

## Impulse control and aggressive response generation as predictors of aggressive behaviour in children with mild intellectual disabilities and borderline intelligence

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### Abstract

**Background** A growing interest exists in mechanisms involved in behaviour problems in children with mild intellectual disabilities and borderline intelligence (MID/BI). Social problem solving difficulties have been found to be an explanatory mechanism for aggressive behaviour in these children. However, recently a discrepancy was found between automatic and reflective responding in social situations. We hypothesise that low impulse control and aggressive social problem solving strategies *together* may explain mechanisms involved in aggressive behaviour by children with MID/BI.

**Method** In a clinical sample of 130 children with MID/BI receiving intramural treatment, main, moderating and mediating effects of impulse control and aggressive response generation on aggressive behaviour were examined by conducting hierarchical linear multiple regression analyses.

**Results** Independent main effects of both impulse control and aggressive response generation on aggressive behaviour were found. Results indicated

that low impulse control and aggressive response generation each explain unique variance in aggressive behaviour.

**Conclusions** As this study is the first that has shown both impulse control and aggressive response generation to be important predictors for aggressive behaviour in children with MID/BI, future research should further examine the nature of relations between low impulse control and social problem solving.

**Keywords** aggressive behaviour, aggressive response generation, borderline intelligence, impulse control, mild intellectual disabilities, social problem solving

### Introduction

Research on behaviour problems in children with mild intellectual disabilities and borderline intelligence (MID/BI) has primarily focused on the prevalence of behaviour problems and psychopathology (Einfeld & Tonge 1996; Linna *et al.* 1999; Dekker *et al.* 2002; Dekker & Koot 2003a; Emerson 2003). A growing interest exists in risk factors for these problems in children with MID/BI. A few

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large survey studies have found both family and child characteristics to predict behaviour problems in children with MID/BI (Dekker & Koot 2003b; Emerson 2003; Wallander *et al.* 2006). However, focusing on broader, more distal, social environmental factors and a few general child characteristics, such as ID and physical symptoms, these studies did not include proximal psychological factors within the child (Wallander *et al.* 2006). We argue that especially the individual psychological factors social cognitive skills and impulse control, are important factors to come to understand behaviour problems in children with MID/BI.

The relation between social cognitive skills and aggressive behaviour has been explained by the Social Information Processing model (SIP; Crick & Dodge 1994). Ample research has shown aggressive children with average intelligence to encode less relevant information, make hostile attributions, have more instrumental goals, generate more aggressive responses, evaluate those responses positively, select aggressive responses and use them in enactment (for reviews, see Crick & Dodge 1994; Matthys & Lochman 2005; Mize & Pettit *in press*).

In previous studies examining social cognition and behaviour problems in children with MID/BI social problem solving difficulties were found to be an explanatory mechanism for externalising and aggressive behaviour in children with MID/BI. Especially response generation has been proven to be important in explaining behaviour problems (Van Nieuwenhuijzen *et al.* 2005, 2006, *in press*).

Interestingly, a discrepancy has been found between automatic and reflective responding on social problems in children with MID/BI. When responding immediately to an open question, which simulates automatic retrieval processes, aggressive children generated aggressive problem solving strategies. However, when responding reflectively, i.e. after evaluating different strategies and choosing one of them, aggressive children had higher rates of pro-social strategies (Van Nieuwenhuijzen *et al.* 2006). Similar results have been found in aggressive children with average intelligence (Lochman *et al.* 1989; Rabiner *et al.* 1990).

These findings suggest that aggressive children, either with MID/BI or with average intelligence, are able to recognise and select pro-social solutions to social problems, but do not generate these compe-

tent solutions automatically and do not behave in real-life as such. This yields the question why this discrepancy between automatic and reflective social problem solving exists. It has been suggested that limited impulse control in children with MID/BI and behaviour problems may explain this issue (Van Nieuwenhuijzen *et al.* 2006).

