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Predicting aggressive behavior in children with the help of measures of implicit and explicit aggression

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Abstract

Aggressive behavior between children in schools is a topic that receives much interest as violence and aggressive behavior cause many maladaptive social outcomes in the school setting. In the current study the Implicit Association Test (IAT) was adapted as a measure of children's implicit aggression, by assessing the association of the self category (vs. other) with the attribute concept of aggressive (vs. peaceful). In addition to the IAT, a questionnaire measure to assess explicit aggression was utilized. The main goal of the present contribution was to examine the predictive validity of measures of implicit as well as explicit aggression in predicting the scores in a competitive computer game as an indicator of children's aggressive behavior. Taken together, the results indicated that measures of implicit and explicit aggression could serve as reliable predictors of children's aggressive behavior and that the IAT possesses incremental validity in addition to the self-report measure.

Keywords

aggressive behavior, competitive computer game, explicit aggression, implicit aggression, implicit Association Test

Hardly any topic has received as much interest as violence and aggressive behaviors between children in school (Holtappels, Heitmeyer, Melzer, & Tillmann, 2009). The distress and harm resulting from aggressive behaviors motivates researchers, teachers and politicians alike to find new ways to help prevent or reduce aggressive behaviors. Nonetheless, approximately 5% to 15% of children between 5 and 11 years of age show clinically relevant aggressive behaviors (Lee, Baillargeon, Vermunt, Wu, & Tremblay, 2007; Scheithauer, 2003), such as hitting, kicking or fighting. However, if we take a closer look at less severe forms of aggressive behaviors in schools (e.g., verbal aggressive behaviors such as swearing at somebody), more than 50% of students in schools in Hesse and Saxony (Germany) report to observe such behaviors regularly. Consequently, it is not surprising that many efforts have been made to improve the diagnosis and measurement of aggression. That is why the focus of the present study is on the assessment of the predictive validity of two measures assessing children's aggression level.

Traditionally, the level of aggression of a particular person is measured by using self- or other-report questionnaires (see Suris et al., 2004, for an overview). To measure state levels of aggressive behavior, experimental procedures (e.g., hot-sauce paradigm, competitive tasks) have been used (Ritter & Eslea, 2005). These and other measures of aggression and aggressive behavior have frequently been used in many studies investigating the topic of aggression in children and adults. In previous studies the predictive validity of different measures of aggression has already been explored. For example, Giancola and Parrott (2008) found that self-report measures related to trait aggression were significantly associated with certain dependent variables derived from an experimental task (e.g., shock intensity). A study conducted by Phillips and Lochman (2003) that analyzed experimentally manipulated changes in reactive and proactive aggressive behaviors in children, demonstrated connections between teacher ratings of reactive aggression and the number of tilt-button presses (behavioral indicator for aggression). In addition Stadler, Rohrmann, Steuber, and Poustka (2006) found that a self-report questionnaire of aggression predicted children's behavior throughout a competitive reaction-time task. In the studies described here, aggression has been defined as an intentional action aimed at doing harm or causing pain (Aronson, Wilson, & Akert, 2008). For the present contribution, the same definition is applied. In addition we emphasize the importance of a further aspect that was highlighted by Baron and Richardson (1994). The authors proposed that it is important to assume that the victim of an aggressive action is motivated to avoid such treatment.

In recent years, however, psychological theorizing about aggression and aggressive behaviors experienced a shift. According to the assumptions of current dual-process models of social information processing (e.g., Strack & Deutsch, 2004; see also Chaiken & Trope, 1999, for an overview), two forms of self-evaluations that have differential impacts in predicting behaviors can be distinguished. Drawing on the distinction between explicit and implicit attitudes (Wilson, Lindsey, & Schooler, 2000), many researchers distinguish between implicit and explicit aggression as well (Gollwitzer, Banse, Eisenbach, & Naumann, 2007; Richetin & Richardson, 2008). The term explicit aggression refers to a concept encompassing aggression that is conscious and deliberate in nature,

