

The transactional process between the relationships with caregivers and children's externalizing behavior



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ABSTRACT

Externalizing behavior (EB) has been found to be pervasive in children across different interactional systems. The transactional model is one of the most interesting and plausible mechanisms explaining the development of behavioral problems (Sameroff, 2009). The main goal of the study is to test bidirectional and recursive transactional relations between the quality of the caregiver–child relationship and children's externalizing behavior. The transactional model was tested in three-wave longitudinal cross-lagged models involving 117 children (78.5% boys) aged 4 at the beginning of the study and three caregivers, i.e. their mother, father and teacher. All of the children had been clinically referred for externalizing behavior. The multi-informant three-wave design was an original feature of this research. The results provided no evidence for a transactional process. The results suggest the singularity of each of these three interactional systems. They are discussed from the theoretical viewpoint and in terms of their clinical implications.

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Externalizing behavior (EB) is characterized by arousal, aggression, defiance and impulsiveness. For some children, EB is pervasive across settings and interactional systems, with an increased risk of antisocial outcomes (Reef, Diamantopoulou, van Meurs, Verhulst, & van der Ende, 2011). Hypotheses have been formed about the mechanisms explaining both the emergence and the maintenance of EB in children, and contextual impact has received considerable attention (Bartels et al., 2004). The extent to which children's EB can be related to the quality of the caregiver–child relationship (QR) has been particularly studied. QR can be approached as a combination of behaviors, feelings, and expectations that are unique to a particular caregiver and a particular child. It is a broad concept encompassing both positive dimensions such as closeness, responsiveness, warmth, involvement, support, and positive affect, and negative dimensions such as negative affect, criticism, intrusiveness, irritability, control, and harsh discipline (MacFie & Swan, 2009; McCall, Groark, & Fish, 2010; Recchia, 2012; Vu, Hustedt, Pinder, & Han, 2015). Significant relations between QR with caregivers and children's EB have been widely reported in previous studies, both cross-sectionally and longitudinally (Caspi et al., 2004; Daley, Renyard, & Sonuga-Barke, 2005; Peris & Baker, 2000). Overall, a relationship characterized for instance by emotional support and warmth has been related to positive outcomes in children (Boeldt et al., 2012). Conversely, a relationship characterized for instance by criticism and rejection has been repeatedly identified as a risk factor for developing EB (Hoeve et al., 2009). The main objective of the current study is to test the transactional relations

between QR with caregivers (mothers, fathers and teachers) and children's EB as a plausible mechanism underlying the development of behavioral problems.

The transactional model

One of the most important ecologically oriented theories about the relations between children and their caregivers is the transactional model (Sameroff, 2009). Central to the transactional model is the emphasis on *bidirectional relations* and the interdependence of children and their social environment. Since the transactional model involves a developmental perspective, it also postulates *recursive relations* whereby the caregiver at T1 relates to the child at T2, who in turn relates to the caregiver at T3, and whereby the child at T1 relates to the caregiver at T2, who in turn relates to the child at T3. The transactional model viewing children and their parents as interdependent over time integrates empirical evidence about both children's effects on caregivers and caregivers' effects on children.

With regard to EB, caring for externalized children is often described as more challenging and less rewarding than caring for other children, leading to lower levels of satisfaction, negative feelings, and higher criticism in caregivers as well as to more negative childrearing behaviors (Coleman & Karraker, 2003; Meunier, Roskam, & Browne, 2011; Slagt, Deković, de Haan, van den Akker, & Prinzie, 2012). At the same time, EB is thought to be more likely to emerge or persist when caregivers resort to criticism, controlling or harsh discipline that in turn reinforces children's problematic behavior (Dishion, French, & Patterson, 1995; Patterson, DeBaryshe, & Ramsey, 1989; Slagt et al., 2012; Snyder, Reid, &

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Patterson, 2003). It has therefore been suggested that negative transactions account for the development of EB. Children's EB leads to negative behaviors, feelings, and expectations in caregivers, which in turn reinforce negative behaviors, feelings, and expectations in children, and vice versa. These links have most commonly been found in the family context, but have also been identified between negative relationships with teachers, characterized by criticism and a lack of positive comments, and pupils' conduct problems (Daley et al., 2005).

Transactional relations have previously been empirically tested with longitudinal cross-lagged models for mother–child dyads and to a lesser extent for both father–child and teacher–child interactional systems (Doumen et al., 2008; Meunier et al., 2011). This is because longitudinal cross-lagged models are the most appropriate for testing transactional relations, although they do not enable causality issues to be addressed. In order to provide a very focused literature review, only existing studies based on such designs that tested bidirectional relations (with at least two waves of data collection) or both bidirectional and recursive relations (with at least three waves of data collection) between caregiver–child QR and children's EB will now be reviewed. Empirical studies that do not correspond to these requirements will be excluded.

