predictive validity of this IAT using the pleasant/unpleasant attribute categories might be more difficult with less extreme populations. In the same vein, some studies demonstrated that activation of the self-concept increases the predictive validity of the IAT (e.g., Perugini, O'Gorman, & Prestwich, 2007). Therefore, the activation of the node 'me' might be necessary to assess individual differences in aggressiveness and the IAT measure of aggressiveness would reflect the strength of the association between 'me' and aggressiveness.

As far as target categories are concerned, the issue is the same for category labels as for item selection. First, Banse and Fischer (2002) demonstrated that an IAT using interaction words had better predictive validity than an IAT using trait words. Second, Schnabel et al. (2006) suggested that lack of predictive validity of the IAT and its low internal consistency might have been due to inconsistency of motivational direction and valence of the stimuli. That is, automatic categorization of stimuli within the anger IAT may have been obstructed because angry versus self-control combines approach-related words (e.g. angry) with negative valence, and avoidance related words (e.g. self-control) with positive valence. Third, Banse and Fischer (2002) used aggressive and peaceful as label categories whereas Schnabel et al. (2006) used angry versus self-controlled. Therefore, the inconsistency in the results concerning the predictive validity of the IAT might be due partly to the materials used. As a consequence, one should assure that the type of items and category labels implemented in the IAT assess what one wants to test.

Type of aggression also should be considered in developing an IAT. As far as explicit measures of aggression are concerned, Bettencourt, Talley, Benjamin, and Valentine (2006) noted in their meta-analysis, that the vast majority of available studies had measured physical aggression, largely ignoring other types of aggressive behavior (e.g., verbal or indirect aggression). However, given for example the differences between direct and indirect aggression (Richardson & Green, 2003), it would be wise to consider that the predictive validity of implicit measures would differ depending on the type of aggression one is attempting to predict.

Richetin, Richardson, and Mason (submitted for publication) tested this hypothesis, using two different IATs varying the type of aggression to which the target category referred (direct versus indirect aggression). They included the Richardson Conflict Response Questionnaire (RCRQ, Richardson & Green, 2003) and the Buss and Perry Aggression Questionnaire (Buss & Perry, 1992) as explicit self-report measures of direct and indirect aggression as well as a behavioral measure that involved evaluation of an experimenter who had or had not delivered an insult. By introducing two versions of the IAT, they wanted to examine whether implicit and explicit measures of indirect aggression would better predict an indirect aggressive behavior than implicit and explicit measures of direct aggression would. In both versions of the IAT the target category labels were 'harmful' versus 'harmless' and the attribute category labels were 'me' versus 'not me.' The stimuli for the 'harmful' category in the direct aggression IAT were verbs exemplifying direct aggression (e.g., strangle) whereas the stimuli for the indirect aggression IAT were verbs illustrating indirect aggression (e.g., discredit). Unlike other studies using the IAT that illustrated the attribute categories Me/Others with words like 'I' versus 'Them,' Richetin and colleagues used items to which one could identify oneself (i.e., student, female) in order to enhance the activation of the self-concept (Perugini et al., 2007). The results showed that neither of the IATs predicted indirect aggressive behavior. However, an interaction effect between the IAT-direct aggression and the experimental manipulation was obtained: The IAT-direct aggression predicted the behavioral criteria when participants were provoked; it did not predict when participants were not provoked. The authors explained the lack of effects for the indirect aggression IAT as a result of the higher impact of the direct aggression items. The indirect items may be less clearly associated with aggressiveness and in consequence less salient in the association between the self-concept and aggression.

Richetin et al.'s (submitted for publication) results provide some new insights about the validity of the IAT for predicting aggressive behavior. They found that the IAT-direct aggression predicted aggressive behavior but only when individuals had been provoked. In sum, they showed a moderation effect of the context of provocation for the predictive validity of implicit measures.

5. Interaction between individual differences and situation

Measures of aggression, whether explicit or implicit, aim to assess individual differences. However, these measures do not always predict aggressive behavior. The situation in which the behavior is performed is also a key in the prediction.