Impulse control and the control of emotions have proven critical for understanding social behaviour (Block & Block 1980; Lemerise & Arsenio 2000; Orobio de Castro *et al.* 2003, 2005; Nigg 2006). In one of the conceptualisations of impulse control, Jack Block (Block & Block 1980; Funder & Block 1989) formulated a personality construct for understanding motivation, emotion and behaviour: Ego-control. Ego-control refers to impulse inhibition vs. expression. Overcontrolled individuals contain their impulses and affects; undercontrollers characteristically express their impulses and affects. In the general population, it has been shown that low levels of impulse control are related to adjustment problems, especially externalising behaviour problems (Robins *et al.* 1996; Hart *et al.* 1997; Huey & Weisz 1997; Asendorpf & Van Aken 1999).

To date, not much is known on the relation between impulse control, response generation and behaviour problems in children, either with or without MID/BI, although it has been suggested that aggressive behaviour can be explained by the joint effects of impulse control and social cognitive processes (Dodge & Pettit 2003). In their biosychosocial model of development of behaviour problems, Dodge & Pettit (2003) argue that biological predispositions, such as impulsivity and temperament, and life experiences predict later behaviour problems, but this relation is mediated by social cognitive processes (mediation). In addition, the model suggests that certain risk factors only lead to negative outcomes in children with a certain biological predisposition (moderation).

Regarding mediation, social cognitive processes has been found to (partially) mediate relations between aggressive behaviour and early life experiences, such as harsh discipline (Weiss *et al.* 1992; Dodge *et al.* 1995; Mize *et al.* 2000), peer rejection (Dodge *et al.* 2003), and social economical background of the family (Schultz & Shaw 2003). No empirical data are known to support the idea that social cognitive processes mediate the relation

between impulsivity and aggressive behaviour. However, control of emotions and behaviour has been found to be related to social cognitive processes (Orobio de Castro *et al.* 2003), which in turn are related to aggressive behaviour. These findings may be an indication for the mediating role of social cognitive processes.

Regarding moderation, two recent studies have found difficult temperament and impulse control to moderate the relation between hostile attribution and aggressive behaviour (Meece & Luster 2007; Meece *et al.* 2007). Hostile intent attributions were found to be related to aggressive behaviour only for impulsive children and children with a difficult temperament, but not for children who are less impulsive or have a less difficult temperament. These results indicate that impulsive children may not use cognitive processes of response generation and evaluation before they show aggressive behaviour.

Thus, the reported studies indicate that social cognitive processes and impulse control may interact and jointly affect behaviour. However, they did not focus on the combination of impulse control and response generation, whereas we believe these two variables *together* are important in explaining aggressive behaviour in children with MID/BI (Van Nieuwenhuijzen *et al.* 2006). Only one study has examined both impulse control and aggressive response generation in children with average intelligence (Waldman 1996), and examined whether aggressive response generation had an effect on aggressive behaviour, after controlling for impulsivity. The results showed that aggressive children were characterised by aggressive response generation, even when taking into account their impulsivity. However, the Waldman study did not provide information on the unique effect of impulse control on aggressive behaviour, over and above the effect of aggressive response generation. Neither did the study investigate how impulse control and aggressive response generation interact in their effect and jointly influence aggressive behaviour.

The present study is innovative in investigating the interactive effects of impulse control and aggressive response generation on aggressive behaviour, and will bring our knowledge of the development of aggressive behaviour in children with MID a step further. We believe there are two ways in which impulse control may interact with aggressive

response generation. First, the relation between impulse control and aggressive behaviour may be mediated by aggressive response generation. Children who have difficulties controlling their impulses may generate an inadequate response, as these generally come to mind first in children with MID/BI (Van Nieuwenhuijzen *et al.* 2004). In turn, aggressive response generation will lead to aggressive behaviour (Van Nieuwenhuijzen *et al.* 2006).

