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Social information processing, normative beliefs about aggression and parenting in children with mild intellectual disabilities and aggressive behavior

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ABSTRACT

Background: High levels of aggressive behavior in children with mild intellectual disabilities to borderline intellectual functioning (MID-BIF) are associated with deviant social information processing (SIP) steps. The current study investigated deviant SIP as a mediating mechanism linking both children's normative beliefs about aggression and parenting to aggressive behavior in children with MID-BIF. Additionally, the mediating role of normative beliefs about aggression in linking parenting and deviant SIP was investigated.

Methods: 140 children with MID-BIF in community care in the Netherlands, their parent(s) or caretaker(s), and their teacher participated in this cross-sectional study. Structural equation modeling was performed to test mediations. Models were run separately for parent and teacher reports of aggression, and included three deviant SIP steps (interpretation, response generation, response selection).

Results: A total indirect effect through deviant SIP steps was found from normative beliefs about aggression to teacher-reported aggression, but not to parent-reported aggression. An indirect effect was found from positive parenting through normative beliefs about aggression to deviant SIP.

Conclusion: The results of this study suggest that, next to deviant SIP and parenting, normative beliefs about aggression may be a relevant intervention target for children with MID-BIF and aggressive behavior.

What this paper adds?

1. It analyses multiple deviant SIP steps simultaneously in one model, while also incorporating factors from both a contextual (i.e., parenting) and a proximal (i.e., normative beliefs about aggression) level;

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2. It provides evidence for deviant SIP as a mediating mechanism linking normative beliefs about aggression to teacher-reported aggression, and for normative beliefs about aggression linking positive parenting to both aggressive response generation and selection;
3. Thereby, it highlights the importance of incorporating normative beliefs about aggression as an intervention target for children with MID-BIF.

Data Availability

Data will be made available on request.

1. Introduction

Understanding the development of aggressive behavior is especially important in children with mild intellectual disabilities to borderline intellectual functioning (MID-BIF), who have impairments in intellectual and adaptive functioning (Schalock et al., 2010). In comparison to children without MID-BIF, children with MID-BIF have more persistent behavior problems (Emerson et al., 2011), and both higher levels and incidence of aggressive behavior (Dekker et al., 2002). In addition, aggressive behavior in children with MID-BIF is associated with limited opportunities for later employment and independent living (Lowe et al., 2007), a higher caregiver burden (Unwin & Debb, 2001), and high societal costs (Knapp et al., 2005).

One well-substantiated model in explaining aggressive behavior is the social information processing (SIP) model of Crick and Dodge (1994). This model proposes that social behavior is preceded by five mental steps. During social situations, individuals (1) encode social cues, (2) interpret intent and emotions of self and others, (3) set goals for their own behavior, (4) generate possible responses, and (5) make a response decision by first evaluating the response options, considering one's self-efficacy in the enactment of the responses, and selecting a response (Crick & Dodge, 1994; Dodge & Pettit, 2003), which they then enact. Though the SIP steps are seen as sequential, SIP has a circular structure as individuals can be engaged in multiple SIP steps simultaneously (Crick & Dodge, 1994). Importantly, several studies show that children with more deviant biases in their SIP steps are more likely to show aggressive behavior (e.g., Dodge et al., 2015).

For children with MID-BIF, several studies have substantiated the association between SIP steps and aggressive behavior (Schuiringa, 2014; Van Nieuwenhuijzen et al., 2006, 2009, 2011; Van Rest et al., 2019a). In addition, some of these studies also showed that children with MID-BIF tend to have several biases in their SIP compared to children without MID-BIF: Children with MID-BIF interpret social situations as more hostile (step 2; Van Nieuwenhuijzen et al., 2011; Van Rest et al., 2019a, 2020) and they generate more aggressive responses (step 4; Van Nieuwenhuijzen et al., 2011). Studies that investigated whether children with MID-BIF who make more deviant response decisions (step 5) show more aggressive behavior yielded mixed results (i.e., Van Nieuwenhuijzen et al., 2006; Van Rest et al., 2019a, 2020).

Although it is well-established that children with MID-BIF tend to have deviant SIP steps, there is little knowledge on *why* these children have deviant SIP steps. From a theoretical perspective, the SIP model proposes that both contextual and proximal factors precede SIP, and that SIP is a central mediating mechanism in explaining aggressive behavior and its associations with these contextual and proximal factors (i.e., Crick & Dodge, 1994; Dodge & Pettit, 2003). Indeed, studies in samples without MID-BIF support these hypotheses (e.g., Calvete & Orue, 2012; Crosswhite & Kerpelman, 2009; Pettit et al., 2010). However, these findings cannot simply be generalized to children with MID-BIF, as previous studies have shown SIP to be different (i.e., more deviant) for children with MID-BIF than for children without MID-BIF (Van Nieuwenhuijzen et al., 2011; Van Rest et al., 2019a, 2020). Consequently, it could be that associations of SIP with proximal and contextual factors also differ between children with and without MID-BIF.

Therefore, extending our knowledge on the role of SIP and consequent aggressive behavior in children with MID-BIF is important. If we know what explains the deviant SIP steps and aggressive behavior of children with MID-BIF, we can target these preceding factors in order to prevent or reduce their aggressive behavior. Therefore, the current study will investigate an integrated SIP model in children with MID-BIF. It will be investigated whether deviant SIP steps act as a mediating mechanism in linking both proximal and contextual factors to aggressive behavior in children with MID-BIF.