Transactional relations between mother–child QR and child's EB

Most studies focus on the reciprocal relations between mothers' behavior and children's EB. Such relations were for example studied in a community sample in which negative maternal behavior at age 3 was seen to contribute to children's EB at age 6 (Combs-Ronto, Olson, Lunkenheimer, & Sameroff, 2009). In the other direction, children's EB at age 3 was found to influence negative maternal behavior at age 6. The interaction between negative maternal behavior and children's EB were also demonstrated in another large population-based study (Larsson, Viding, Rijdsdijk, & Plomin, 2008). A bidirectional influence was found between the two variables at age 4 and age 7. Similar findings were made in a community sample, with children's EB at age 4 influencing the controlling behavior they received from mothers at age 5, and supportive behavior of mothers at age 4 influencing children's EB at age 5 (Meunier et al., 2011). In another recent study, bidirectional relations were not confirmed, but only a caregiver effect between mothers' behavior at age 4 and children's EB at age 5 (Newland & Crnic, 2011). In addition to these two-wave studies, longitudinal cross-lagged studies based on three waves of data collection have been helpful in studying both bidirectional and recursive relations. For example, transactional effects were demonstrated in a clinically referred sample of boys (Burke, Pardini, & Loeber, 2008). Annual measures of EB and maternal behavior from age 7–15 to age 17 provided evidence of both mother and child effects. Another transactional analysis of negative maternal behavior and EB in children was conducted with three time points in a community sample (Zadeh, Jenkins, & Pepler, 2010). Both bidirectional and recursive effects were demonstrated between maternal behavior and EB at ages 10–11, 12–13 and 14–15. Finally, a study was conducted with mothers and adolescents from the general community at ages 13, 14 and 15 (Hale et al., 2011). A strong adolescent effect was reported, with a link between EB at age 13 and QR at age 14, and the same relation between EB at age 14 and QR at age 15. Transactional relations were only found between mothers' irritability and adolescents' EB: irritability at age 13 was linked to EB at age 14, which in turn was linked to irritability at age 15, and EB at age 13 was linked to irritability at age 14, which was in turn related to EB at age 15. These studies were among the first to provide empirical evidence for transactional processes, i.e. both bidirectional influences and recursive effects, between mother–child QR and children's EB. In sum, both bidirectional and recursive effects in the mother–child dyad have been found in previous studies (Combs-Ronto et al., 2009; Larsson et al., 2008; Meunier et al., 2011). However, only a caregiver effect was identified by Newland and Crnic (2011) and a strong child effect was found in adolescence by Hale et al. (2011).

Transactional relations between the father–child relationship and children's EB

While several cross-lagged studies testing the transactional influences between mother–child QR and children's EB are available, there is far less evidence for bidirectional effects and no evidence at all for recursive effects within the father–child dyad. Since the importance of differential contributions from mothers and fathers to child's behavioral outcomes has been suggested (Lewis & Lamb, 2003), empirical studies testing transactional processes with fathers are needed. Results in a study based on a two-wave data collection showed that the way fathers and mothers influence and are influenced by their child's EB is different (Meunier et al., 2011). In this community-based study, only child effects were displayed for the fathers. In particular, children's EB at age 4 was seen to influence both supportive and controlling behavior in fathers at age 5, but the influence of fathers' behavior at age 4 did not contribute significantly to children's EB at age 5. In sum, the present state of our knowledge is far from sufficient to fully understand the transactional relations between father–child QR and children's behavioral adjustment. Children's EB was found to relate to the father–child relationship, but no evidence of bidirectional influences was found (Meunier et al., 2011). Recursive effects were also not tested in a study encompassing at least three waves of data collection with father–child dyads.

Transactional relations between teacher–child QR and children's EB

Existing studies focusing on the relation between teacher–child QR and children's EB conceptualize QR according to the concepts of closeness and conflict (Pianta & Nimetz, 1991). Closeness refers to teachers' feelings of affection for and open communication with children, while conflict refers to the extent to which teachers experience discordant interactions and a lack of positive rapport with children (Pianta & Nimetz, 1991). Relations between these two constructs and children's EB have been shown (Birch & Ladd, 1998; Hamre & Pianta, 2001; Silver, Measelle, Armstrong, & Essex, 2005). Bidirectional relations were tested in a two-wave study encompassing preschoolers from the general community (Zhang & Sun, 2011). Teachers reported about teacher–child QR and children's EB at 3 months after starting school and at the end of the school year among children aged 2–3 years. No evidence was found for bidirectional relations between teacher–child closeness and EB, but conflict in the first wave was linked to EB in the second wave and vice versa. Another three-wave study was conducted among preschoolers from the general community and their teachers who reported about children's aggressiveness towards peers and about teacher–child closeness and conflict. Three measurement moments were organized, i.e. 1 to 3 months after starting school, in the middle, and at the end of the kindergarten school year. The results showed recursive relations between EB and teacher–child conflict but not closeness (Doumen et al., 2008). Children's aggressiveness at the beginning of the school year was related to higher teacher–child conflict mid-year, which in turn was linked to aggressiveness in children at the end of the year. A reciprocal transaction starting with teacher–child conflict in wave 1 was not observed. In sum, both bidirectional and recursive effects have been demonstrated for teachers, but only with regard to conflict with children (as reported by teachers), and not with regard to reported closeness (Doumen et al., 2008; Zhang & Sun, 2011).

The current study

There is a limited set of empirical studies testing the transactional processes between caregiver–child QR and children's EB with appropriate longitudinal cross-lagged models. Most existing studies considered caregivers' behaviors towards children rather than feelings or expectations. They were mainly conducted with community samples and less

with clinically-referred children. Studies conducted with clinical samples are nevertheless needed when it comes to test mechanisms explaining the emergence and persistence of behavioral problems. Moreover, existing studies considered one caregiver, the mother or the teacher, and it remains unclear if transactional relations between one caregiver, i.e. mother, father, or teacher, and a child can generalize and therefore be observed in other caregiver–child dyads.

The aim of the current study is to fill this gap by testing the transactional model with both bidirectional and recursive relations between caregiver–child QR considered on the basis of caregivers' feelings about children and children's EB. It is therefore based on a cross-lagged longitudinal design involving three waves of data collection. The transactional model was tested among 117 young children at ages 4, 5 and 6 who had been clinically referred for EB and among three groups of caregiver: mothers, fathers and teachers. In accordance with previous findings, EB was expected to be associated with lower caregiver–child QR in the three dyads (Daley et al., 2005; Meunier et al., 2011; Slagt et al., 2012). The involvement of the three caregivers made it possible to test the validity of the transactional model in three different interactional systems. In line with the transactional model (Sameroff, 2009), both bidirectional and recursive relations between caregiver–child QR and children's EB were expected. The theoretical assumptions also led us to expect that the model would fit well for all three dyads because of the generalization process. It therefore seemed likely that dysfunctional interaction that had been learned and reinforced by children in a particular system would be reproduced with other caregivers (Snyder et al., 2003). Previous empirical findings from the studies that have been reviewed support these predictions in both mother–child and teacher–child dyads, whereas analyses remain exploratory in father–child dyads.