Second, impulse control may moderate the effect of aggressive response generation on aggressive behaviour. This means that aggressive response generation is related to aggressive behaviour, only for children who have difficulty controlling their impulses and suppressing inadequate aggressive responses, but not for children who have less difficulty with impulse control. As was discussed by Van Nieuwenhuijzen *et al.* (2006), children who show low impulse control of their emotions and behaviour may behave directly according to what comes in mind. They do know that there are more adequate forms of responding, if they take more time to think about these responses (Huesmann 1998; Anderson & Bushman 2002; Orobio de Castro *et al.* 2003), but their pre-emptive processing style may prevent them from generating and selecting these adequate responses spontaneously.

The aim of this study is to investigate the interactive effects of impulse control and aggressive response generation on aggression in children with MID/BI. It is questioned whether (1) impulse control and aggressive response generation both have an effect on aggressive behaviour; (2) impulse control has a moderating effect on the relation between aggressive response generation and aggressive behaviour; and whether (3) aggressive response generation mediates the relation between impulse control and aggressive behaviour.

## Method

### Participants

The study population was derived from a sample of children with MID/BI aged 10 to 14 receiving intramural treatment in a residential treatment centre in the Netherlands. In the Netherlands there are 21 special treatment centres for children with MID/BI who, because of their ID and behaviour problems,

demonstrate adjustment problems in one or more social contexts including the family, school, work and peers. Indication criteria for these treatment centres are: IQ between 55 and 85, limitations in social and adaptive behaviour and a chronically need of care, which is in line with the most recent definition of ID provided by the American Association on Mental Retardation (Luckasson *et al.* 2002). Eight of these treatment centres were selected because of their geographical position; almost the whole country was covered by this selection. In each of these eight treatment centres all clients receiving residential treatment between the age of 10 and 14 and their parents or caretakers were asked to participate in the study. Individuals with identified syndromes were excluded from the study. The research was undertaken with the understanding and written consent of each participant. In addition, the study has been independently reviewed and approved by the medical ethical committee of Utrecht University, the Netherlands.

A total of 130 children with MID/BI and severe behaviour problems participated in the present study: 81 boys and 49 girls with a mean age of 12.4 (SD = 1.23) and a mean IQ of 72 (SD = 8.9). All of these children received special education. This clinical sample is characterised by severe behaviour problems: the aggressive behaviour mean T-scores on the Teacher's Report Form (TRF) all fell within the clinical range ( $M = 66.22$ ,  $SD = 10.26$ ). Compared with children in special education (data presented in Van Lier *et al.* 1992), the impulse control mean scores fell in the 60th percentile ( $M = 58.88$ ,  $SD = 28.50$ ). No participants were dropped from the study because of inability to complete the measures satisfactorily or for other reasons. In Table 1 means and standard deviations are given for the total sample.

**Table 1** Means and standard deviations of the measures

	Mean	SD
Aggressive behaviour (TRF T-score)	66.25	10.26
Aggressive response generation	1.16	1.15
Low impulse control	50.07	11.79
Raven standard progressive matrices	29.19	8.74

TRF, Teacher's Report Form.

## Measures

### *Behaviour problems*

For each child, the Dutch version of the TRF was completed (Achenbach 1991; for the Dutch version see Verhulst *et al.* 1997). The TRF was completed by the teacher who knew the student for at least two months. Each teacher rated several children, with a maximum of five. The Dutch version of the TRF has been shown to have good reliability and validity for both the general population (Verhulst *et al.* 1997) and for children with MID (Dekker *et al.* 2002). For this study, raw scores on the scale Aggressive behaviour were used. Using Dutch norms, T-scores on the scale Aggressive behaviour were obtained for descriptive purposes only.