1.1. SIP as a mediating mechanism

On the proximal level, the SIP model proposes that hostile social schemas affect children's SIP and in turn their aggressive behavior (Crick & Dodge, 1994). Dodge (2006) hypothesized that social schemas continuously influence SIP by providing a "lens" through which new social information is processed. Huesmann and Guerra (1997) hypothesized three ways in which normative beliefs affect children's aggressive behavior. First, normative beliefs may affect the way in which children perceive or interpret the behaviors of others; the more children approve of aggression, the more likely they may be to perceive hostility in others, even if no hostility is present (step 2 in the SIP model). Second, normative beliefs in support of aggression may cue the retrieval of aggressive scripts for social behavior; in other words, they may help generating aggressive solutions to social problems (step 4). Finally, if normative beliefs act as filters to eliminate "inappropriate" behaviors from children's repertoires, children with normative beliefs in support of aggression are less likely to reject aggressive solutions once they have thought of them as solutions to social problems. Thus, normative beliefs may play a role in the evaluation step of SIP (step 5). The three hypotheses by Huesmann and Guerra (1997) were confirmed in a

longitudinal study by Zelli et al. (1999) in children without MID-BIF. In addition, it is well-established that the association between normative beliefs about aggression and aggressive behavior is (partly) explained by deviant SIP steps (i.e., Calvete & Orue, 2010, 2012; Orue et al., 2019). However, in children with MID-BIF, only one study has investigated these associations (Van Nieuwenhuijzen et al., 2006). The study found that aggressive response generation mediated the association between normative beliefs about aggression and aggressive behavior.

On the contextual level, the SIP model proposes that parenting affects children's SIP and in turn their aggressive behavior (Dodge, 2006). Especially more negative parenting (e.g., harshness and inconsistency) and less positive parenting (e.g., warmth and support) may predict deviant SIP steps in children (Dodge, 2006). By observing negative parenting, children learn that others often act with hostile intent and in a hostile manner (Dodge et al., 1990), and are prone to develop deviant SIP. Alternatively, a lack of exposure to positive parenting may lead to deviant SIP as it deprives children from a model showing benign attributions and behavior. Indeed, more negative and less positive parenting appear to be associated with deviant SIP in children without MID-BIF (i.e., Goraya & Kazim, 2013). Further, in children without MID-BIF, deviant SIP is a well-substantiated mediator of the association between parenting and aggressive behavior (for a review, see Crosswhite & Kerpelman, 2009). However, to our knowledge, no studies on this topic have been conducted in children with MID-BIF.

1.2. Normative beliefs about aggression as a mediating mechanism

Parenting may have an additional role within the process of SIP. It may not only affect children's SIP and in turn their aggressive behavior, it may also influence the child's normative beliefs about aggression and in turn their SIP (Dodge, 2006; Huesmann & Guerra, 1997). In general, social schemas are a function of early life experiences (Dodge, 2006). Normative beliefs about aggression are initially acquired through observational learning and conditioning (Huesmann, 2018). As parents pose as the main social model for children through their parenting behavior (Bandura, 1973), parenting is expected to influence the formation of normative beliefs about aggression. Specifically, positive parenting, such as warmth and parental modeling of benign attributions, is proposed to foster benign schemas (Dodge, 2006) and teach children that aggression is not an acceptable strategy to solve social problems (Dodge et al., 1990; Huesmann, 2018). In contrast, negative parenting, such as physical abuse and parental modeling of hostile attributions, is proposed to foster hostile schemas and set children up to develop beliefs about aggression as an acceptable response to social problems (Dodge, 2006). Thus, the SIP model proposes that normative beliefs about aggression mediate the association between parenting and SIP. However, to our knowledge, no studies have investigated the indirect association between parenting and SIP through children's normative beliefs about aggression in children with or without MID-BIF.

1.3. The present study: investigating an integrated SIP model in children with MID-BIF

The present study investigates an integrated SIP model (see Fig. 1) in children with MID-BIF that incorporates the three proposed mediations of the SIP model described above. The study has the following hypotheses based on the extended SIP model (Dodge, 2006): In children with MID-BIF in community care, (1) deviant SIP has a mediating role in the association between normative beliefs about aggression and aggressive behavior; (2) deviant SIP has a mediating role in the association between parenting and aggressive behavior; and (3) normative beliefs about aggression has a mediating role in the association between parenting and deviant SIP (see Fig. 1). Herein, it is expected that positive parenting is negatively associated with other variables, whereas negative parenting, normative beliefs about aggression, deviant SIP and aggressive behavior are positively associated. Investigating these factors will provide us with important information, as both parenting and normative beliefs about aggression can be altered through intervention (Dodge, 2006). Therefore, these factors could serve as intervention targets for interventions aiming to prevent or reduce aggressive behavior in

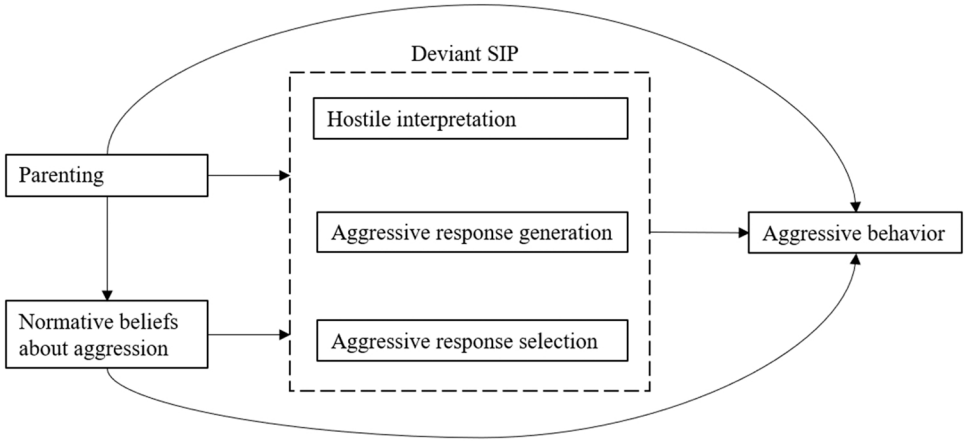

Fig. 1. Studied Model of Parenting, Normative Beliefs about Aggression, Deviant Social Information Processing, and Aggressive Behavior in Children with MID-BIF.

children with MID-BIF.

2. Method

2.1. Participants

In total, 152 children with MID-BIF aged 9–17, their parent(s) or caretaker(s), and teachers participated in this cross-sectional study. We used data from a previous study investigating externalizing behavior in children with MID-BIF (see Schuiringa et al., 2017).