Numerous studies have examined the moderating role of the situation in the predictive validity of explicit measures of individual differences in aggressiveness. For example in a meta-analysis of 63 studies, Bettencourt et al. (2006) showed that trait aggressiveness and trait irritability influenced aggressive behavior under both provoking and neutral conditions but that other personality variables, such as trait anger, type A personality and dissipation-rumination, influenced aggressive behavior only

under provoking conditions. For example, studies showed that the predictive validity of self-report measures of aggression (e.g., Giancola & Zeichner, 1995; Hammock & Richardson, 1992) was even stronger when the confederate angered the participants or when participants watched a violent videotape (Bushman, 1995). This work on explicit measures of aggression has contributed to a better understanding of why some people act aggressively whereas others do not, and why some people react aggressively in some situations and not in others. In other words, at the explicit level, measures of individual differences in aggression have better predictive power when the situation elicits an aggressive response.

Conclusions as to implicit measures are less clear. Since Higgins, Rholes, and Jones (1977), numerous studies have shown that the unconscious activation of psychological concepts (e.g., trait inferences, stereotypes, goals) via subliminal or supra-liminal priming can lead directly to behavior (for reviews, see Dijksterhuis & Bargh, 2001; Higgins, 1996). For example, if one is primed with the concept “rude,” the likelihood of behaving rudely is increased because the concept is temporarily accessible and triggers relevant cognitive activities that lead to behavior without need for conscious or deliberative decision making (cf. Bargh, Chen, & Burrows, 1996). The auto-motive model (Bargh, 1990) theorizes this often automatic and direct perception-behavior path by postulating that behavior is a consequence of relevant cognitive activities that can be induced by internal (intentional) or external (automatic) sources (such as priming) that in turn activate behavior. Thus, according to the auto-motive model, if one is primed by an aggressive concept via subliminal priming or via a provocation, one will automatically act aggressively. Indeed, it has been already shown that “aggressive” primes activate aggressive concepts that make violence more salient to individuals (Langley, O’Neal, Craig, & Yost, 1992). In their review, Todorov and Bargh (2002) provided extensive support for this model.

However, some findings have challenged this ‘all automatic’ conception. Cesario, Plaks, and Higgins (2006) demonstrated in three studies that a perception (e.g., via priming manipulation) will activate the relevant behavior only if the personal motivation is consistent with such behavior. Closer to our concerns, Smeesters, Warlop, Van Avermaet, Corneille, and Yzerbyt (2003) showed that a prime will vary in its effect on cooperative behavior depending on individual differences in social value orientation. Specifically, they showed that priming a picture of a priest enhanced cooperative behavior for people who scored high in pro-social orientation whereas it reduced cooperation among people who scored high in pro-self-orientation.

From a broader perspective, Perugini and Prestwich (2007) suggested that the auto-motive model fails to consider the role of individual differences in the perception-behavior link and proposed the gatekeeper model in which, as in the auto-motive model, a primed concept will activate fast cognitive activities but that individual differences relevant to these cognitive activities are assumed to be key in determining whether and what behavior will follow. In other words, perception can trigger action automatically only if there is a link between the two in memory at the individual level. This assumption implies that priming can increase (assimilation) or decrease (contrast) the likelihood of performing a congruent action depending on the direction of the idiosyncratic association between the two. For example, if the link between provocation and aggressive behavior exists and is strong, the aggressive prime will lead automatically to aggressive behavior. But if the link is weak or nonexistent, the aggressive prime will not lead to an aggressive behavior or will lead to a pro-social behavior. In sum, the gatekeeper model argues that individual differences moderate the effect of priming on behavior.

Perugini and Prestwich (2007) provided support for this argument by showing that a more positive implicit attitude towards Americans on the part of English participants predicted a more positive evaluation of an essay in which the spelling of some words indicated that it was written by an American (e.g., behavior instead of behaviour), but only when the American concept had been primed. Other similar results (Perugini & Prestwich, 2007) support this model. In a similar vein, Gawronski and Bodenhausen (2006) suggested that arousal should enhance automatic associations (and IAT effects) because an increase of arousal enhances dominant responses (Zajonc, 1965) and automatic associations reflect a dominant response (e.g., Lambert et al., 2003).

Florack, Scarabis, and Bless (2001) showed that the IAT predicted Germans’ judgments of the guilt of a Turkish criminal defendant when participants were made to feel threatened whereas the IAT did not predict when participants were not threatened. Although not directly measuring aggressive behavior, those judgments of guilt might be considered as aggressive given their potentially harmful consequences for the defendant. From the perspective of the gatekeeper model, the threat acted as a prime that activated individual differences in aggression at the implicit level. In the condition of no threat, there was no such a prime, so the individual differences in aggression were not activated. The results obtained by Richetin, Richardson, and Mason (submitted for publication) also supported this hypothesis: the IAT-direct aggression predicted an aggressive behavior only for participants who had been provoked. In other words, as for the explicit measures, the predictive power of the implicit measures is greater when the situation elicits individual differences in aggressiveness.