Method

Sample

This study was part of the longitudinal H2M (Hard-to-Manage) Children research program conducted at the Psychological Sciences Research Institute of the University of Louvain (Belgium) with the collaboration of the Saint Luc University Clinic in Brussels (Belgium). Data were collected from a sample of 117 clinically referred preschool age children, their biological mothers and fathers, and their teachers. All of them came from the French-speaking part of Belgium. They were Belgian or European citizens. All of the children were born in Belgium. They were recruited from pediatric units at the Saint Luc University Clinic in Brussels, where the parents had brought their child due to EB problems. The parents were informed about the study and that they were participating in a longitudinal research program. They were assured that the data would remain confidential. Informed consent was obtained from all the adult participants. The research project received the approval of the Ethics Committee of the Saint Luc University Clinic in Brussels (Belgium). As is almost inevitable in longitudinal designs when the sample is followed up annually across three waves, there was a significant drop-out rate (e.g. the father was not available for the interview, or the teacher was ill at the moment of the annual school visit). At T1, a full response rate of 95.7%/82.5%/88.6% was obtained for mothers, fathers and teachers respectively. At T2, the response rate was 100%/83.7%/93.1%, and at T3, it was 97.4%/83.7%/89.7%. Such a response rate was good considering that the multi-task longitudinal design was regarded as time-consuming for the families involved. Due to the strategy of recruitment in pediatric units of a university clinic (rather than in general mental health services) and the fact that the subjects participated in a 3-year longitudinal research program without any financial compensation, we recruited a homogeneous sample of middle-class families. Socio-demographic information about the sample is presented in Table 1.

Table 1
Demographic information about the sample.

Mean age at the onset of the study	T1	4.19 (sd = 1.00)
	T2	5.21 (sd = 1.01)
	T3	6.22 (sd = 1.04)
Gender (% boys)		78.50%
Mothers' educational level	Secondary school	24.78%
	Undergraduate degree	52.99%
	Postgraduate degree	19.66%
	Missing	2.57%
Fathers' educational level	Secondary school	33.33%
	Undergraduate degree	40.17%
	Postgraduate degree	19.65%
	Missing	6.85%
Marital status	Living together	80.34%
	Separated	17.09%
	Missing	2.57%

Exclusion criteria were added in order to select children whose EB was the core mental health problem. We therefore excluded children with overall developmental delay or intellectual disability. This applied to children born prematurely (before 37 weeks), or with autism, dysphasia or substantial language delay according to an examination by a speech therapist, or with an IQ below 80 tested using the WPPSI-III (Wechsler, 2004). All the referred children attended normal preschool classes at the onset of the study. Another exclusion criterion concerned non-biological parents, in order to avoid foster care or adopting parents for whom QR with the child might be influenced by the history of abandonment or placement. Also note that in the French-speaking part of Belgium, neither systematic diagnosis nor treatment is provided to externalized children before the age of 7. In this context, the referred children in our sample had not undergone any systematic drug and/or therapy treatment between the three waves of assessment, although a few of them (9%) had taken part in psychomotor activities conducted by physiotherapists. The frequency of such activities and their relation to the caregiver–child relationships and EB were explored and found not to have any significant effect on the variables under consideration. The effect of these activities as a variable was therefore dropped in subsequent analyses.

Data collection procedure

Three research assistants, who were all professional clinicians with Master's degrees and professional experience varying from 1 to 10 years, were involved in data collection. They were systematically trained in the procedure to be used. At each of the three measurement occasions, the mothers, fathers and teachers were interviewed separately and asked to speak freely for 5 minutes about the child and the relationship they had with the child. All three caregivers were also asked to complete separately a questionnaire assessing the child's EB and to send it back to the research institute within the two next weeks. Both the mothers and the fathers were interviewed annually by one of the three research assistants when they came to the university clinic. Data from the teachers were collected from three different teachers in the fall (November–December, i.e. 3 months after starting school) in the three waves. They were interviewed during an annual school visit by one of the research assistants.

Measures

The assessment of caregiver–child QR was carried out with the mothers, fathers and teachers separately with the Five Minutes Speech Sample (FMSS) (Magana et al., 1986). The FMSS is a quick method designed to rate the feelings and emotions expressed by respondents about a person with a mental, emotional or behavioral disorder. It

consists of a 5-minute monologue. Respondents are asked to speak freely to a third party about a target relative and the relation they have with this target relative. Rating is done from the audiotape. Interest in expressed emotions as an indicator of parent- and teacher-child QR has been growing (Daley et al., 2005; Peris & Baker, 2000; Psychogiou, Netsi, Sethna, & Ramchandani, 2013). The FMSS procedure assumes that caregivers' emotions with regard to a target child will surface during a 5-minute period in which they talk about their feelings towards the child. Another important assumption is that the way in which caregivers talk about a target child will reveal critical aspects of the way they interact with the child in everyday life. The FMSS is two-dimensional, taking account of critical remarks and emotional over-involvement. Criticism taps into feelings of negativity and resentment towards the target; over-involvement is a measure of overprotection or excessive self-sacrifice. Based on previous findings indicating the relevance of criticism and the non-relevance of emotional over-involvement to children's EB (Daley, Sonuga-Barke, & Thompson, 2003; Daley et al., 2005; Hastings, Daley, Burns, & Beck, 2006; Wamboldt, O'Connor, Wamboldt, Gavin, & Klinnert, 2000), we focused on the assessment of criticism in the current study.

Since we planned to test the transactional model in a cross-lagged design in three different interactional systems, we tried to work out a latent variable for caregiver-child QR that was similar for mothers, fathers and teachers. For example, the frequency of positive comments was not taken into account. In line with previous research, the frequency of positive comments by teachers was expected to be independent of the level of EB, because contemporary classroom management strategies encourage them to have a positive outlook towards each child (Daley et al., 2005). As in the studies of Peris and Baker (2000, p. 459) and Psychogiou et al. (2013, p. 2), the criticism dimension under consideration here relied on three indicators, i.e. initial statement, number of critical remarks, and comments on the relationship. These three have been found to be relevant during the preschool period (Daley et al., 2003). Rather than attributing a dichotomous status such as critical or uncritical as in the majority of previous studies, we preferred to compute a continuous latent variable based on these three observed variables, which are the same as those typically used to determine high vs. low expressed emotions status.