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aimed at causing pain or doing harm, and therefore reflects the traditional definition of aggression. Explicit aggression is mainly measured by means of questionnaires. The second form of aggression, the so-called implicit aggression, is often regarded as the result of automatic self-evaluative processes that can be assessed with indirect measurement tools. Specifically, implicit aggression is often conceptualized as an automatically activated self-attitude (e.g., Gollwitzer et al., 2007; Uhlmann & Swanson, 2004). Todorov and Bargh (2002) define implicit aggression as automatic (mainly not intentional) in a way that situational features may directly trigger cognitions, emotions, motivations and behavior. The idea behind the concept of implicit aggression is characterized by assumptions according to an associative social-knowledge structure (Greenwald et al., 2002). "An important portion of social knowledge can be represented as a network of variable-strength associations among person concepts (including self and groups) and attributes (including valence)" (Greenwald et al., 2002, p. 5). With respect to aggression, the association between person concepts and attributes can be described as an association between "self" and the evaluative attribute "aggressive." We assume that the strength of the association between the own self-concept and attributes belonging to the concept aggression (mirrored in high or low implicit-aggression values) is an important source of individual differences in the access to social knowledge about aggression.

Taking a developmental focus, Rudman (2004) argues that early developmental events may shape implicit concepts (e.g., aggression) more than explicit ones. Moreover, she highlights that these implicit concepts provide a foundation for future learning processes and that they can be regarded as a nonconscious source for actions and evaluations. Taken together it can be suggested that both explicit and implicit forms of aggression should be taken into account in studies investigating aggressive behaviors in children. Before outlining the hypothesis of the present contribution in detail, we provide a short description of the measurement of implicit aggression.

An increasing use of implicit measures to assess the self-concept in general, and specifically that of aggression, can be noticed. This might be due to the fact that we are dealing with a construct that is highly overlapped with social-desirability concerns. Especially, when aggression or antisocial behaviors are the constructs of interest, self-reports might be affected by motivational biases (Blümke & Zumbach, 2007; Gollwitzer et al., 2007). Another benefit of implicit measures is that they are not influenced by the individual ability to recall aggression-relevant knowledge from memory (Fazio & Olson, 2003; Greenwald, McGhee, & Schwartz, 1998). One of the most often-used and best-known measurement tools to assess implicit attitudes is the Implicit Association Test (IAT; Greenwald et al., 1998). The IAT is a reaction-time-based classification task, measuring the association between the concept of self and the attribute aggressive by contrasting reaction times from two different response tasks. IATs to assess implicit aggression have already been used by Blümke and Zumbach (2007), Gollwitzer et al. (2007; this was a study with children as well), and Uhlmann and Swanson (2004).

Bushman and Anderson (2001) emphasize that aggressive acts have attributes that lie on a continuum ranging from "automatic" to "controlled" information processing. If one looks at aggressive behaviors in children it becomes obvious that various kinds of aggressive behaviors are shown and that explicit as well as implicit aggression might function as sources of those behaviors. Consequently, aggressive acts might be predictable with the help of measures assessing implicit and/or explicit aggression. Berkowitz (2008) supports this claim. In his work he reviews a number of experiments in which stimuli decreased or increased aggressive tendencies. Finally he concludes that we might behave in a spontaneous aggressive manner if we are not intentionally monitoring our actions. Richetin and Richardson (2008) are also considering automatic and controlled processes in aggressive behavior. They argue that these processes might enlarge our understanding of aggressive behaviors. In their work, the authors outline commonalities between the processes underlying aggressive behaviors and other forms of behavior.

Goals of the present research

In the present contribution the predictive validity of measures of implicit and explicit aggression was examined. Therefore, we conducted a study in which the level of explicit and implicit aggression and a behavioral indicator of aggression were assessed. To measure the aggression-related behavior, a competitive computer game was employed. One of the major aspects we were thinking of while developing the behavioral measure was its ecological validity. In our view, this means that a behavioral measure should provide reaction alternatives that are related to naturalistic competitive behavior in a good manner. As children do competitively interact with their peers in school, it was decided to design a competitive reaction-time task in which the children would get the opportunity to take an egoistic and unfair advantage over a fictive opponent. It was expected that the questionnaire measure of aggression would exhibit predictive validity for the aggressive behavior shown during the reaction-time task (Stadler et al., 2006). This hypothesis was set up in accordance with the definition of explicit aggression as a disposition to behave aggressively. Moreover, we assumed that implicit aggression would show incremental validity in predicting the aggressive behavior, because processes that are not cognitively controlled should influence aggressive responses. The present contribution focuses on the investigation of the predictive validity of measures of implicit and explicit aggression for the behavioral outcome in a competitive reaction-time task.