The logic underlying the gatekeeper model is, to some extent, similar to the first level of Berkowitz’s (1969, 1989, 1994) cognitive-neoassociationist model. Indeed, Berkowitz postulates that the association between negative experience and aggressive thoughts will lead to aggressive behavior only when the association is sufficiently strong. According to this argument, unthinking or impulsive aggression is most likely to occur when people are engaged in routine activities without a conscious monitor over thoughts or actions; if higher-order cognitive processes are activated, these aggression-related tendencies are modified and controlled.

6. The role of control in aggressive behavior

Although our discussion so far has focused on automatic processes, we should also briefly consider the issue of control. Given diversity of results and theoretical positions and the lack of consistent results, we do not have space here to examine the issue of when control can occur. Rather, we will focus our attention on the effects of control or, more specifically the effects of a lack of control, on the predictive validity of implicit measures.

Research suggests that control mechanisms are activated with self-awareness and attention to what one is thinking, feeling, and doing (Mischel, Cantor, & Feldman, 1996). Tangney, Baumeister, and Boone (2004) defined control as the “ability to override or change one’s inner responses, as well as to interrupt undesired behavioral tendencies and refrain from acting on them” (p. 275). In other words, control processes are viewed as different from deliberative processes in the sense that they enter into play to interrupt deliberative processes or override impulsive ones. Therefore, if individuals are not able to activate control processes because they do not have the motivation to do so or because their cognitive resources are not sufficient, they are more likely to act according to their behavioral tendencies or automatic associations. Hofmann, Rauch, and Gawronski (2007) showed that when self-regulation resources were high, candy consumption was uniquely related to dietary restraint standards; when self-regulation resources were low, candy consumption was predicted by automatic candy attitudes. As we suggested previously, the behavioral impact of automatic attitudes depends on available control resources.

Experimental studies have consistently demonstrated that individuals who have consumed alcohol behave more aggressively or respond more strongly to provocation than do persons who consume nonalcoholic drinks (e.g., Giancola & Zeichner, 1995; Ito, Miller, & Pollock, 1996; MacDonald, Zanna, & Holmes, 2000; Richardson, 1981). The effects of alcohol, as well as the effects of stress (e.g., Hennessy & Wiesenthal, 1999), result in a decrease of the ability to control aggression. Stucke and Baumeister (2006) showed that people who had reduced resources of self-control because they have been asked to self-regulate themselves in a previous task (i.e., situation of ego-depletion) responded more aggressively to a provocation than people who were not in an ego-depletion situation. This difference did not occur under when there was no provocation and the effect of ego-depletion was even stronger for people who were low in self-control (DeWall, Baumeister, Stillman, & Gailliot, 2007). We could thus hypothesize that implicit aggression would show a stronger relationship with aggressive behavior under conditions of no control than under conditions of strong control.

7. Some future potential directions

We have raised several issues that could constitute good starting points for future research. First, given the small number of studies on implicit aggressiveness, it will be necessary to conduct additional studies to establish whether the IAT is able to predict aggressive behavior. Particular attention should be devoted to examining type of categories and category labels used to exemplify aggression. It also could be useful to employ other implicit measures such as the Go/No go task (Nosek & Banaji, 2001) that allow an approach/avoidance perspective to see whether they assess the same construct and predict the same kind of behavior that the IAT did. Some additional empirical and theoretical work is also required for a better understanding of the relation between individual differences in aggressiveness and environmental inputs at the implicit level.

There is also a need for more empirical work on the predictive validity of implicit measures for different types of aggression (verbal, physical, direct, indirect). For example, it could be very informative to conduct research on how explicit and implicit measures of direct versus indirect aggression are related to incidental versus controlled aggressive behaviors. Even more interestingly, some types of aggression (e.g., reactive aggression) might be considered as more automatic or incidental than deliberative, and they could benefit from the use of implicit measures. Although self-report measures have been successfully used to assess reactive aggression (e.g., Barker, Tremblay, & Nagin, 2006; McAuliffe, Hubbard, & Rubin, 2006), one could suggest that implicit measures would assess and predict it even better. Indeed, automatic and deliberative aggression differ in the sense that these constructs are respectively determined more by automatic and deliberative processes and therefore that implicit and explicit measures respectively would assess them better.