Participants were excluded from analyses if all data from the parenting questionnaire was missing ($n = 11$), or if no other data than the parenting questionnaire was available ($n = 1$), since parenting was an exogenous variable in the structural equation models. Participants were deleted listwise, since Little's test indicated that data was missing at random ($p = .271$). This resulted in a final sample size of 140 participants. Children had a mean age of 12.34 years ($SD = 2.05$), and a mean estimated IQ-score of 71 ($SD = 7.77$), ranging from 56 to 85. Characteristics of the final sample are displayed in Table 1. Children with MID (IQ 55–70; $n = 66$) and children with BIF (IQ 70–85; $n = 72$) did not differ significantly on study variables, indicating that children with MID-BIF could indeed be seen as one group for current analyses.

2.2. Procedure

Both children with and without externalizing behavior were included in the study to ensure sufficient distribution of aggression scores. Children with externalizing behavior were recruited from 12 special day care treatment centers in the Netherlands, where the children were receiving treatment for their externalizing behavior. Families meeting the inclusion criteria were approached for participation. At each center, three to five families were included in the study using a convenience sampling method. Children were included when they scored above the 90th percentile on one or both of the subscales Aggression and Rule-Breaking from the Child Behavior Check List (CBCL), which was completed by either the child's parent(s) or day care staff. Children without externalizing behavior were recruited from five schools for special education. Children were included if they scored below the 90th percentile on both the Aggression and Rule-Breaking subscales from the Teacher Report Form (TRF). Additional inclusion criteria were an estimated IQ-score between 55 and 85, fluency in the Dutch language, and child residency with parents or caretakers. Exclusion criteria were child active psychosis, severe hearing problems, visual impairment, or an autism spectrum disorder. Since aggressive behavior was viewed as a continuum, both children with and without externalizing behavior were taken together in the analyses.

The Ethics Committee of Utrecht University approved the present study. Each family provided written informed consent. Child measures were individually administered in a separate room at school by a trained test assistant. Parent measures were administered by a research assistant during a home visit or over telephone. Research assistants were provided with a guideline including explanations and synonyms of difficult words, ensuring clear and unambiguous explanations of questionnaire items. When possible, both parents or caretakes participated in the study and collectively completed one set of questionnaires. Otherwise, the main caretaker was asked to complete the questionnaires. Teacher measures were obtained by e-mail.

2.3. Measures

2.3.1. Normative beliefs about aggression

The Dutch translation of the Normative Beliefs About Aggression Scale (NOBAGS; Huesmann & Guerra, 1997) was used to assess whether children think of aggression as an appropriate response in social situations. The questionnaire consists of 20 items, with answers ranging from 1 (*it's really wrong*) to 4 (*it's perfectly OK*). A mean score was calculated, where a higher score indicated more deviant normative beliefs about aggression (i.e., aggression is viewed as an acceptable response in social situations). The NOBAGS total scale has been found to have good reliability ($\alpha = .86$; Huesmann & Guerra, 1997, $\alpha = .88$ for the present sample).

2.3.2. Positive and negative parenting

Positive parenting was measured using parent report on a combination of subscales from the Dutch translation of the Alabama Parenting Questionnaire (APQ; Shelton et al., 1996) and the Ghent Parental Behavior Scale (GPBS; Van Leeuwen & Vermulst, 2004).

Table 1
Characteristics of the final sample.

Characteristic	Final sample
Problem-behavior group, *n* (%)	68 (48.6)
Girl, *n* (%)	54 (38.6)
Child born in the Netherlands, *n* (%)	130 (92.9)
Mother born in the Netherlands, *n* (%)	113 (80.7)
Father born in the Netherlands, *n* (%)	101 (72.1)
Educational attainment, *n* (%)	
Primary education	18 (12.8)
Secondary education	64 (45.6)
Vocational or higher education	56 (40.0)

Both the APQ (Shelton et al., 1996) and the GPBS (Van Leeuwen & Vermulst, 2004) have been shown to have acceptable to good reliability and validity. The APQ subscales Involvement (10 items; α = .67), Positive Parenting Practices (5 items; α = .65), and Monitoring (9 items; α = .63), and the GPBS subscale Rules were included (7 items; α = .84). Items were rated on a 5-point Likert scale ranging from 0 (*never*) to 4 (*always*). Item five from the subscale Involvement (i.e., "You help your child with his/her homework") was excluded, since most children with MID-BIF do not receive homework from their schools. For the confirmatory factor analysis (CFA; see Section 2.4), all subscales except for the subscale Monitoring were reverse coded, so that a higher mean score indicated less positive parenting. In case of a 2-factor model, to ensure easy interpretation, the factor score of positive parenting was reverse coded for the mediation analyses. Then, a higher score indicated more positive parenting.

Negative parenting was measured using parent report on the GPBS subscales Inconsistent Discipline (three items; α = .64) and Harsh Discipline (four items, α = .58), and the APQ subscale Harsh Discipline (four items; α = .62). For all subscales, a higher mean score indicated more negative parenting.

A CFA was performed to investigate whether the subscales from the APQ and GPBS represented parenting as a 1-factor model, or as a 2-factor model differentiating positive and negative parenting (see Section 2.4 for an explanation on the interpretation of model fit indices). The 1-factor model of parenting showed poor fit to the data, CFI = .42, TLI = .13, RMSEA = .23 [.194,.271], SRMR = .12. The 2-factor model yielded a warning, indicating that the residual variance of Harsh Discipline APQ was not positive definite. An adjusted 2-factor model was specified with this residual variance constrained to zero, since the coefficient was small and non-significant, $p = .614$. The adjusted 2-factor model showed acceptable fit to the data, CFI = .95, TLI = .92, RMSEA = .07 [.006,.118], SRMR = .06. The adjusted 2-factor model showed substantial better fit than the 1-factor model, and could thus be preferred, ΔAIC = 74.337, ΔBIC = 74.338, ΔCFI = .525, ΔRMSEA = .161. All factor loadings of the adjusted 2-factor model were significant (see Table 2). Additionally, there was a significant covariance between the latent variables of positive parenting and negative parenting, β = .27, $p = .035$. Subsequent analyses were performed separately for negative parenting and reversed positive parenting factor mean scores.