Method

Participants

One hundred and fifteen children from elementary schools in Hesse (61 boys and 54 girls) participated in the study. All children were between 9 and 11 years old ($M = 9.70$, $SD = 0.51$). One hundred and one children remained in the final sample (53 boys and 48 girls). Fourteen children had to be excluded from the analysis due to error rates surmounting 25% during the IAT. For all children we obtained written active informed consent from their parents and verbal assent from the children. The children did not receive any compensation for their efforts.

Materials

Measure of explicit aggression. To assess the level of aggression, children were asked to complete a German version of the aggression subscale of the Youth Self Report (YSR; Achenbach, 1991; Arbeitsgruppe Deutsche Child Behavior Checklist, 1998). This scale comprises 19 items assessing a broad variety of aggressive behaviors (e.g., yelling, attacking, threatening, gossiping) and has to be answered on a 3-point scale ranging

from 0 (*not true for me*), 1 (*a bit true for me*) to 2 (*completely or often true for me*) resulting in a maximum score of 38. A sample item reads: ''I attack others physically.''

Measure of implicit aggression. The level of implicit aggression was measured with the IAT. Verbal stimuli that had been selected according to children's reports in a pretest were used.[1] The concepts of ''self'' and ''other'' served as the target categories. Stimuli of the target category ''self'' were six idiographic items (own first name, own family name, own gender, own hair color, favorite city and own month of birth of each individual child). These items were provided by the subject. The stimuli representing the target category ''other'' were also generated by the participants. Participants were instructed to select six items that were not self-identifying (e.g., ''other'' first name, ''other'' family name, ''other'' gender; for a similar procedure see Greenwald & Farnham, 2000). The attribute categories were defined as ''aggressive'' and ''peaceful.'' Stimuli of the attribute categories were the following six verbs: hit, argue, exasperate, shout, kick and fight (for the category ''aggressive''), as well as six verbs for the ''peaceful'' category: help, laugh, play, like, hug and get along. (In the study all verbs were in the German language.) In the present contribution the verbs representing the attribute categories were chosen from a pretest set of different verbs that had been generated by children and were rated as either aggressive or peaceful on a 5-point Likert scale by other children in a second step. Other authors have already implemented an IAT with children (Gollwitzer et al., 2007), in which they used adjectives as well as verbs. We preferred to use only verbs, as they represent actual aggressive behavior.[2]

Generating idiographic stimuli for the IAT might increase its predictive validity, since this can be considered as self-activation (Perugini, O'Gorman, & Prestwich, 2007).

Behavioral measure of aggression. To get an indicator of aggressive behavior we used a competitive reaction-time task as aggression is one of the behaviors shown in many competitive situations (Rocha & Rogers, 1976). We wanted to assess aggressive behaviors in an ecological valid manner and therefore it was decided to use a computer game in which the children could strive for a desired object, as competition for desirable objects can be regarded as part of social reality (Rocha & Rogers, 1976). In our computerized competitive reaction-time task the children were playing a game against a fictitious opponent. In reality, no opponent actually existed, and the sequence and the outcome of the computer game were predetermined by the experimenter. The children's task was to push a button as soon as they saw a smiley on the computer screen. They were told that the child that was faster in reacting to the smiley would get the chance to withdraw points from the opponent's account. Each child began the game with 1,000 points and played 20 trials. During these 20 trials the child lost in 10 rounds and won in 10 rounds. After each predetermined loss of the child, a medium-level provocation was performed by withdrawing 40 to 60 points from the subject's account (resulting in a total loss of 500 points over all trials). If the child won a trial, he or she was asked to indicate how many points he or she wanted to withdraw from the opponent (possible range between 0 and 100 points in steps of 5 points). This task was selected, as it would allow to aggress in a more online fashion compared to standard Taylor aggression paradigm (TAP) procedures that require the participant to decide how many points he wants to withdraw from the opponent's account prior to the reaction-time trial (see also Beal, O'Neal, Ong, & Ruscher, 2000; Giancola & Parrott, 2008). Our task should enable the children to determine the amount of points to be withdrawn from the opponent's account immediately before subtracting them, in order to have a high level of correspondence between response choice and response enactment. Furthermore, the possibility to subtract zero points from the opponent's account was provided, because many nonaggressive response options are available in naturalistic settings as well. Moreover, all children were informed that they as well as their opponents would receive some sweets if they had at least 450 points left after all 20 trials. This clearly adds a competitive element to the procedure and it also provides a chance for the participants to aggress in a more proactive way (Rocha & Rogers, 1976). We consider this modification to reflect a behavior which is better related to naturalistic settings and therefore to provide an important amount of ecological validity. The experimental procedure was chosen in accordance with the definition of aggression given in the first part of this paper. It was important that the withdrawal of points from the opponent's account represented an act of harming the other person, who would be motivated to avoid such treatment in order the get the sweets. Thus, it is assumed that we are measuring aggressive behavior in concordance with the conceptual definition used (Giancola & Chermack, 1998).