The initial coding system of the FMSS was used to score the three indicators (Magana et al., 1986). First, the initial statement is coded 1 as *positive* (e.g. "Sam is a very cheerful child"), 2 as *neutral* (e.g. "Sam is a 5-year-old boy") or 3 as *negative* (e.g. "Sam is really impossible to live with"). Second, the number of critical remarks relates to the number of critical or negative comments the caregiver makes about the child using both negative language and critical tone, reflecting the caregiver's feelings about the child's characteristics (e.g. "It is

unbearable for me when Sam behaves roughly; I feel embarrassed to be his mother."). The score is established in terms of frequency (the total number of statements coded in this category) in the whole interview. Third, for the relationship, each statement is coded as either strongly positive, weakly positive, weakly negative or strongly negative on the basis of the comments involving both the caregiver and the child as they relate to each other. For example "When I am with Sam, we always get on badly" is coded as 4 (*strongly negative*); "We have had some conflicts recently with Sam" is coded as 3 (*weakly negative*); "Things are generally going well with Sam" is coded as 2 (*weakly positive*); and "We have a great relationship with Sam" is coded as 1 (*strongly positive*).

For the present study, 12 coders scored the FMSS, four in each wave of assessment. Each coder received 5 hours of training in the coding of the three indicators from a leader who had been extensively trained during a scientific stay abroad. Each speech sample was coded by two independent coders, and disagreements between them were resolved by the leader. Inter-rater agreement was computed with intra-class correlations. Overall inter-rater reliability estimated with Kappa coefficients was .75, .82, .83 for the initial statement, .85, .76, .91 for the number of critical remarks, and .77, .69, .80 for the relationship in T1, T2 and T3 respectively.

The assessment of *children's EB* was obtained with the *Profil Socio-Affectif (PSA)* (LaFreniere & Dumas, 1996; LaFreniere, Dumas, Capuano, & Dubeau, 1992), completed by the mothers, fathers and teachers separately. The items focus on the presence or absence of both positive and problematic behavior. The French adaptation of the scale, consisting of an 80-item 1-to-6-point Likert-type scale, was validated on a sample of 608 preschoolers and demonstrated good properties (LaFreniere et al., 1992). The 20 items of the EB scale, encompassing aggressiveness, irritability and non-compliance, were used for this study. For example, "Takes pleasure in harming others" scores highly on the aggressiveness scale, "Is easily upset" scores highly on the irritability scale, and "Agrees to make compromises if we explain the reasons" scores negatively on the non-compliance scale. The internal consistency of the EB scale in our sample was good: for mothers $\alpha = .76$, $\alpha = .81$, $\alpha = .82$ at T 1, 2 and 3 respectively, for fathers $\alpha = .75$, $\alpha = .79$, $\alpha = .79$ and for teachers $\alpha = .87$, $\alpha = .87$, $\alpha = .88$. The scoring of the PSA is such that a higher score on the scales corresponds to a higher level of behavioral adjustment, in other words to a lower level of EB. For the sake of the readability of the results, we recoded the PSA scores so that higher scores indicated more EB.

Data analysis

The main statistical analyses were carried out using the *SEM* software AMOS 18.0 (Arbuckle, 1995). The data were checked for

Table 2
Descriptive statistics for the three indicators of QR and EB.

	QR				EB				
	Initial statement	Critical comments		Relationship	High expressed emotions status	Aggressiveness	Irritability	Resistance	Clinical range
	Mean (sd)	Mean (sd)	Range	Mean (sd)	%	Mean (sd)	Mean (sd)	Mean (sd)	%
<i>Mothers</i>									
T1	2.08 (.74)	10.16 (4.11)	2–24	1.92 (.59)	73	3.27 (.76)	3.96 (.63)	3.43 (.66)	83
T2	1.71 (.77)	10.55 (6.87)	1–47	2.06 (.76)	55	3.19 (.75)	3.88 (.69)	3.30 (.76)	71
T3	1.57 (.71)	7.63 (3.94)	1–20	2.23 (.57)	33	3.13 (.76)	3.75 (.71)	3.34 (.65)	69
<i>Fathers</i>									
T1	1.89 (.75)	7.66 (3.33)	2–18	2.17 (.53)	85	3.19 (.72)	3.82 (.67)	3.24 (.63)	64
T2	1.80 (.73)	7.84 (4.11)	2–23	2.20 (.53)	41	3.07 (.69)	3.72 (.64)	3.61 (.63)	61
T3	1.87 (.76)	6.87 (3.47)	2–18	2.23 (.50)	23	3.05 (.69)	3.76 (.64)	3.12 (.63)	51
<i>Teachers</i>									
T1	1.83 (.70)	8.78 (5.37)	1–27	2.29 (.63)	76	3.41 (.94)	3.40 (.90)	2.81 (.86)	35
T2	1.52 (.77)	7.22 (4.87)	0–27	2.37 (.74)	36	3.28 (.89)	3.30 (.92)	2.65 (.81)	41
T3	1.67 (.77)	7.04 (5.01)	0–27	2.09 (.77)	40	3.20 (.91)	3.19 (.88)	2.52 (.78)	33

Note: *sd* = standard deviation.