Aggression scholars disagree about the intention of harm-doing behavior (Tedeschi & Felson, 1994). Such behavior may be intended to hurt the target, to control the target, or to get one’s own way. In fact, aggressive behavior can be driven by automatic processes and, as a consequence, the intention of harming could be activated without any consciousness. Moreover, explicit intentions may or may not be consistent with implicit intentions. Could implicit and explicit intentions in the same situation differ from one another? For example, when Amanda gossips about the love life of her friend, Aimee, she might explicitly intend to express concern about her friend’s life; she might implicitly wish to discredit Aimee in the opinions of their social group members. If we asked Amanda why she gossiped about Aimee, she would report pro-social motivation. Perhaps an implicit measure would reveal an association of self with intention to harm.

One could also test the moderating effects of priming a harmful versus a pro-social intention on the predictive validity of implicit measures of aggression. Finally, given the role of high level goals in aggression (e.g., Tedeschi & Felson, 1994) and the research on automatically triggering goals (Bargh, 1997; Todorov & Bargh, 2002), one could determine whether priming of the goal of controlling someone would lead to an increase in the predictive validity of implicit measures of individual differences in aggression. Such investigations could provide evidence in our ongoing debates about the definition and the nature of aggression.

References

- Aarts, H., & Dijksterhuis, A. (2003). The silence of the library: Environment, situational norm, and social behavior. *Journal of Personality and Social Psychology*, 84, 18–28.
- Anderson, C. A., & Bushman, B. J. (2002). Human aggression. *Annual Review of Psychology*, 53, 27–51.
- Asendorpf, J. B., Banse, R., & Mücke, D. (2002). Double dissociation between implicit and explicit personality self-concept: The case of shy behavior. *Journal of Personality and Social Psychology*, 83, 380–393.
- Banse, R., & Fischer, I. (2002). Implicit and explicit aggressiveness and the prediction of aggressive behaviour. *Poster presented at the 11th Conference on Personality of the European Association of Personality Psychology, Jena 21–25 July 2002*.
- Banse, R., & Greenwald, A. G. (2007). Commentary – Personality and implicit social cognition research: Past, present, and future. *European Journal of Personality*, 21, 371–382.