Procedure

The IAT was structurally identical to the standard procedure recommended by Greenwald et al. (1998) and comprised seven blocks separated by a short pause for instructions. In the first block (24 trials) participants practiced the discrimination of self and other stimuli (target discrimination). In the second block participants had to discriminate between the categories ''aggressive'' and ''peaceful'' (attribute discrimination). In the fifth block participants practiced the reversed attribute discrimination (36 trials), where the assignment of the aggressive and peaceful categories to the response keys was changed from left to right. The critical Blocks 3 and 4 as well as 6 and 7 consisted of 48 trials. In these trials participants categorized items into four categories (two attribute and two target categories), of which two categories each shared one response key. In Blocks 3 and 4 the categories ''self'' and ''peaceful'' as well as ''other'' and ''aggressive'' shared one response key. In Blocks 6 and 7 the categories ''self'' and ''aggressive'' as well as ''other'' and ''peaceful'' shared one response key. All participants went through the seven IAT blocks in an identical sequence, whereas the order of presentation of the single stimuli in each block was randomized.

In each trial a stimulus appearing in the center of the screen in white letters on a black background had to be assigned to one of the categories presented in the upper left and right corners of the screen by pressing the keys ''A'' for a left and ''L'' for a right response (QWERTZ keyboard, where only the two response keys remained). If participants made a mistake, the message ''false key'' appeared right above the stimulus and the correct response had to be given. The intertrial interval was set to 500 ms.

All participants began the experiment in individual test sessions with the IAT, directly followed by the behavior measure. Before starting with the behavioral measure, the research assistant explained the rules of the game and enssured that all children believed they were playing against another child via the Internet.

Self-report questionnaires had already been filled in some days before the computerized testing in a group-test situation. After the completion of the computer game measure all children were asked what they thought about whom they were playing against. All children reported to believe that they were playing against another student of the same age from a school in Frankfurt am Main (the gender of the opponent was not specified).

Data selection

Before computing IAT effects, the data of 14 participants who showed error rates of more than 25% in the IATs had to be discarded from the analysis. The IAT scores were calculated such that higher scores indicated a stronger association between the self category and aggressive attributes. The IAT data were treated following the improved scoring algorithm presented by Greenwald, Nosek, and Banaji (2003). The D_1-measure was chosen for this analysis and a built-in error penalty (time until first key press + time until correction) was used. For the D_1-measure (a) trials with latencies greater than 10,000 ms were eliminated—there was no treatment of low reaction times; (b) error trials were included in the analysis by using the latency until the correct response was given; (c) the mean latency in critical trials of the self + aggressive block was subtracted from the self + peaceful block (Block 6 minus Block 3 as well as Block 7 minus Block 4), leading to two differences; (d) these differences were divided by the individual respondent standard deviations of reaction times in Blocks 3 and 6 or Blocks 4 and 7, respectively, leading to two scores; (e) the IAT effect for the aggression IAT was computed as the average of these two scores.

Results

Implicit Association Test. The IAT-D_1-effect was significantly different from zero: $M = -.45$, $SD = 0.26$, $t(100) = -17.32$, $p < .01$, $d = 2.44$.