2.3.3. Deviant SIP

Deviant SIP steps were assessed using the Social Problem Solving Test revised for children with MID (SPT-MID; see Van Nieuwenhuijzen et al., 2001). The SPT-MID consists of five hypothetical, video-taped vignettes, where a social problem is presented. After viewing each vignette, the interviewer poses several questions assessing deviant SIP steps. The question assessing interpretation was: "[Event] happened, did it happen on purpose or by accident?" Responses were coded 1 (*on purpose*), 2 (*by accident*), or 3 (*cannot choose*). The question assessing response generation was: "If [event] happened to you, what would you do?" The first response was coded 1 (*assertive*), 2 (*aggressive*), 3 (*submissive*), 4 (*an emotion*), or 5 (*authority*). Next, three solutions to the social problem were shown on video: an assertive response, an aggressive response, and a submissive response. The question assessing response selection was: "Which way of responding do you find best?" Responses were coded 1 (*assertive*), 2 (*aggressive*), or 3 (*submissive*).

For all three SIP steps, a variable was computed for each vignette indicating whether the child had a hostile interpretation (i.e., response coded as 1 = *on purpose*), an aggressive generation or an aggressive response selection or not. Mean scores were calculated over the five variables for each SIP step, ranging from 0 to 1. Higher scores indicated a more deviant SIP step.

2.3.4. Aggressive behavior

Aggressive behavior was measured using parent report on the CBCL subscale Aggression (18 items; α = .87; Achenbach & Rescorla, 2001), and teacher report on the TRF subscale Aggression (20 items; α = .96; Achenbach & Rescorla, 2001). The Dutch versions of the CBCL (Verhulst et al., 1996) and TRF (Verhulst et al., 1997) have been shown to have good validity and reliability for children with MID-BIF (Dekker et al., 2002). Items on both subscales were rated on a 3-point Likert scale ranging from 0 (*not true*) to 2 (*very true or often true*).

2.3.5. Intelligence

Child intelligence was estimated using the subtests Vocabulary and Block Design from the Dutch version of the Wechsler Intelligence Scale (WISC-III; Kort et al., 2005; Silverstein, 1970a). These two subtests together correlate more strongly ($r = .86$) with the complete WISC-III than any other WISC-III short form, thus providing an accurate estimate of children's IQ-score (Silverstein, 1970b).

Table 2
Factor loadings of adjusted 2-factor model of positive and negative parenting.

	Subscale	*b*	*SE*	β	R-square
Positive Parenting	Involvement	1.00	.00	.71	.51 **
	Positive Parenting Practices	1.34 **	.24	.82	.66 **
	Rules	0.73 **	.15	.51	.26 **
	Monitoring	0.29 **	.10	.28	.08
Negative Parenting	Inconsistent Discipline	1.00	.00	.30	.09 *
	Harsh Parenting GPBS	0.71 **	.24	.63	.39 **
	Harsh Parenting APQ	1.83 **	.46	1.00	1.00

Note. GPBS = Ghent Parental Behavior Scale; APQ = Alabama Parenting Questionnaire.
* $p < .05$. ** $p < .01$

2.4. Statistical analyses

Data were analyzed with a significance level of .05 using IBM SPSS Statistics (Version 25) and Mplus (Version 8.5). In SPSS, participant's mean subscale scores were calculated when a maximum of 10 % of items was missing. Assumption checks indicated that the subscale Rules and both Harsh Parenting subscales had skewed distributions. Eight univariate outliers were detected. These were kept in the dataset, but analyses were reran on a dataset excluding outliers to test result robustness.

For the main analyses, structural equation modeling was performed in Mplus. Full interval maximum likelihood (FIML) was used to handle missing data, and a maximum likelihood estimation with robust standard errors (MLR) was used to account for non-normally distributed data. Model fit was investigated using the comparative fit index (CFI) and the Tucker-Lewis index (TLI; both >.90 acceptable fit, >.95 good fit), the root-mean-squared error of approximation (RMSEA) with 90 % confidence interval (CI), and the standardized root-mean-square residual (SRMR; both <.08 acceptable fit, <.05 good fit; Geiser, 2013). Non-nested models were compared using the Akaike information criterion (AIC) and Bayesian information criterion (BIC) index, ΔCFI, and ΔRMSEA, where a better model fit was indicated by lower AIC and BIC values, a ΔCFI of.010 and a ΔRMSEA of.015 (Chen, 2007). Factor loadings and proportion of explained variance were investigated and effect sizes were interpreted based on Cohen (1992).

The hypothesized path model (see Fig. 1) was tested. Separate models were constructed for parent-reported and teacher-reported aggressive behavior, since it can be expected that different behavior is displayed in school versus home situations (Achenbach et al., 1987). Investigating both reporters separately is preferred over aggregating them, in order to identify cross-situation differences in the expression of aggressive behavior (Little et al., 2003). Therefore, in total, four separate models were constructed, which included: (1) parent-reported aggressive behavior and positive parenting, (2) teacher-reported aggressive behavior and positive parenting, (3) parent-reported aggressive behavior and negative parenting, and (4) teacher-reported aggressive behavior and negative parenting. First, model fit was assessed to ensure sufficient fit to the data to robustly test the hypothesized mediations. Second, the hypothesized mediations were investigated by testing indirect effects using the 95 % bootstrapped CIs with 5000 bootstrap samples and a Maximum Likelihood (ML) estimator, as this method is preferred over MLR for small samples (Cheung & Lau, 2008). Since our sample was relatively small for our hypothesized model (Kline, 2015), we tested result robustness by specifying simpler models including less variables, and by investigating direct paths using ML and bootstrapping as well.