- Bargh, J. A. (1990). Auto-motives: Preconscious determinants of social interaction. In E. T. Higgins, & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition*, Vol. 2. (pp. 93–130) New York: Guilford.
- Bargh, J. A. (1997). The automaticity of everyday life. In R. S. Wyer Jr. (Ed.), *The automaticity of everyday life: Advances in social cognition*, Vol. 10. (pp. 1–61) Mahwah, NJ: Erlbaum.
- Bargh, J. A. (2006). What have we been priming all these years? On the development, mechanisms, and ecology of nonconscious social behavior. *European Journal of Social Psychology*, 36, 147–168.
- Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology*, 71, 230–244.
- Barker, E. D., Tremblay, R. E., & Nagin, D. S. (2006). Development of male proactive and reactive physical aggression during adolescence. *Journal of Child Psychology and Psychiatry*, 47, 783–790.
- Berkowitz, L. (1969). The frustration–aggression hypothesis revisited. In L. Berkowitz (Ed.), *Roots of aggression* (pp. 1–28). New York: Atherton.
- Berkowitz, L. (1989). Frustration–aggression hypothesis: Examination and reformulation. *Psychological Bulletin*, 106, 59–73.
- Berkowitz, L. (1993). *Aggression: Its causes, consequences, and control*. McGraw-Hill.
- Berkowitz, L. (1994). Is something missing? Some observations prompted by the cognitive-neoassociationist view of anger and emotional aggression. In L. R. Huesmann (Ed.), *Aggressive behavior: Current perspectives* (pp. 35–57). New York: Plenum.
- Bettencourt, B. A., Talley, A., Benjamin, A. J., & Valentine, J. (2006). Personality and aggressive behavior under provoking and neutral conditions: A meta-analytic review. *Psychological Bulletin*, 132, 751–777.
- Bluemke, M., & Zumbach, J. (submitted for publication). Aggression and violent computer gaming: A quasi-experimental online-study analysing implicit and explicit measures of aggressiveness of long-time computer gamers.
- Bluemke, M., & Zumbach, J. (2007). Implicit and explicit measures for analyzing the aggression of computer gamers. In G. Steffgen, & M. Gollwitzer (Eds.), *Emotions and aggressive behavior* (pp. 38–57). Göttingen: Hogrefe & Huber Publishers.
- Bushman, B. J. (1995). Moderating role of trait aggressiveness in the effects of violent media on aggression. *Journal of Personality and Social Psychology*, 69, 950–960.
- Bushman, B. J., & Anderson, C. A. (2001). Is it time to pull the plug on the hostile versus instrumental aggression dichotomy? *Psychological Review*, 108, 273–279.
- Buss, A. H., & Perry, M. (1992). The aggression questionnaire. *Journal of Personality and Social Psychology*, 63, 452–459.
- Caprara, G. V., Perugini, M., & Barbaranelli, C. (1994). Studies of individual differences in aggression. In M. Potegal, & J. F. Knutson (Eds.), *The dynamics of aggression: Biological and social processes in dyads and groups* (pp. 123–153). Hillsdale, NJ: Erlbaum.
- Cesario, J., Plaks, J. E., & Higgins, E. T. (2006). Automatic social behavior as motivated preparation to interact. *Journal of Personality and Social Psychology*, 90, 893–910.
- Dasgupta, A. G., & Greenwald, A. G. (2001). Exposure to admired group members reduces automatic intergroup bias. *Journal of Personality and Social Psychology*, 81, 800–814.
- De Houwer, J. (2003). The Extrinsic Affective Simon Task. *Experimental Psychology*, 50, 77–85.
- De Houwer, J. (2006). What are implicit measures and why are we using them. In R. W. Wiers, & A. W. Stacy (Eds.), *The handbook of implicit cognition and addiction* (pp. 11–28). Thousand Oaks, CA: Sage Publishers.
- DeWall, C. N., Baumeister, R. F., Stillman, T. F., & Gailliot, M. T. (2007). Violence restrained: Effects of self-regulation and its depletion on aggression. *Journal of Experimental Social Psychology*, 43, 62–76.
- Dijksterhuis, A., & Bargh, J. A. (2001). The perception-behavior expressway: Automatic effects of social perception on social behavior. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology*, 33, 1–40.
- Dovidio, J. F., Kawakami, K., & Gaertner, S. L. (2002). Implicit and explicit prejudice and interracial interaction. *Journal of Personality and Social Psychology*, 82, 62–68.
- Egloff, B., & Schmukle, S. C. (2002). Predictive validity of an Implicit Association Test for assessing anxiety. *Journal of Personality and Social Psychology*, 83, 1441–1455.
- Epstein, S. (1990). Cognitive-experiential self-theory. In L. Pervin (Ed.), *Handbook of personality theory and research* (pp. 165–192). New York: Guilford Press.