normality, which is a critical assumption underlying the maximum-likelihood procedure used in this study. Tests for normality and homogeneity of variances were conducted on the three indicators of QR and EB for the three respondents at the three measurement moments. The Kolmogorov–Smirnov test as well as extra data plots were conducted in order to make a decision about the extent of non-normality (Field, 2009), and results characterized by normality and homogeneity of variances with a significant threshold of .05 were considered. Using the boxplots and Tukey's hinges procedures in SPSS 22, no observation was found to lie outside the outer fences. Drop-out analyses conducted with the SPSS 20.0 Missing Value Analysis package to investigate the randomness of the missing data using Student's *t* statistic for continuous variables or cross-tabulations of categorical variables showed that the pattern of missing data was not associated with background measures, such as caregivers' educational level, marital status, children's age and gender, or with T1 measures of EB and caregiver–child QR. That data are missing at random (MAR) can only be an assumption, since “When data are missing beyond the investigator's control, one can never be certain whether MAR holds. The MAR hypothesis in such data sets cannot be formally tested unless the missing values, or at least a sample of them, are available from an external source. When such an external source is unavailable, deciding whether or not MAR is plausible will necessarily involve some guesswork (Schafer, 1997, p. 22).” (Schafer, 1997). However, excluding cases with missing data from the analyses can reduce the statistical power and bias the estimates of parameters (Allison, 2003). In order to maintain as much power as possible, the full-information maximum likelihood (FIML), which uses all the available data to estimate the parameters of a model (by calculating the log-likelihood of the data for each observational unit separately) was used to estimate missing data (Allison, 2003). Note that following usual recommendations, a ratio of 5 (sample size) to 1 (number of free parameters) is needed to compute SEM analyses suggesting that 115 participants were required for the current study (Bentler & Chou, 1987).

In line with the multi-informant perspective and to avoid mono-rater bias issues, mothers' and fathers' assessments of children's aggressiveness, irritability and non-compliance were averaged in each wave of data collection. Inter-rater correlations were $r = .52/.57/.43$ for irritability at T1/T2/T3 respectively. They were $r = .66/.61/.73$ for aggressiveness, and $r = .47/.47/.50$ for non-compliance. The mean scores of the three indicators of EB were used in all subsequent analyses of mother- and father–child QR. For teachers, however, low correlations were found with parents' assessment of children's aggressiveness, irritability and non-compliance. Inter-rater correlations were $r = .10/.24/.21$ for irritability at T1/T2/T3 respectively. They were $r = .04/.30/.16$ for aggressiveness, and $r = .01/.10/.08$ for non-compliance. Therefore, no averaging procedure was computed for the three informants. In the models including teacher–child dyads, the informant was different at each measurement point, however, since the children changed class each year.

Structural equation modeling analyses were completed in two phases: a measurement phase and a structural phase. In the first phase, measurement models including the six latent variables and their three standardized indicators were evaluated for the mothers, fathers and teachers. The three indicators for both the latent variables (QR and EB) were chosen on the basis of factor loadings, i.e. initial comment, criticism and quality of the relationship for caregiver–child QR and aggressiveness, irritability and non-compliance for children's EB (Marsh & Hau, 2007).

In the second phase, models were tested and compared. The first was the baseline model (Model 1), which only took account of autoregressive paths and cross-sectional correlations. The second tested a full transactional process with bidirectional and recursive relations between T1, T2 and T3, autoregressive paths and cross-sectional correlations (Model 2). Finally, the full transactional model was trimmed in order to obtain the most parsimonious model (Model 3). Evaluation of

the fit of the models was carried out on the basis of inferential goodness-of-fit statistics (χ^2) and χ^2/df , the comparative fit index (CFI) (Marsh & Hau, 2007) and the root mean square error of approximation (RMSEA) (Cole & Maxwell, 2003). Chi-square compares the observed variance-covariance matrix with the predicted variance-covariance matrix. It theoretically ranges from 0 (perfect fit) to ∞ (poor fit). It is considered as satisfactory when it is non-significant ($p > .05$) (Byrne, 2001). χ^2/df is considered as satisfactory when it is < 2.5 in medium-sized samples ($100 < N < 200$) (Byrne, 2001; Hu & Bentler, 1999). Values close to or greater than .90 are desirable on the CFI, while the RMSEA should preferably be less than or equal to .06 (Hu & Bentler, 1999). The chi-square difference test was used to compare the relative fit between the tested models in the second structural phase. A significant $\Delta\chi^2$ indicates a significant difference in fit between the two compared models.

Results

Descriptive statistics

The descriptive statistics for the three indicators of both caregiver–child QR and EB are presented in Table 2. The standard expressed emotions status has also been given in order to make it possible to compare this sample with others using the traditional high vs. low expressed emotions classification.

Validity of the measurement models

The three measurement models provided an acceptable to good fit to the data: for mothers, $\chi^2(113) = 126.87$, $p > .05$, $\chi^2/df = 1.12$, CFI = .98, RMSEA = .03, for fathers, $\chi^2(113) = 143.89$, $p < .05$, $\chi^2/df = 1.27$, CFI = .97, RMSEA = .04, and for teachers, $\chi^2(113) = 171.29$, $p < .05$, $\chi^2/df = 1.51$, CFI = .94, RMSEA = .06. Loadings of the three indicators on the latent EB variables ranged from .63 to .92 for mothers' and fathers' mean scores, and .76 to .91 for teachers across the three measurement moments. Loadings of the three indicators on the latent caregiver–child QR variables ranged from .34 to .77 for mothers, .40 to .94 for fathers and .20 to .77 for teachers, across the three measurement moments.

Correlations between the constructs

Based on the measurement models, the indicators for each latent construct were aggregated for descriptive purposes. Table 3 lists the latent variables and the correlations between them. First, the stability of EB over time was high for parents and teachers. The stability of caregiver–child QR was also high for fathers, but moderate for mothers and low to moderate for teachers. Second, correlations enabled us to explore the inter-rater agreement in each wave. The agreement between the three teachers was high for EB at T1, 2 and 3. The agreement between parents and teachers was far lower. Third, the correlations enabled us to explore the associations between the two constructs, i.e. QR and EB. For parents, negative QR was moderately associated with EB both cross-sectionally and longitudinally. For teachers, with an exception between EB at T1 and QR at T2, the association between the two constructs was also moderate.

The transactional process between caregiver–child QR and children's EB

The comparison of the two successive models is presented in Table 4, i.e. the baseline one (Model 1) representing the moment-to-moment relation between the two constructs, i.e. QR and EB, and the full cross-lagged model (Model 2) representing the transactional process in the caregiver–child dyads.