3. Results

3.1. Descriptive statistics

Descriptives and correlations for parenting subscales are depicted in Table 3, and for the variables included in the path models in Table 4. Correlations were in the expected direction, but not all were significant. Notably, positive parenting correlated significantly with parent-reported aggressive behavior, but not with teacher-reported aggressive behavior. Hostile interpretation did not correlate significantly with any variable. Further, parent-reported aggressive behavior, teacher-reported aggressive behavior, and aggressive response generation and selection were negatively correlated with positive parenting, and positively correlated with all other variables, although not always significantly. Normative beliefs about aggression were negatively correlated with positive parenting and both aggressive response generation and selection, but not significantly correlated with negative parenting.

3.2. Model fit

The four mediation models showed acceptable to good fit to the data (parent-reported aggressive behavior and positive parenting: CFI =.99, TLI =.91, RMSEA =.06 [.000,.240], SRMR =.02; parent-reported aggressive behavior and negative parenting: CFI = 1.00, TLI =.92, RMSEA =.05 [.000,.237], SRMR =.02; teacher-reported aggressive behavior and positive parenting: CFI =.99, TLI =.90, RMSEA =.05 [.000,.238], SRMR =.02; teacher-reported aggressive behavior and negative parenting: CFI = 1.00, TLI =.93, RMSEA =.05 [.000,.236], SRMR =.02). Path coefficients of the models can be found in Table 5. Direct path coefficients were mostly similar for

Table 3
Descriptive statistics and correlations for parenting subscales.

	1	2	3	4	5	6	7
1. Involvement	-						
2. Positive parenting practices	.59 **	-					
3. Rules	.32 **	.44 *	-				
4. Monitoring	.21 *	.19 *	.18 *	-			
5. Inconsistent discipline	-.22 *	-.12	-.02	-.03	-		
6. Harsh discipline GPBS	-.12	.00	-.16	-.22 **	.17 *	-	
7. Harsh discipline APQ	-.25 **	-.17 *	-.12	-.21 *	.30 *	.63 *	-
n	140	140	140	140	140	140	140
M	2.63	3.00	3.49	3.49	1.73	0.12	0.52
SD	.59	.69	.60	.44	.93	.32	.51

Note. GPBS = Ghent Parental Behavior Scale; APQ = Alabama Parenting Questionnaire.
* $p < .05$. ** $p < .01$

Table 4
Descriptive statistics and correlations for study variables.

	1	2	3	4	5	6	7	8
1. Positive parenting	-							
2. Negative parenting	-.31 **	-						
3. Normative beliefs	-.18 *	.05	-					
4. Interpretation	.03	.02	-.12	-				
5. Generation	-.12	.10	.30 **	.14	-			
6. Selection	-.05	.03	.38 **	.11	.44 **	-		
7. CBCL	-.25 **	.30 **	.03	.15	.21 *	.20 *	-	
8. TRF	-.18	.33 **	.05	-.01	.24 **	.14	.43 **	-
n	140	140	138	137	137	135	137	125
M	0.00	-0.00	1.86	0.65	0.23	0.21	0.48	0.38
SD	.37	.28	.37	.21	.23	.24	.34	.48

Note. Normative beliefs = normative beliefs about aggression; Interpretation = hostile interpretation; Generation = aggressive response generation; Selection = aggressive response selection; CBCL = Child Behavior Checklist; TRF = Teacher Report Form.
*$p < .05$. * * $p < .01$

Table 5
Model estimates of mediation models.

Association		CBCL				TRF			
		b	*SE*	*p*	β	*b*	*SE*	*p*	β
Positive parenting									
Positive parenting →	Aggression	**-.22**	**.07**	**.001**	**-.24**	-.20	.12	.100	-.16
	Interpretation	.01	.05	.859	.02	.01	.05	.882	.01
	Generation	-.04	.06	.450	-.07	-.04	.06	.454	-.07
	Selection	.02	.05	.615	.04	.02	.05	.617	.04
	Normative beliefs	**-.18**	**.09**	**.039**	**-.18**	**-.18**	**.09**	**.038**	**-.18**
Normative beliefs →	Aggression	-.09	.08	.256	-.10	-.11	.14	.461	-.08
	Interpretation	-.06	.04	.158	-.12	-.06	.04	.153	-.12
	Generation	**.19**	**.05**	**.000**	**.31**	**.19**	**.05**	**.000**	**.31**
	Selection	**.18**	**.06**	**.001**	**.28**	**.18**	**.06**	**.001**	**.28**
Interpretation →	Generation	**.21**	**.10**	**.044**	**.18**	**.21**	**.10**	**.045**	**.18**
Generation →	Selection	**.37**	**.08**	**.000**	**.36**	**.37**	**.08**	**.000**	**.36**
Interpretation →	Aggression	.18	.13	.165	.11	-.12	.23	.618	-.05
Generation →	Aggression	.20	.13	.144	.13	.46	.256	.070	.22
Selection →	Aggression	.22	.15	.138	.15	.17	.22	.434	.08
Negative parenting									
Negative parenting →	Aggression	**.35**	**.09**	**.000**	**.29**	**.54**	**.15**	**.000**	**.31**
	Interpretation	.02	.07	.783	.03	.02	.06	.794	.02
	Generation	.08	.06	.176	.09	.08	.06	.173	.09
	Selection	-.00	.07	.990	-.00	-.00	.07	.986	-.00
	Normative beliefs	.05	.12	.642	.04	.05	.12	.643	.04
Normative beliefs →	Aggression	-.05	.08	.480	-.06	-.06	.15	.657	-.05
	Interpretation	-.06	.04	.137	-.12	-.07	.07	.794	-.12
	Generation	**.20**	**.05**	**.000**	**.32**	**.20**	**.05**	**.000**	**.32**
	Selection	**.18**	**.06**	**.001**	**.28**	**.18**	**.06**	**.001**	**.28**
Interpretation →	Generation	**.20**	**.10**	**.048**	**.18**	**.20**	**.10**	**.048**	**.18**
Generation →	Selection	**.37**	**.08**	**.000**	**.36**	**.37**	**.08**	**.000**	**.36**
Interpretation →	Aggression	.17	.12	.169	.10	-.14	.22	.521	-.06
Generation →	Aggression	.19	.13	.136	.13	.44	.24	.061	.21
Selection →	Aggression	.19	.15	.215	.13	.14	.21	.515	.07

