

The Interplay of Early Adolescents' Depressive Symptoms, Aggression and Perceived Parental Rejection: A Four-Year Community Study

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Received: 18 December 2007 / Accepted: 25 February 2008 / Published online: 21 March 2008
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Abstract This study of early adolescents from the general population examined the direction of effects adolescents' depressive symptoms, aggression, and perceived parental rejection have on one another in a longitudinal study. Over a four-year period, data were collected yearly from 940 early adolescents (50.6% boys and 49.4% girls) who completed self-report questionnaires of depressive symptoms, aggressive behaviors, and perceived parental rejection. The longitudinal relationships of adolescent reported depressive symptoms, aggression, and perceived parental rejection were tested in multi-group structural equation models. The findings of this study demonstrate that adolescents' depressive symptoms, aggression, and perceived parental rejection can be viewed as two unidirectional effects models that work in tandem: adolescents' depressive symptoms longitudinally predicting perceived parental rejection and, in turn, perceived parental rejection longitudinally predicting adolescents' aggression. Additionally, the strength of these effects diminished as the adolescents grew older and the effects were similar for both adolescent boys and girls.

Keywords Adolescent · Aggression · Depression · Parent · Rejection

Introduction

Negative interactions in a family can lead to a blame game. Adolescents may blame their aggressive and depressive behaviors on their parents' rejecting attitudes, and parents may excuse their rejecting attitudes on their children's behaviors. But instead of blame, maybe it is more a question of dysfunctional interactions that are self-perpetuating, negativity begetting negativity as it were. It is for this reason that developmental researchers are focusing more of their attention toward bidirectional interaction models and away from models that examine these interactions only in a unidirectional manner.

According to Spoth et al. (2006), the study of negative parent—child interactions can be categorized into two general groups: the unidirectional models (i.e., parent or child effects models) and the bidirectional models (i.e., parent—child interaction effects models). They suggest that bidirectional modeling of parent—child interactions helps to better describe how both negative parental upbringing behaviors and children's problem behaviors can jointly affect one another. In other words, negative parental upbringing behaviors and a child's problem behaviors are considered as a complex, integrated whole, in which each individual member exert a continuous and reciprocal impact on the other (Branje et al. 2008; Cox and Paley 1997).

Studies of negative parent—child interactions have shown that early adolescent problem behavior and negative parental upbringing behaviors often enhance one another. Spoth et al. (2006) found that early adolescent problem behaviors and negative parental upbringing behaviors were strongly and reciprocally related to one another. Similar findings have been noted by Conger and Simons (1997).

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However, the impact parents have on adolescents lessens over time as adolescents grow older, begin to develop their own identity beyond their parents and when peer relationships also begin to grow in emotional importance to the adolescent (Meeus et al. 2005; Steinberg and Morris 2001). Additionally, new social obligations in later adolescence, such as attending high school, result in adolescents and parents spending less time with one another (Collins and Laursen 2004). Furthermore, parents stimulate the growth of the adolescent's autonomy during this period, producing an increasingly egalitarian parent—child relationship (Baer 2002). This increasing independence of the adolescent results in a gradual decline of the impact between negative parental upbringing behaviors and adolescent problem behaviors (e.g., Feinberg et al. 2000). Therefore, studying early adolescence can help to illuminate the initiation of the bidirectional effects of negative parental upbringing behaviors and adolescent problem behaviors.

To research bidirectionality, longitudinal data are needed in order to study how negative parental upbringing behaviors and adolescent problem behaviors develop over time. Additionally, such longitudinal studies need to consider estimates of initial associations and stability paths of adolescent problem behaviors and negative parental upbringing behaviors when determining the reciprocal effects between these constructs. If these estimates of initial associations and stability paths are not considered, then the predictive effects of either the early adolescent or parental constructs can become artificially inflated (Branje et al. 2008). Unfortunately, many previous studies of the relationship between negative parental upbringing behaviors and adolescent problem behaviors have been either cross-sectional or longitudinal studies that have not included such estimates. Therefore, the present study examines longitudinal data of early adolescents from the general community and employs the estimates of initial associations and stability paths of negative adolescent problem behaviors and negative parental upbringing behaviors when analyzing the bidirectional effects between these constructs.