### *Intelligence*

An estimate of intelligence was obtained using Raven's Standard Progressive Matrices (SPM; Raven *et al.* 1983), which consists of incomplete arrays of abstract geometrical figures and requires respondents to identify the relations between the elements in an array in order to select the correct figure to complete the array. The internal consistency of the test has been found to be around 0.90, and the test-retest reliability of the test has been found to vary from 0.90 for short term to 0.80 for long term. Moderate to high correlations between the SPM and other nonverbal tests of intelligence have been reported (Raven *et al.* 1983). Based on the norm scores for typically developing children percentile scores were obtained, which were transferred into estimates of IQ scores.

### *Impulse control*

Impulse control was assessed with the California Child Q-set (CCQ; Dutch version Nijmegen-California-Kinder-Sorteertechniek; Van Lier *et al.* 1992). The CCQ consists of 100 statements, printed on separate cards, describing a wide range of behavioural and personality characteristics of children. Care staff who knew the child best were asked to sort all the cards into nine categories ranging from least (category 1) to most characteristic (category 9) of a particular child. Eleven statements are thus placed in each category, with the exception of

category 5, which contains 12 statements. A scale score was calculated for low impulse control, which has been proved to be reliable (Van Lier *et al.* 1992; Juffer *et al.* 2004). The low impulse control scale is a measure that reflects the extent to which a child's handling of problematic situations is characterised by immediately and directly showing feelings, needs and impulses. Examples of items that reflect low impulse control are 'Shows emotions clearly' and 'Is restless or nervous'. Low impulse control scores ranging from 9 to 81.

#### *Aggressive response generation*

Aggressive response generation was assessed by the Social Problem Solving Test revised for children with MID (SPT-MID; Matthys *et al.* 1999; Van Nieuwenhuijzen *et al.* 2001). The child is being asked about social problem solving strategies after having seen several hypothetical situations on videotape, which is described extensively in the Van Nieuwenhuijzen *et al.*'s (2006) study. The SPT was administered and scored by trained graduate students and the first author of the article.

In the present paper only one variable was used in the analyses: 'generation of aggressive responses'. This variable represents the number of times that an aggressive response is provided by the child as the first response, with a minimum score of 0 (= never given) and a maximum score of 5 (= always given).

#### **Data analyses**

To investigate the first two research questions of this study, correlations were calculated and a series of Hierarchical Linear Multiple Regression (HLMR) analyses were undertaken. First, the Pearson's moment product correlation coefficient between aggressive response generation and impulse control was examined to investigate whether these two predictors of aggressive behaviour are interrelated. If so, the investigation of the unique relations of both variables with aggressive behaviour is relevant. To examine the unique effect of impulse control on aggression over and above the effect of aggressive response generation, a HLMR was conducted with aggression as the dependent variable, aggressive response generation as independent vari-

able entered in the first step, and impulse control as independent variable entered in the second step of the model. Next, to examine the unique effect of aggressive response generation on aggression over and above the effect of impulse control, again a HLMR was conducted with aggression as the dependent variable, this time with impulse control as independent variable entered in the first step, and aggressive response generation entered in the second step of the model.

We exploratively tested whether results of these analyses depended on gender or IQ. No correlations between gender, IQ and aggressive response generation were found, nor did gender and IQ influence the relation between aggressive response generation and aggressive behaviour in regression analyses. It was therefore not necessary to enter gender and IQ in the regression models.

To answer the second question, whether there is a moderating effect of impulse control, the interaction term between aggressive response generation and impulse control was entered in the model, in addition to impulse control and aggressive response generation. For a moderator effect, there has to be an effect of the interaction between aggressive response generation and impulse control on aggressive behaviour, over and above the main effects of both variables (Baron & Kenny 1986; Holmbeck 1997).