Note. Significant estimates are in bold. CBCL = Child Behavior Checklist; TRF = Teacher Report Form; Interpretation = hostile interpretation; Generation = aggressive response generation; Selection = aggressive response selection; Normative beliefs = normative beliefs about aggression. For positive parenting: $R^2_{CBCL} = .128$, $p = .02$; $R^2_{TRF} = .091$, $p = 11$. For negative parenting: $R^2_{CBCL} = .15$, $p = .006$; $R^2_{TRF} = .17$, $p = .016$.

the four models. However, whereas positive parenting was positively associated with parent-reported aggressive behavior, it was not associated with teacher-reported aggressive behavior. Robustness checks indicated that models excluding outliers and models using bootstrapped ML yielded similar results. As all four models showed acceptable to good model fit to the data, the three hypotheses were tested. Significant direct paths for the mediation models are combinedly depicted for parent-reported aggressive behavior in Fig. 2, and for teacher-reported aggressive behavior in Fig. 3. Parameter estimates and 95 % CIs for significant indirect effects can be found in Table 6.

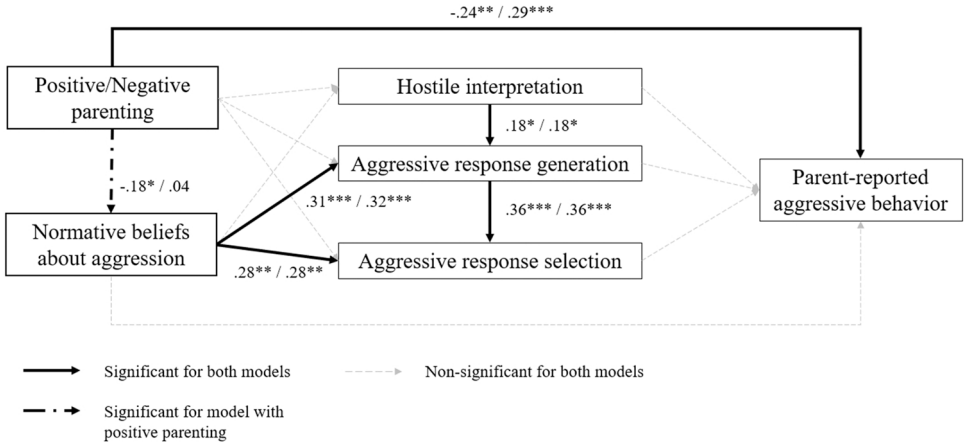

Fig. 2. Combined Results of Direct Associations in Models with Positive and Negative Parenting and Parent-Reported Aggressive Behavior.Note. Coefficients presented are Betas. *$p < .05$, **p < .01, *** $p < .001$.

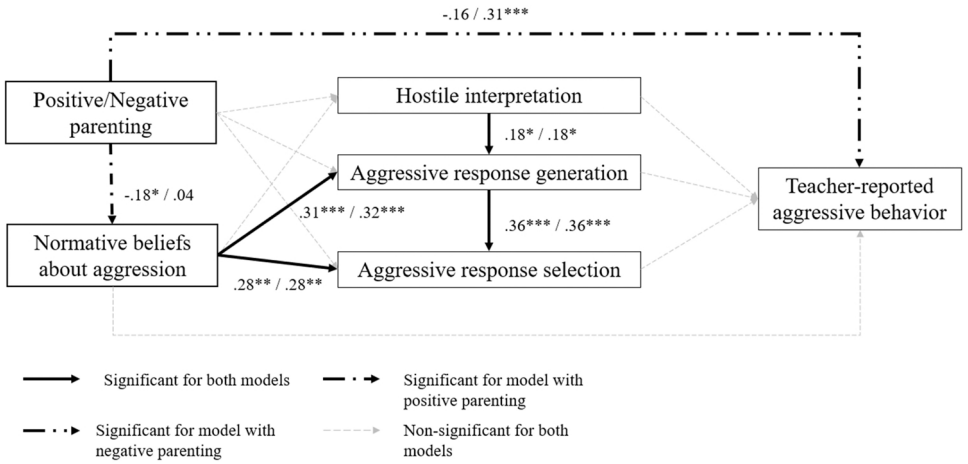

Fig. 3. Combined Results of Direct Associations in Models with Positive and Negative Parenting and Teacher-Reported Aggressive Behavior.Note. Coefficients presented are Betas. * $p < .05$; **p < .01; *** $p < .001$.

Table 6
Significant indirect effects for tested mediation models.

Mediation	95 % CI	*b*	*SE*	β	95 % CI	*b*	*SE*	β
	CBCL model				TRF model			
Total: Positive parenting → Selection	-.032, −.001	-.06	.03	-.09	-.33, −.001	-.06	.06	-.09
Specific: Positive parenting → Normative beliefs → Selection	-.079, −.001	-.03	.02	-.05	-.080, −.001	-.03	.02	-.05
Specific: Positive parenting → Normative beliefs → Generation → Selection	-.031, −.001	-.01	.01	-.02	-.031, −.001	-.01	.02	-.02
Specific: Positive parenting → Normative beliefs → Generation	-.077, −.001	-.04	.02	-.06	-.078, −.002	-.04	.02	-.06
	Positive parenting model				Negative parenting model			
Total: Normative beliefs → TRF	.010,.261	.13	.07	.10	.007,.253	.12	.06	.10

Note. CBCL = Child Behavior Checklist; TRF = Teacher Report Form; Generation = aggressive response generation; Selection = aggressive response selection; Normative beliefs = normative beliefs about aggression. Total indicates a significant total indirect effect; Specific indicates a significant specific indirect effect.

3.3. Mediation analyses

3.3.1. Research question 1: SIP as a mediating mechanism linking normative beliefs about aggression and aggressive behavior

First, in the two models including teacher-reported aggressive behavior, a significant total indirect effect of small to medium size

from normative beliefs about aggression to aggressive behavior was found (see Table 6). Second, in the two models including parent-reported aggression, the indirect effects from normative beliefs about aggression to aggressive behavior through SIP were non-significant. These results show SIP to mediate the association of normative beliefs about aggression with teacher-reported aggressive behavior, but not with parent-reported aggressive behavior.