The reliability of the IAT-D_1-effect was calculated by applying the algorithm separately to two mutually exclusive subsets of combined task trials of the IAT. The Spearman–Brown adjusted split-half correlation was quite good for the aggression IAT ($r_{tt} = .74$).

Explicit aggression. To compute the measure of explicit aggression all items of the YSR aggression scale were summed up. The mean and standard deviation of the explicit aggression scores in our sample were as follows: $M = 5.48$, $SD = 5.11$. The internal consistency of the scale was $\alpha = .85$.

Behavioral measure of aggression. Aggression was defined as the number of points the children had taken away from their opponent's accounts. We first computed the sum of all withdrawn points throughout the 10 win trials of the game for each individual participant. The mean number of points withdrawn in the course of the computer game was $M = 814.85$ ($SD = 202.18$). There were some children who had taken away 100 points from their opponent's account in every trial where possible ($n = 34$), but there were no children who did not take away any of their opponent's points during all trials. All children took at least 385 points away from their opponent's account throughout the 10 trials that they had won.

Correlation. In the next step we computed the correlations between our measures. The correlation between the measure of implicit and explicit aggression was not significant ($r = .18$, $p = .07$) but fell in the normal range (Hofmann, Gawronski, Gschwendner, Le, & Schmitt, 2005).

Prediction of behavior. To examine the main question of the present investigation, we computed regression analyses to determine the contribution of the explicit and implicit aggression for the prediction of aggressive behavior in the competitive computer game. In the first step we entered participants' explicit-aggression scores as predictor and the behavioral indicator of aggression as dependent variable. The model was significant and explicit aggression was a significant predictor of aggressive behavior during the computer game ($\beta_{YSR\text{-}aggression} = .31$, $R^2 = .09$, $F(1, 99) = 10.14$, $p < .01$). In the next step we used two predictors (explicit and implicit aggression) and analyzed whether both would serve as predictors of aggressive behavior. We found the model to be significant, and both predictors made a significant contribution in predicting the magnitude of aggressive behavior in the computer game ($\beta_{IAT} = .23$, $t = 2.43$, $p = .02$, $\beta_{YSR\text{-}aggression} = .26$, $t = 2.78$, $p < .01$, $R^2 = .14$, $F(2, 98) = 8.26$, $p < .01$). The change in R^2 was significant ($p < .02$).

Discussion

In this study we explored the predictive validity of measures of explicit and implicit aggression with respect to aggressive behavior. Results indicated that implicit and explicit aggression were positively, but not significantly, correlated with each other. Regression analyses revealed that implicit and explicit aggression both had significant effects in predicting aggressive behavior.

We may conclude from our results that measures of implicit as well as explicit aggression are both important for the prediction of aggressive behaviors. Due to their joint contribution to the prediction of aggressive behavior it can be argued that both are indispensable predictors one should utilize to gain a better insight into the determinants of aggressive behavior. As we implemented a competitive reaction-time task that is similar to aggressive behavior between peers in a naturalistic setting, we may conclude that the use of measures of implicit and explicit aggression would add to our understanding of aggressive behavior in schools. In this study the measure of implicit aggression had incremental validity in addition to the measure of explicit aggression in predicting aggressive behavior. However, this might be a consequence of the behavioral indicator used in our study. As children had the opportunity to choose the number of points to be withdrawn from their opponent without time constraints and after they had already learned that they had won the trial, we might suppose that the behavior shown by the children was not as noncognitively controlled as it might have been under time constraints. Consequently, we can assume that the aggressive behavior assessed in this study comprises controlled as well as noncontrolled aspects. A study supporting the predictive validity of implicit measures of aggression for actual aggressive behaviors in response to provocation in an adult sample was recently published by Richetin, Richardson, and Mason (2010). The authors demonstrated that measures of implicit aggression are valuable predictors for aggressive behavior in response to provocation. However, as the distinction of implicit and explicit aggression is a relatively novel one, more research to establish the predictive validity of implicit aggression would be needed. A more spontaneous behavioral indicator could be a variant of the competitive computer game used in our study but under time constraints.