To answer the third question, whether a mediating effect exists of aggressive response generation on the relation between impulse control and aggressive behaviour, the following analyses were conducted. First, the correlation between aggressive behaviour, aggressive response generation, and impulse control was examined by Pearson's moment product correlation coefficient. Next, three Linear Regression Analyses were conducted with (1) aggressive behaviour as the dependent variable, and impulse control as the independent variable; (2) aggressive response generation as the dependent variable, and impulse control as the independent variable; and (3) aggressive behaviour as the dependent variable, and both impulse control and aggressive response generation as the independent variables. To be able to speak of a mediation effect, (1) the three variables should be interrelated; (2) there has to be an effect of impulse control on aggressive behaviour and on aggressive response



**Table 2** Prediction of aggressive behaviour

	Independent variable	Beta	R <sup>2</sup> change
Step 1	Aggressive response generation	0.17*	0.05*
Step 2	Low impulse control	0.35**	0.12**
Step 1	Low impulse control	0.35**	0.15**
Step 2	Aggressive response generation	0.17*	0.03*
Step 3	Low impulse control × aggressive response generation	0.11	0.00

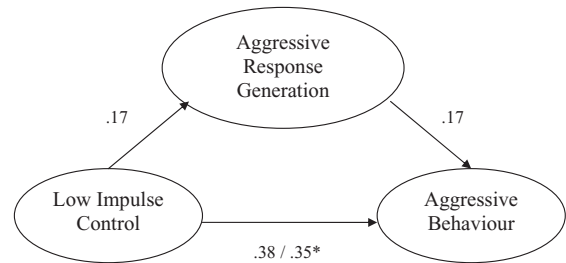
\*  $P < 0.05$ ; \*\*  $P < 0.001$ .

generation; and (3) of aggressive response generation on aggressive behaviour; and (4) the effect of impulse control has to decrease after controlling for aggressive response generation (Baron & Kenny 1986). As a final step a Sobel test was conducted to test whether the drop in the effect of impulse control on aggressive behaviour, after inclusion of the mediator aggressive response generation in the model, is significant (Preacher & Hayes 2004).

## Results

Regarding the first research question, the results show that aggressive response generation and impulse control are correlated significantly ( $r = 0.17$ ,  $p = 0.05$ ). Therefore, it is relevant to investigate the unique contributions of aggressive response generation and impulse control on aggressive behaviour. The results of the HLMR show that a significant amount of the variance in aggressive behaviour problems was explained by impulse control and aggressive response generation. After controlling for the effect of aggressive response generation, the results show additional effects of impulse control. In turn, after controlling for the effect of impulse control, additional effects were found for aggressive response generation (see Table 2). Thus, each of these variables contributed uniquely to the variance of aggressive behaviour.

Regarding the second research question, to investigate the moderation effect the interaction term of both variables was entered as next step in the HLMR. No effect on aggressive behaviour was found for the interaction between impulse control and aggressive response generation (see Table 2).



**Figure 1** Effects of low impulse control and aggressive response generation on aggressive behaviour. \* Effect after controlling for aggressive response generation.

This means that impulse control was not found to have a moderating effect on the relation between aggressive response generation and aggressive behaviour.

Regarding the third research question, to study the mediation effect, first the correlations between the three variables were studied as a prerequisite (Baron & Kenny 1986). The results show that aggressive behaviour was related to aggressive response generation ( $r = 0.23$ ;  $p = 0.01$ ), and to impulse control ( $r = 0.38$ ,  $p < 0.001$ ), and, as mentioned before, that aggressive response generation was related to impulse control ( $r = 0.17$ ;  $p = 0.05$ ).

Next, the second series of analyses show that a significant amount of the variance in aggressive behaviour and in aggressive response generation was explained by impulse control (see Fig. 1). Further, as was mentioned before, a significant amount of variance in aggressive behaviour can be explained by aggressive response generation (see Table 2 and Fig. 1). Moreover, the effect of impulse control on aggressive behaviour ( $\beta = 0.38$ ,  $p < 0.001$ ) decreases after controlling for aggressive response generation ( $\beta = 0.35$ ;  $p < 0.001$ ) (see Fig. 1), albeit minimal. Sobel test shows, however, that the decrease in the effect does not significantly differ from 0 ( $z = 1.35$ ,  $p = 0.18$ ). Thus, the relation between impulse control and aggressive behaviour is not mediated by aggressive response generation.