- Fazio, R. H. (1990). Multiple processes by which attitudes guide behavior: The MODE model as an integrative framework. In M. P. Zanna (Ed.), *Advances in experimental social psychology*, Vol. 23. (pp. 75–109) New York: Academic Press.
- Fazio, R. H., & Olson, M. A. (2003). Implicit measures in social cognition research: Their meaning and use. *Annual Review of Psychology*, 69, 1013–1027.
- Fazio, R. H., Sanbonmatsu, D. M., Powell, M. C., & Kardes, F. R. (1986). On the automatic activation of attitudes. *Journal of Personality and Social Psychology*, 50, 229–238.
- Florack, A., Scarabis, M., & Bless, H. (2001). Der Einfluss wahrgenommener Bedrohung auf die Nutzung automatischer Assoziationen bei der Personenbeurteilung./ The impact of perceived threat on the use of automatic associations in person judgment. *Zeitschrift fuer Sozialpsychologie*, 32, 249–259.
- Frings, C. G., & Wentura, D. (2003). Who is watching Big Brother? TV consumption predicted by masked affective priming. *European Journal of Social Psychology*, 33, 779–791.
- Gawronski, B., & Bodenhausen, G. V. (2006). Associative and propositional processes in evaluation: An integrative review of implicit and explicit attitude change. *Psychological Bulletin*, 132, 692–731.
- Gawronski, B., & Bodenhausen, G. V. (2007). Unraveling the processes underlying evaluation: Attitudes from the perspective of the APE model. *Social Cognition*, 25, 687–717.
- Giancola, P. R., & Zeichner, A. (1995). Alcohol related aggression in males and females: Effects of blood alcohol concentration, subjective intoxication, personality or provocation. *Alcoholism: Clinical and Experimental Research*, 19, 130–134.
- Gollwitzer, M., Banse, R., Eisenbach, K., & Naumann, A. (2007). Effectiveness of the Vienna social competence training on explicit and implicit aggression: Evidence from aggressiveness-IAT. *European Journal of Psychological Assessment*, 23, 150–156.
- Gray, N. S., MacCulloch, M. J., Smith, J., Morris, M., & Snowden, R. J. (2003). Implicit affective associations to violence in psychopathic murderers. *Nature*, 423, 497–498.
- Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review*, 102, 4–27.
- Greenwald, A. G., & Farnham, S. D. (2000). Using the Implicit Association Test to measure self-esteem and self-concept. *Journal of Personality and Social Psychology*, 79, 1022–1038.
- Greenwald, A. G., McGhee, D. E., & Schwartz, J. K. L. (1998). Measuring individual differences in implicit cognition: The Implicit Association Test. *Journal of Personality and Social Psychology*, 74, 1464–1480.
- Greenwald, A. G., Banaji, M. R., Rudman, L. A., Farnham, S. D., Nosek, B. A., & Mellot, D. S. (2002). A unified theory of implicit attitudes, stereotypes, self-esteem, and self-concept. *Psychological Review*, 109, 3–25.
- Greenwald, A.G., Poehlman, T.A., Uhlmann, E.L., & Banaji, M.R. (in press). Understanding and Using the Implicit Association Test: III. Meta-analysis of Predictive Validity.
- Hammock, G. S., & Richardson, D. R. (1992). Predictors of aggressive behavior. *Aggressive Behavior*, 18, 219–229.
- Hennessy, D. A., & Wiensenthal, D. L. (1999). Traffic congestion, driver stress, and driver aggression. *Aggressive Behavior*, 25, 409–423.
- Higgins, E. T. (1996). Knowledge activation: Accessibility, applicability, and salience. In E. T. Higgins, & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 133–168). New York: Guilford.
- Higgins, E. T., Rholes, W. S., & Jones, C. R. (1977). Category accessibility and impression formation. *Journal of Experimental Social Psychology*, 13, 141–154.
- Hofmann, W., Rauch, W., & Gawronski, B. (2007). And deplete us not into temptation: Automatic attitudes, dietary restraint, and self-regulatory resources as determinants of eating behavior. *Journal of Experimental Social Psychology*, 43, 497–504.
- Huesmann, L. R. (1988). An information-processing model for the development of aggression. *Aggressive Behavior*, 14, 13–24.
- Huesmann, L. R., & Guerra, N. G. (1997). Children's normative beliefs about aggression and aggressive behavior. *Journal of Personality and Social Psychology*, 72, 408–419.
- Ito, T. A., Miller, N., & Pollock, V. E. (1996). Alcohol and aggression: A meta-analysis on the moderating effects of inhibitory cues, triggering events, and self-focused attention. *Psychological Bulletin*, 120, 60–82.