The models with significant paths and cross-sectional correlations are presented in Figs. 1, 2 and 3 for mothers, fathers and teachers

Table 3
Intercorrelations between the two constructs QR and EB for parents and teachers.

		QR1			QR2			QR3			EB1		EB2		EB3	
		M	F	T	M	F	T	M	F	T	P	T	P	T	P	T
QR1	M	–	.49***	.12	.29***	.36***	.05	.31***	.10	.12	.42***	.04	.29**	.06	.43***	.08
	F		–	.01	.32***	.90***	.18*	.14	.82***	.10	.28*	.19*	.25*	.00	.29**	.08
	T			–	.06	.02	.07	.35***	.05	.28***	.08	.53***	.07	.40***	.02	.46***
QR2	M				–	.32***	.28***	.30***	.15	.32***	.20*	.13	.25**	.15	.22***	.13
	F					–	.29***	.18*	.82***	.10	.26*	.13	.26*	.06	.23*	.02
	T						–	.08	.26**	.25**	.17	.13	.00	.40***	.10	.26**
QR3	M						–		.10	.19*	.21*	.37***	.25*	.38***	.32***	.19*
	F							–		.10	.25*	.09	.23*	.03	.21*	.10
	T								–		.04	.42***	.04	.51***	.04	.46***
EB1	P										–	.20*	.79***	.18	.78***	.04
	T											–	.24*	.76***	.00	.67***
EB2	P												–	.19*	.81***	.10
	T													–	.08	.67***
EB3	P														–	.02
	T															–

Note: N = 80–117. QR1 = QR at T1, QR2 = QR at T2, QR3 = QR at T3, EB1 = EB at T1, EB2 = EB at T2, EB3 = EB at T3. P = Parents (Mothers and Fathers), M = Mothers, F = Fathers, T = Teachers.
p* < .05 *p* < .01 ****p* < .001.

respectively. The fit indices presented in Table 4 show that for mothers and fathers, the full cross-lagged model (Model 2) was not significantly better than the baseline model (Model 1), which was more parsimonious. The trimmed models (Model 3) keeping the significant causal paths did not provide a significantly closer fit to the data than the baseline model. No evidence was found for a transactional process in the mother–child and father–child dyads between negative QR and children’s EB. In the model for mothers, the R² values for endogenous variables were .75 for EB at T2, .85 for EB at T3, .53 for QR at T2 and .28 for the QR at T3. In the model for fathers, the R² values for endogenous variables were .75 for EB at T2, .67 for QR at T3, .98 for QR at T2 and .77 for QR at T3. For teachers on the contrary, the second model had a significantly better fit to the data than the baseline one (Model 1). The trimmed model (Model 3) keeping the significant causal paths provided a significantly closer fit to the data than the baseline model and can therefore be considered as the most parsimonious model for teacher–child dyads. In this final model presented in Fig. 3, no evidence was found for bidirectional and recursive effects as predicted by the transactional model. Rather, we found a strong child effect, whereby children’s EB at T1 was related to negative QR at T2 and children’s EB at T2 was related to negative QR at T3. In the model for teachers, the R² values for endogenous variables were .64 for EB at T2, .53 for EB at T3, .45 for QR at T2 and .96 for QR at T3.

Table 4
Comparison between the baseline model (Model 1), the full cross-lagged model (Model 2) and the trimmed model (Model 3).

	χ^2 (df)	χ^2 /df	CFI	RMSEA	$\Delta\chi^2$
<i>Mothers</i>					
Model 1	(110) = 120.12	1.09	.99	.02	
Model 2	(106) = 116.70	1.10	.99	.02	(4) = 3.42
Model 3	(111) = 121.19	1.09	.99	.02	(1) = 1.07
<i>Fathers</i>					
Model 1	(110) = 116.09	1.05	.99	.02	
Model 2	(106) = 112.07	1.05	.97	.02	(4) = 4.02
Model 3	(111) = 116.75	1.05	.99	.02	(1) = .66
<i>Teachers</i>					
Model 1	(110) = 134.19	1.22	.98	.04	
Model 2	(106) = 124.27	1.17	.98	.03	(4) = 9.92*
Model 3	(109) = 130.53	1.18	.98	.03	(1) = 3.66*

* *p* < .05.

Discussion

The transactional model provides stimulating theoretical assumptions about bidirectionality and recursivity in caregiver–child relationships (Sameroff, 2009). Like any other model, it has to be tested and validated in empirical studies. Existing research using appropriate longitudinal cross-lagged models to test the transactional relations between QR with caregivers and children’s behavioral adjustment is still very limited. First, it mainly concerns mothers’ or teachers’ behavior rather than their feelings or expectations towards preschoolers; second, it has been conducted in community samples; third, it offers no comparison between different interactional systems. What has been empirically shown by existing studies in this field supports the theoretical assumptions of the transactional model in mother- and teacher–child dyads, but father–child transactional relationships have never been tested.

Lack of evidence for the transactional model

In contrast with previous findings (Burke et al., 2008; Combs-Ronto et al., 2009; Larsson et al., 2008; Meunier et al., 2011; Zadeh et al., 2010), the current results do not provide overall support for the theoretical assumptions of the transactional model. Instead, the results tend to replicate the effect from mothers to children that was found in one previous longitudinal cross-lagged study reviewed in the introductory section

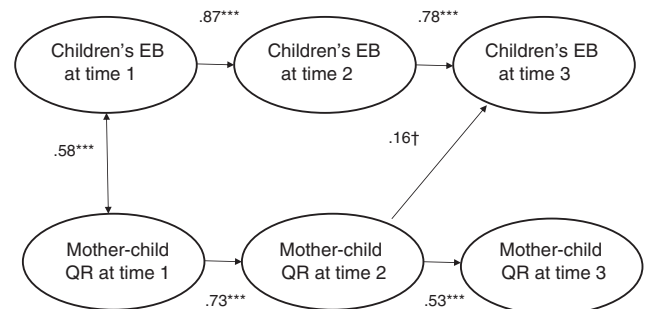


Fig. 1. Model for mothers with significant cross-lagged paths, autoregressive paths and cross-sectional correlations. Note The standardized paths are shown, meaning for example that when children’s EB at time 1 goes up by 1 standard deviation, children’s EB at time 2 goes up by .87 standard deviations. † *p* < .10 ****p* < .001.