## Discussion

This study examined the interactive effects of both impulse control and aggressive response generation in children with MID or BI. We examined whether

(1) impulse control and aggressive response generation both have unique effects on aggressive behaviour; (2) impulse control has a moderating effect on the relation between aggressive response generation and aggressive behaviour; and whether (3) aggressive response generation mediates the effect between impulse control and aggressive behaviour. The results show that both impulse control and aggressive response generation have unique effects on aggressive behaviour. This is line with the findings of Waldman (1996), who has found aggressive response generation to have an effect on aggression over and above low impulse control. No moderating effect of impulse control and no mediating effect of aggressive response generation have been found.

Thus, both a lack of impulse control and aggressive response generation are important characteristics of children with MID/BI with aggressive behaviour problems. There seem to be two separate processes involved in aggressive behaviour by these children. Children are either impulsive and directly behaving aggressively, or they can think of only one aggressive response, which they will execute. In this sample low impulse control has the most effect on aggressive behaviour. Nevertheless, aggressive response generation is an important factor as well. Children have a higher risk of behaving aggressively, when both having difficulties controlling their impulses, and generating aggressive responses. Note, however, that we did not demonstrate causal relations between these factors. To examine causal effects of these factors experimental designs are needed (cf. Orobio de Castro *et al.* 2003).

Almost all participants had rather high impulsivity scores. Even though the scores on the low impulse control scale were normally distributed, the mean score of the clinical sample was higher than for example a group of Dutch children in special education (Van Lier *et al.* 1992). Thus, the absence of a moderator effect for impulse control may be partly due to restriction of range on this variable. Perhaps the relations between social problem solving and aggressive behaviour are different for children with better impulse control, because their responses to social cues are less impulse-driven and more reflection-driven. To examine this issue, future research should include children with a broader range of impulsivity.

Furthermore, this study only included children with MID/BI in residential settings at the ages of 10 to 14 years old, so the findings cannot be generalised to other age groups or to children in community setting. In addition, no information was available on medication use of the children, although the use of medication may have influenced impulse control and response generation.

This is the first study to examine the combined relation of impulse control and social problem solving strategies with aggressive behaviour in children with MID. Having found important roles for impulse control and aggressive response generation, future research should further examine the nature of relations between low impulse control and social problem solving. In this study we have measured impulse control indirectly by asking direct care staff. Future research should include direct measures of impulse control, e.g. tasks of inhibition which assess related executive functions. Ideally, such measures should be taken in the context of social problem solving tasks or even actual social conflicts (cf. Van Nieuwenhuijzen *et al.* 2005). Furthermore, SIP involves more processes than aggressive response generation, such as encoding and interpretation of information. Although previous studies indicated aggressive response generation to be the most important predictor of aggressive behaviour in children with MID (Van Nieuwenhuijzen *et al.* 2006), other SIP processes may be related to impulse control as well. Future research should examine these relations.

Obviously, the child characteristics examined here are by no means the only factors involved in aggressive behaviour. Combinations of multiple factors, including – but not limited to – parenting and peer relations are also important to consider. The present study was not intended to be exhaustive in this respect. We did try to partly explain aggressive behaviour by focusing on proximal child factors. It may be very interesting for future research to examine whether the relations between distal factors, such as parenting, and aggressive behaviour, are mediated by the proximal factors examined here. Evidence for such mediation has been found in children with average intellectual functioning (Dodge 2006).

These present findings have practical implications as well. As aggressive response generation is directly

related to aggressive behaviour regardless the level of impulse control, children with MID/BI should be trained in generating other responses. However, if future research confirms the finding that low impulse control is the most important predictor in aggressive behaviour, one has to wonder whether training generation of responses is effective for every child. Effect studies of social problem solving training should include impulse control as a moderator to be able to indicate whether all children with MID/BI profit from training response generation.

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