3.3.2. Research question 2: SIP as a mediating mechanism linking parenting and aggressive behavior

In all four models, the indirect effects from parenting to aggressive behavior through SIP were non-significant. These results show SIP not to mediate the association of parenting with aggressive behavior.

3.3.3. Research question 3: Normative beliefs about aggression as a mediating mechanism linking parenting and SIP

In the two models including negative parenting, the indirect effects from negative parenting to SIP through normative beliefs about aggression were non-significant. In contrast, in the two models including positive parenting, several significant indirect effects were found. First, several significant indirect effects were found from positive parenting, to normative beliefs about aggression, to aggressive response generation (see Table 6). These results indicated that normative beliefs about aggression mediated the association between positive parenting and aggressive response generation: Less positive parenting was associated with more deviant normative beliefs about aggression (i.e., aggression is viewed as an acceptable response in social situations), which in turn was associated with more aggressive response generation. Second, a significant total indirect effect was found from positive parenting to aggressive response selection. Third, two specific indirect effects were found between positive parenting and aggressive response selection: (1) Through normative beliefs about aggression, and (2) through firstly normative beliefs about aggression and secondly aggressive response generation. These results show normative beliefs about aggression to mediate the association of positive parenting with SIP, but not of negative parenting with SIP.

4. Discussion

The aim of the present study was to investigate whether deviant SIP acts as a mediating mechanism linking positive parenting, negative parenting, and children's normative beliefs about aggression with aggressive behavior in children with MID-BIF within community care. In addition, the aim was to investigate whether children's normative beliefs about aggression mediate the association between parenting and deviant SIP. First, results supported our hypothesis that deviant SIP has a mediating role linking normative beliefs about aggression and teacher-reported aggressive behavior. However, contrary to our hypothesis, deviant SIP did not have a mediating role in linking normative beliefs about aggression and parent-reported aggressive behavior. Second, results did not support our hypothesis that deviant SIP has as a mediating role linking parenting and aggressive behavior. Rather, the association between parenting and aggressive behavior was direct. Third, as expected, normative beliefs about aggression had a mediating role linking positive parenting with both aggressive response generation and selection. In contrast, negative parenting was neither directly nor indirectly associated with normative beliefs about aggression or deviant SIP. Below, the most important findings are discussed.

4.1. Indirect association between normative beliefs about aggression and aggressive behavior: the role of deviant SIP

Results showed that deviant SIP was a mediating mechanism linking normative beliefs about aggression and teacher-reported aggressive behavior. In contrast, our results indicated that deviant SIP did not link normative beliefs about aggression with parent-reported aggressive behavior. In other words, our findings suggest that when children with MID-BIF believe aggressive responses in social situations to be normal, they are more prone to interpret social situations as hostile and to generate and select more aggressive responses, and eventually to exhibit more aggressive behavior at school, but not at home. Additionally, normative beliefs about aggression and deviant SIP did not have direct associations with parent-reported aggressive behavior. An explanation for this lack of findings surrounding parent-reported aggressive behavior could be that the instruments measuring normative beliefs about aggression (NOBAGS; Huesmann & Guerra, 1997) and deviant SIP (SPT-MID; Van Nieuwenhuijzen et al., 2001) mainly assess children's interactions with peers, rather than with parents or other adults. As teachers presumably witness more peer-to-peer interactions than parents do (see Ostrov et al., 2021), the above measures possibly relate more reliably and more consistently to teacher-reported than to parent-reported aggressive behavior.

Our finding of only total indirect effects from normative beliefs about aggression to teacher-reported aggressive behavior, rather than specific indirect effects, suggest that children's normative beliefs about aggression influence SIP as a whole, rather than specific SIP steps. Our results therefore support defining and operationalizing SIP as a circular process (Crick & Dodge, 1994), instead of viewing SIP as consisting of separate, sequential steps. In order to strengthen these findings, future studies should include multiple deviant SIP steps in one statistical model as well and specify all SIP steps as mediators. Most previous studies only included one SIP step (e.g., Schuiringa, 2014; Van Nieuwenhuijzen et al., 2009), or did not specify direct associations from all SIP steps to aggressive behavior, and thereby only included response selection as a mediator (Van Nieuwenhuijzen et al., 2006). This difference in statistical approach could explain why the study of Van Nieuwenhuijzen et al. (2006) found a mediating role for only aggressive response generation in the association between normative beliefs about aggression and aggressive behavior, whereas our study found SIP as a whole to be a mediating mechanism. Nevertheless, it cannot be ruled out that the different results could be due to differences in sample characteristics (i.e., children with MID-BIF in residential versus community care).

The interrelatedness of the deviant SIP steps could also explain why, in contrast to previous studies in children with MID-BIF (e.g., Schuiringa, 2014; Van Nieuwenhuijzen et al., 2009; Van Rest et al., 2020), none of the deviant SIP steps had a direct association with

aggressive behavior. By taking the interrelatedness into account, the deviant SIP steps might have explained part of each other's variance with aggressive behavior. The current study might have captured reality more accurately, but therefore also yielded different results.

4.2. Indirect association between parenting and deviant SIP: the role of normative beliefs about aggression

Second, as expected, our results support an indirect association from positive parenting, through normative beliefs about aggression, to aggressive response generation and selection. In line with the SIP model (Crick & Dodge, 1994, 2006), our findings indicate that when parenting is less positive, children are more prone to think about aggression as being an appropriate response in social situations, and more prone to generate and select aggressive responses in social situations. Positive parenting is expected to influence children's normative beliefs about aggression and SIP both implicitly (e.g., through modeling; Bandura & Walters, 1977) and explicitly (e.g., through attributional messages; Dix, 1993). First, through positive parenting behavior, parents might model benign interpretations and responses to social problems. For instance, by rewarding helpful behavior of children or by solving fights in a prosocial way, parents convey to their children that prosocial behavior is appropriate and desired. A lack of positive parenting deprives children from such a model, making them more prone to develop deviant SIP (Dodge, 2006). Second, a lack of positive parenting might represent a lack of benign attributional messages. When parents do not use benign attributional messages, children can be expected not to make benign attributions (Dix, 1993). Although these exact pathways necessitate further investigation, positive parenting seems to promote children with MID-BIF to obtain non-aggressive social schemas and process social information in a benign (rather than an aggressive) way.