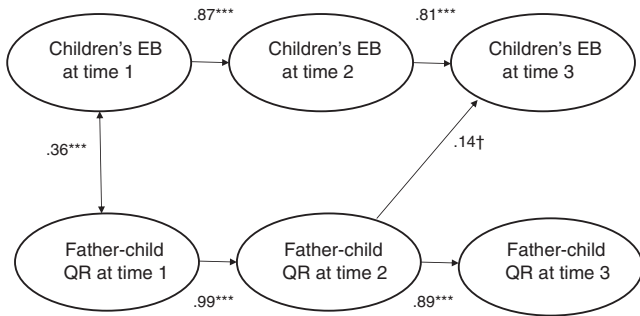


Fig. 2. Model for fathers with significant cross-lagged paths, autoregressive paths and cross-sectional correlations. *Note* The standardized paths are shown, meaning for example that when children's EB at time 1 goes up by 1 standard deviation, children's EB at time 2 goes up by .87 standard deviations. † $p < .10$ *** $p < .001$.

(Newland & Crnic, 2011). Similar results were found for fathers. In this way, the present study highlights generalization processes within the family. What has occurred and been reinforced with one parent seems to be reproduced with the other parent. The same is not true for teachers, for whom neither bidirectionality nor recursivity were replicated: instead, a strong effect from children to teachers was displayed. Generalization processes seem to occur for different interactional systems within the same setting, i.e. the family environment, but not across settings, i.e. the family and the school environments. The direction of the relations was also shown to be different in these two environments: they were adult-driven within the family and child-driven at school. It may be concluded from our results that parent- and teacher-child dyads are separate interactional systems. With regard to parent-child interactions, it may be suggested that young children are less influential than their parents because they are less actively involved in initiating and controlling family interactions than older children or adolescents (Larsson et al., 2008). With regard to the teacher-child model, QR may not only be related to pupils' current behavioral adaptation (mono-rater situation), but also to pupils' behavior in the previous year, as assessed earlier by another teacher. In this way, the final teacher model illustrates a well-known phenomenon in the school setting, whereby children's negative reputation adversely affects teacher-child QR in the subsequent school year (White, Jones, & Sherman, 1998). As shown by the stability coefficients for teacher-child QR, the feelings expressed by teachers in one grade do not seem to have much effect on those expressed by teachers in the subsequent grade. Unfortunately, they do seem to be related to children's EB during the previous school year and to their current EB.

The implication of the singularity of the parent-child vs. teacher-child interactional systems for clinical purposes may be that programs aiming to improve the quality of the caregiver-child interaction should differ for parents and teachers. Programs designed for parents should

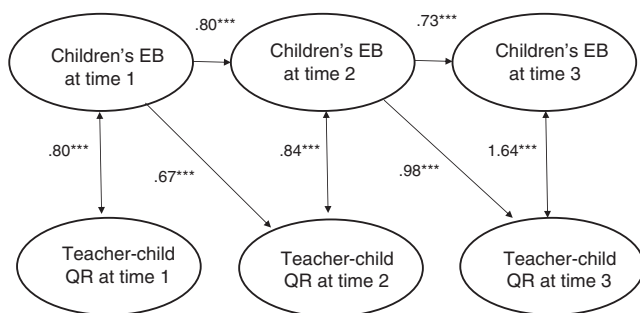


Fig. 3. Final trimmed model for teachers with significant cross-lagged paths, autoregressive paths and cross-sectional correlations. *Note* The standardized paths are shown, meaning for example that when children's EB at time 1 goes up by 1 standard deviation, children's EB at time 2 goes up by .80 standard deviations. *** $p < .001$.

preferably focus on the feelings expressed by parents towards their children, while those designed for teachers should preferably focus on children's behavior itself as well as on shared representations about their behavior in the school setting. The singularity of each interactional system that has been suggested by the final models is also supported by the inter-rater agreement with regard to EB and QR. The inter-rater correlations confirmed the results from numerous studies that have found multi-informant variability in the assessment of children's behavior. (Achenbach, McConaughy, & Howell, 1987; Duhig, Renk, Epstein, & Phares, 2000; Ferdinand, van der Ende, & Verhulst, 2007; Grietens et al., 2004; Gross, Fogg, Garvey, & Julion, 2004). With regard to the inter-rater agreement for QR, the low correlations between parents and teachers at T1, as well as among the three caregivers at T3, mainly support the core idea of independent interactional systems. However, the moderate correlations between mothers and fathers at T1 and among the three caregivers at T2 suggest that some of the children sometimes experience negative relationships with several caregivers at the same time. Such children will probably be particularly at risk of negative outcomes due to the multiple negative relationships in their social setting, and should therefore be the object of particular attention from clinicians. Finally, with regard to the hypothesized singularity of parent-child vs. teacher-child interactional systems, the possibility cannot be completely ruled out that the teachers' models provided more significant results than the mothers' and fathers' ones because different respondents were used in the different waves. This limitation is impossible to control for, given the organization of Belgian schooling. A future investigation could take the form of a three-wave longitudinal design within a single school year, or a 3-year longitudinal study in schools where children work in multi-grade classrooms, retaining the same teacher from year to year.

Why did we fail to identify transactional relations in our models?