- Lambert, A. J., Payne, B. K., Jacoby, L. L., Shaffer, L. M., Chasteen, A. L., & Khan, S. R. (2003). Stereotypes as dominant responses: On the "social facilitation" of prejudice in anticipated public contexts. *Journal of Personality and Social Psychology*, *84*, 277–295.
- Langley, T., O'Neal, E. C., Craig, K. M., & Yost, E. A. (1992). Aggression-consistent, -inconsistent, and -irrelevant priming effects on selective exposure to media violence. *Aggressive Behavior*, *18*, 349–356.
- MacDonald, G., Zanna, M. P., & Holmes, J. G. (2000). An experimental test of the role of alcohol in a relationship conflict. *Journal of Experimental Social Psychology*, *36*, 182–193.
- McAuliffe, M. E., Hubbard, J. A., & Rubin, R. M. (2006). Reactive and proactive aggression: Stability of constructs and relations to correlates. *Journal of Genetic Psychology*, *167*, 365–382.
- Metcalfe, J., & Mischel, W. (1999). A hot/cool system analysis of delay of gratification: Dynamics of willpower. *Psychological Review*, *106*, 3–19.
- Mischel, W., Cantor, N., & Feldman, S. (1996). Principles of self-regulation: The nature of will-power and self-control. In E. T. Higgins, & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 329–360). New York: Guilford Press.
- Neumann, R., & Seibt, B. (2001). The structure of prejudice: Associative strength as a determinant of prejudice endorsement. *European Journal of Social Psychology*, *31*, 609–620.
- Nosek, B. A., & Banaji, M. R. (2001). The go/no go association task. *Social Cognition*, *19*, 625–666.
- Olson, M. A., & Fazio, R. H. (2004). Reducing the influence of extra-personal associations on the Implicit Association Test: Personalizing the IAT. *Journal of Personality and Social Psychology*, *86*, 653–667.
- Perugini, M. (2005). Predictive models of implicit and explicit attitudes. *British Journal of Social Psychology*, *44*, 29–45.
- Perugini, M., & Prestwich, A. (2007). The gatekeeper: Individual differences in the chain from perception to behavior. *European Journal of Personality*, *21*, 303–317.
- Perugini, M., O'Gorman, R., & Prestwich, A. (2007). An ontological test of the IAT: Self-activation can increase predictive validity. *Experimental Psychology*, *54*, 134–147.
- Ratcliff, R., & McKoon, G. (1997). A counter model for implicit priming in perceptual word identification. *Psychological Review*, *104*, 319–343.
- Richardson, D. (1981). The effect of alcohol on male aggression toward female targets. *Motivation and Emotion*, *5*, 333–344.
- Richardson, D. S., & Green, L. R. (2003). Defining direct and indirect aggression: The Richardson Conflict Response Questionnaire. *International Review of Social Psychology*, *16*, 11–30.
- Richetin, J., Perugini, M., Adjali, I., & Hurling, R. (2007). The moderator role of intuitive versus Deliberative decision making for the predictive validity of implicit and explicit measures. *European Journal of Personality*, *21*, 529–546.
- Richetin, J., Perugini, M., Prestwich, A., & O'Gorman, R. (2007). The IAT as a predictor of spontaneous food choice: The case of fruits versus snacks. *International Journal of Psychology*, *42*, 166–173.
- Richetin, J., Richardson, D.S., & Mason, G. (submitted for publication). Predictors of direct versus indirect aggressive behavior: Validity of explicit and implicit measures.
- Schnabel, K., Banse, R., & Asendorpf, J. B. (2006). Assessment of implicit personality self-concept using the Implicit Association Test (IAT): Concurrent assessment of anxiousness and anger. *British Journal of Social Psychology*, *44*, 1–25.
- Smeesters, D., Warlop, L., Van Avermaet, E., Corneille, O., & Yzerbyt, V. (2003). Do not prime hawks with doves: The interplay of construct activation and consistency of social value orientation on cooperative behavior. *Journal of Personality and Social Psychology*, *84*, 972–987.
- Steffens, M. C., & Schulze-König, S. (2006). Predicting spontaneous Big Five behavior with Implicit Association Tests. *European Journal of Psychological Assessment*, *22*, 13–20.
- Strack, F., & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review*, *8*, 220–247.
- Stucke, T., & Baumeister, R. F. (2006). Ego depletion and aggressive behavior: Is the inhibition of aggression a limited resource? *European Journal of Social Psychology*, *36*, 1–13.
- Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, *72*, 271–324.
- Tedeschi, J. T., & Felson, R. B. (1994). *Violence, aggression, and coercive Actions*. Washington, DC: American Psychological Association.
- Teige, S., Schnabel, K., Banse, R., & Asendorpf, J. B. (2004). Assessment of multiple implicit self-concept dimensions using the Extrinsic Affective Simon Task (EAST). *European Journal of Personality*, *18*, 495–520.
- Todorov, A., & Bargh, J. A. (2002). Automatic sources of aggression. *Aggression and Violent Behavior*, *7*, 53–68.
- Uhlmann, E., & Swanson, J. (2004). Exposure to violent games increases automatic aggressiveness. *Journal of Adolescence*, *27*, 41–52.
- Wilson, T. D., Lindsey, S., & Schooler, T. (2000). A model of dual attitudes. *Psychological Review*, *107*, 101–126.
- Zajonc, R. B. (1965). Social facilitation. *Science*, *149*, 269–274.
- Zillmann, D. (1988). Cognitive-excitation interdependencies in aggressive behavior. *Aggressive Behavior*, *14*, 51–64.