In contrast to positive parenting, negative parenting was not associated with normative beliefs about aggression or deviant SIP neither directly, nor indirectly. Rather, negative parenting was directly associated with aggressive behavior as reported by both parents and teachers. Possibly, the current study does not capture the existing influence of negative parenting on the cognitive processes due to the low scores and low variation in negative parenting in our sample. Whereas negative parenting might have such a prominent influence on aggressive behavior in children with MID-BIF that this was captured despite the low scores and variation, its influence on cognitive processes could be more subtle.

4.3. Strengths and limitations

The current study had several strengths. First, our study was the first to investigate deviant SIP in children with MID-BIF as a mediating mechanism linking both contextual (i.e., parenting) and proximal (i.e., normative beliefs about aggression) factors with aggressive behavior. Second, we included child, parent, and teacher reports. By distinguishing between parent and teachers reports of aggressive behavior, we provided tentative indications of the situation-dependency of SIP (Dodge & Pettit, 2003). Third, our models included three deviant SIP steps simultaneously. Thereby, we took into account the proposed interrelatedness of SIP steps (Dodge, 2006), and importantly, emphasized the importance of doing so. Lastly, by specifically investigating a sample of children with MID-BIF in community care, we provided relevant insight into an understudied, but vulnerable population.

Despite these strengths, there are some limitations that should be taken into account when interpreting the results. First, due to our relatively small sample size, covariances between positive parenting and negative parenting and between parent-reported and teacher-reported aggression, and possible covariates could not be taken into account in our models. Second, the inclusion criteria were solely based on the estimated IQ-score, despite the fact that the current definition of an intellectual disability by the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; American Psychiatric Association, 2013) also includes impairments in everyday adaptive functioning. We assumed, however, that impairments in adaptive functioning were present in our sample, since participants were recruited through residential treatment centers or schools for special education. Third, the cross-sectional nature of the study prohibited conclusions about causality or directionality of effect (Cheung & Lau, 2008).

4.4. Future directions

In order to provide more conclusive evidence for the SIP model in children with MID- BIF, future research should investigate the current model using longitudinal data. Additionally, future research should try to incorporate a sample with more variation in negative parenting to investigate its associations more reliably. As questionnaires are subject to socially desirable answering (Krumpal, 2013), more objective measures such as observation might help to reflect (negative) parenting more reliably.

To further extend our knowledge on the SIP model and its associates in children with MID-BIF, future studies could incorporate parental normative beliefs about aggression. Parental cognitions about child misbehavior are proposed to influence parenting behavior, and subsequently children's cognitions about misbehavior (Dix, 1993). Despite some evidence for a direct association between parent and child normative beliefs about aggression in children without MID-BIF (e.g., MacBrayer et al., 2003), this proposed mediation, to our knowledge, has not been investigated in children with or without MID-BIF. Additionally, it would be valuable to assess children's normative beliefs about aggression and SIP not only in social situations including peers, but also including parents or other adults. Then, the situation-specificity of SIP (Dodge & Pettit, 2003) can be investigated further.

4.5. Conclusions and implications

In conclusion, our results provide partial evidence for the extended SIP model as depicted by Dodge (2006) in children with

MID-BIF. When children with MID-BIF think of aggression as an acceptable and appropriate response in peer interactions, they are prone to have deviant SIP, and subsequently to act aggressively at school. Additionally, we established again that negative parenting and positive parenting are important associates of aggressive behavior in children with MID-BIF, thereby extending our knowledge to children with MID-BIF in community care. Finally, especially lower positive parenting seems to be associated with normative beliefs about aggression and subsequent deviant SIP.

Our findings have important clinical implications, as they point to parenting, normative beliefs about aggression, and deviant SIP as promising targets for reducing or preventing aggressive behavior in children with MID-BIF. Where existing interventions already focus on parenting and deviant SIP (e.g., Standing Strong Together; Schuiringa et al., 2017), our study highlights the importance of also incorporating normative beliefs about aggression (see also Matthys & Schutter, 2023). Substantiating this conclusion is the Fast Track study, which showed that a multiyear indicated preventive intervention offered at schools, including not only the promotion of children's social-cognitive and social skills but also the improvement of parenting skills and academic mentoring, resulted in a decrease of antisocial behavior (Dodge et al., 2013). This reduction was mediated by its impact on three deviant SIP steps: (1) Reducing hostile-attribution biases, (2) increasing the generation of socially competent responses to social problems, and (3) improving the evaluation of the outcomes of aggression as detrimental (i.e., devaluing aggression as effective and acceptable). This study not only demonstrates that devaluing aggression as effective and acceptable (i.e., a normative belief about aggression) is feasible, but is also a mechanism of change and as such constitutes an important aspect of cognitive-behavioral oriented treatment approaches. Thus, changing normative beliefs about aggression into beliefs in support of prosocial solutions could alter subsequent SIP and social behavior. Including normative beliefs about aggression as a target in interventions, both for children with MID-BIF and their parents, is promising for influencing the SIP and subsequent behavior of these children.

CRediT authorship contribution statement

Marjolein van Cappellen: Conceptualization, Methodology, Formal analysis, Writing – original draft. **Eva Kühl:** Conceptualization, Methodology, Writing – review & editing, Supervision. **Hilde Schuiringa:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing, Funding acquisition, Data curation, Project administration. **Walter Matthys:** Conceptualization, Methodology, Funding acquisition, Supervision, Writing – review & editing. **Maroesjka van Nieuwenhuijzen:** Conceptualization, Methodology, Funding acquisition, Supervision, Writing – review & editing.

Declaration of Competing Interest

None.

Data Availability

Data will be made available on request.

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