Several plausible explanations may be proposed which will need to be tested in future studies. A first reason concerns the high stability of the constructs, which left little additional variance to be explained in the models. This may have prevented us from identifying other significant paths. Such stability is nevertheless interesting. As developmental studies have already indicated, EB tends to persist over time in young children and across different settings (Price, Chiapa, & Walsh, 2013; Silver et al., 2005). The strong correlations displayed for parents and teachers confirm this finding and give support to the attempts to understand the mechanisms explaining such a development in clinical samples. With regard to caregiver-child QR, stability was high for fathers but moderate for mothers and low for teachers. The results suggest that feelings expressed by mothers are subject to variations at different times and are therefore adaptable. This is very important for parenting programs that focus on developing a positive relationship. In line with the absence of a child effect in the mothers' model, variations in mothers' feelings have for example been explained in previous research according to their level of depression (Bolton et al., 2003), their happiness with their family situation and perceived maternal stress (St. Jonn-Seed & Weiss, 2005). Conversely, the high degree of stability found for fathers raises questions about the constancy of the feelings they express to their children over time. It could be that fathers, because they have less exposure to their children than mothers, offer more global and consistent descriptions over time (Roskam & Meunier, 2012). For teachers, the low to moderate stability of QR shows that even when EB is pervasive across the three school years, variations occur in the feelings expressed by the three teachers towards children. In other words, teacher-child QR in one grade does not seem to be related to teacher-child QR in the subsequent grade. Such relative discontinuity should offer children the opportunity to interact with teachers who respond to them independently of previous interactional patterns.

A second reason may be related to the clinical sample under consideration. Previous empirical evidence for the transactional model has

been mainly displayed with non-referred children. In the current study, high rates of expressed emotions classification were found especially at T1 as well as a high frequency of mothers' critical comments at T1 and T2. This may be due to the reason for referral. The referral of a young child for his/her unacceptable behavior is a step that parents tend to take very reluctantly. They feel both incompetent and frustrated at not being able to attain their parental goals (Morgan, Robinson, & Aldridge, 2002). When parents in the current study were asked to speak freely about their child and the relation they had with him/her, the frequency of critical comments was therefore high, especially for mothers, who spend a lot of time with their children. The high rate of expressed emotions classification at T1 can be understood in the context of the temporal proximity with the difficult referral decision. The high percentage of children whose EB was in the clinical range, especially for mothers' ratings and to a lesser extent for those of fathers and teachers, is consistent with this interpretation. It may be that transactional exchanges between a particular caregiver and a particular externalized child are unbalanced. Rather than fluid interactions where both the caregiver and the child influence each other, parents could try to retain power over their externalized child (Kwon & Elicker, 2012; Meunier et al., 2011) whereas in the school setting, the child's influence may preponderate and undermine teacher-child QR (Houts, Caspi, Pianta, Arseneault, & Moffitt, 2010). Parents' rationale for wishing to retain power could be based on the long-term nature of their involvement, as opposed to teachers' short-term involvement.

A third reason could be the developmental period under consideration. As suggested by some previous findings, transactional processes could differ according to the age period. Previous studies have supported a mother effect for preschoolers (Newland & Crnic, 2011), but have reported a strong child effect during adolescence (Hale et al., 2011). It could be speculated that the direction of relations in the parent-child dyad is mainly parent-driven for preschoolers because of the strong emotional involvement of mothers or fathers in the first stage of their children's social development and the importance of their emotional sensitivity towards young children (De Wolff & van Ijzendoorn, 1997). Conversely, relations during adolescence could be essentially child-driven, in view of the important developmental task facing adolescents as they assume autonomy from their parents (Lansford, Laird, Pettit, Bates, & Dodge, 2014). Stronger evidence for transactional processes might be expected between 6 and 10 years of age, when parents' role remains central but children's influence is also increasing.

Another reason why we failed to identify transactional relations in our models could be the method used to capture caregiver-child QR. Stronger evidence for the transactional process was found in previous studies focusing on caregivers' behavior towards preschoolers rather than on their feelings. In such studies, rather than a speech sample in which feelings about the target child were expressed to a third party, caregiver-child QR was assessed using observation, self-report questionnaires or both (Burke et al., 2008; Combs-Ronto et al., 2009). The validity of this method could be questioned in terms of its capacity to capture the target variable, i.e. caregiver-child QR. However, the choice of feelings rather than behaviors for evaluating the caregiver-child QR may also raise some questions. Although linked, behaviors and feelings tap into different concepts and therefore lead to the collection of different empirical data with different assessment tools. Direct transactional relations as revealed by caregivers' concrete behavior may in fact be clearer than those revealed by caregivers' feelings, which have to be mediated by explicit behaviors. Nevertheless, the FMSS was useful for studying different interactional systems in separate developmental settings, since it can easily be applied to various caregivers with few material constraints. This is not the case for most questionnaires, which have different versions for parents and teachers, or for most observational paradigms, which need standardized settings or have parent- or teacher-oriented coding processes.

A last reason concerns the influence of covariates that were not considered in the current analyses. Family adversity would be an

interesting covariate. However, due to our strategy of recruitment in pediatric units of a university clinic (rather than in general mental health services) and the fact that the subjects participated in a 3-year longitudinal research program without any financial compensation, we recruited a homogeneous sample of middle-class families. The parents had completed at least 12 years of education; more than 82% of the couples were married; at least one of the two parents was in full-time employment. Based on the information we collected, there was no evidence that any of these families were facing adversity. Although adversity may be an interesting correlate for the research question (Herbers, Cutuli, Monn, Narayan, & Masten, 2014), we did not regard a family adversity variable as relevant to the current analyses. Other covariates that have previously been linked with caregiver-child QR and problematic behavior could be considered in future investigations. In particular, caregivers' mental health or self-efficacy beliefs could help explain an additional part of the variance in the models (Amato & Rivera, 1999). Finally the possibility cannot be excluded that the results were gender-specific and that they would differ in a predominantly female sample.

To conclude

In a sample of 117 children referred for EB we tested transactional relations between caregiver-child QR and children's EB. What we know from the results is that there is no empirical evidence either for a transactional process between caregiver-child QR and children's behavioral problems among preschoolers or for generalization processes across interactional settings. In particular, we learned from this study that processes at work within interactional systems where clinically-referred preschoolers are involved in the family and at school are singular. The implications for practice and policy are that programs focusing on the improvement of the caregiver-child interaction should be based on specific interpersonal processes to enhance their efficacy. Such programs need to be implemented in both family and school settings in order to prevent separate harmful mechanisms that could in some cases have a combined negative effect on children.

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