In our study, relatively high levels of points were withdrawn from the opponents' account. We assume that this reflects an angry response. The angry response results due to someone else's attempts to block a desired goal (sweets). This anger might increase the likelihood of aggressive reactions after the children won a trial. According to Rocha and Rogers (1976), striving for desirable objects is part of the reality and competitive situations can lead to aggression. As the children did not know how many trials they would win or lose while they were playing the 20-trial game, they were aware of the possibility of finishing the game with less than 450 points left. This knowledge can be regarded as aggression-inducing provocation and is thus a second possible explanation of the high amount of subtracted points during the computer game. Another possibility to explain the relatively high level of points withdrawn is that it might be a consequence of the modification of the competitive reaction-time task used in our study. The children had already learned that they had won the trial and were then asked to withdraw the points. Maybe this allows for a relatively noncontrolled online fashion of aggression without thinking about the behavioral consequences. However, there can be other reasons for the relatively high amount of withdrawn points. A further possible explanation for the behavior shown in the competitive reaction-time task could be an attempt to restore equity, as an anonymous reviewer pointed out. This explanation seems to be inconsistent with our findings, as the children in the sample withdrew many more points on average than the predetermined mean loss of points. However, this does not answer the inconsistency between self-reported aggression and points withdrawn in the reaction-time task. It has to be outlined that the correlation between the self-report and the computer measure fell in the expected range (Anderson & Bushman, 1997), although the mean level of self-reported aggression was relatively low. Maybe the computer game provided the option to act aggressively without any expected consequences, as the amount of points withdrawn from the child was predetermined and the fictive opponent was out of reach.

Another point that has to be stated critically is that subjects in our study did not know the amount of points the opponent wanted to subtract from their account in case the subject won the trial. In other measures participants receive feedback on the intensity of shocks or noise blasts chosen by the opponent after all trials in order to maintain the provocation level.

A further point that is worth discussing concerns the error rates during the IAT. We had to exclude 14 children from our analyses, because they were having error rates of more than 25%. This criterion is a relatively strict one. Other authors (e.g., Gollwitzer et al., 2007) decided to keep in their sample all children that had error rates of less than 40%. If we were to have applied this criterion, none of the 115 children in our sample would have been excluded. However, as 40% errors in the IAT is a relatively high amount of errors we decided to use a criterion that seems to ensure that the task was correctly understood and that children were not guessing which key they had to press.

The present study gives some further evidence for the usefulness of the IAT in research of aggression in children, since the measure of implicit aggression explains different sources of variance over and above the measure of explicit aggression. A major implication of the present contribution is that both explicit and implicit types of aggression play a pivotal role in the choice of behavioral tendencies. Moreover, the present contribution highlights the feasibility of employing an aggression IAT in research with elementary school children. Hence, we support the claim of Gollwitzer et al. (2007) and Uhlmann and Swanson (2004) to adapt implicit measurement methods for the study of aggressive behavior and the analysis of the effects of aggression-prevention programs. A focal question that many people ask in connection with aggressive behavior in school-aged children is how aggressive behavior can be prevented. In future studies, it would be helpful to assess elicited emotions during a competitive reaction-time task and to link these with underlying motivational aspects like instrumental motivation or revenge motivation (Anderson & Murphy, 2003). Maybe further insights into the role of individual dispositions (implicit and explicit aggression) could enrich the development of appropriate prevention programs. It could be fruitful to know whether noncontrolled processes are crucial for the enactment of a certain behavior and what their contribution is. To conclude, it can be stated that implicit as well as explicit aggression can significantly contribute to research on aggressive behavior (Berkowitz, 2008; Richetin & Richardson, 2008).

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Notes

1. During the pretest, children attending third and fourth grade of elementary school were asked to rate verbs that had previously been chosen by the authors of this paper according to their connectedness with the categories "aggressive" and "peaceful." All ratings were done using 5-point Likert scales. The verbs that were rated as most aggressive or most peaceful respectively were selected for the present study.
2. Some readers might ask themselves if the use of verbs in the IAT can lead to a confusion of the target of aggression in the sense of a "subject–object ambiguity." We believe that this should not be a problem, as the German language has clear differences in active (the child is the actor) and passive (the child is the target) verbs.

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