The Relationship Between Adolescents' Depressive Symptoms, Adolescents' Aggression and Perceived Parental Rejection

In the study of either adolescents' depressive symptoms or adolescents' aggressive behaviors, many times researchers include both these problem behaviors due to their strong comorbidity with one another (e.g., American Psychiatric Association 2000) and findings that many times adolescents' depressive symptoms and aggression appear to be dependent on each other (e.g., Akse et al. 2004). Moreover,

previous research has shown that both adolescents' depressive symptoms and aggression are strongly related to negative parental upbringing behaviors (Herman-Stahl and Petersen 1995; Marcus and Betzer 1996; Scaramella et al. 2002). Specifically, one negative parental upbringing behavior factor that has been studied in relation to adolescents' depressive symptoms and aggression is perceived parental rejection. Perceived parental rejection is defined as an adolescent's belief that his or her parents are not concerned or interested in him or her as a person (Robertson and Simons 1989), parents wanting the adolescent to be a different person or parents frequently criticizing the adolescent (Muris et al. 2001).

It has been demonstrated that perceived parental rejection is strongly associated with general adolescent maladjustment (Harold et al. 1997; Khaleque and Rohner 2002; Steinhausen and Metzke 2001) as well as adolescents' depressive symptoms (Dallaire et al. 2006; MacPhee and Andrews 2006; Magaro and Weisz 2006) and adolescents' aggression (Heidgerken et al. 2004; Simons et al. 1989). Since many studies have documented that aggressive behaviors are more prevalent in adolescent boys (e.g., Kashani et al. 1999) and that depressive symptoms are more prevalent in adolescent girls (e.g., Ge et al. 2001) it could be assumed that negative parental upbringing behaviors, such as perceived parental rejection, have specific differential effects on adolescent boys' and girls' internalizing and externalizing problem behaviors.

However, such gender specific effects have not always been borne out in research. Studies of perceived parental rejection and early adolescent internalizing (e.g., depressive symptoms) and externalizing (e.g., aggression) problem behaviors have not always found specific differences between early adolescent boys and girls (e.g., Scaramella et al. 1999; Yahav 2006). Feinberg et al. (2000) found that maternal verbal aggression had a somewhat stronger effect on aggressive behavior of early adolescent girls than boys, whereas Spoth et al. (2006) found a significant relationship between early adolescent aggressive behavior and negative parental upbringing behaviors, but no significant gender differences. Nolan et al. (2003) stated that parental rejection and adolescents' depressive symptoms had different effects for early adolescent boys and girls, but were unable to statistically analyze these effects due to a too small sample size. Hence, it would appear that the relationship between negative parental upbringing behaviors, such as perceived parental rejection, and adolescent problem behavior, such as depressive symptoms and aggression, are strongly related to one another; however, it is not clear whether this relationship is similar or different for early adolescent boys than it is for girls.

In contrast to the aforementioned studies, far fewer studies have been conducted that explicitly assess the specific association between perceived parental rejection and adolescents' depressive symptoms and aggression in the same design. One notable exception is a recent cross-sectional study that specifically explored the relationship between early and middle adolescents' depressive symptoms, adolescents' aggression and adolescent perceived parental rejection (Hale et al. 2005). This study found that perceived parental rejection explained aggression symptoms of both early and middle adolescents, both via a direct relationship as well as mediated through adolescents' depressive symptoms. This effect was strongest for early adolescents and tapered off with age. Additionally, no significant differences were found between early adolescent boys and girls. However, since this was a cross-sectional study, no inferences can be drawn as to how these relationships develop over time.

The Present Study

In respect to the aforementioned, this four-year longitudinal study tests the following two hypotheses: (1) perceived parental rejection, early adolescents' depressive symptoms and aggression have positive, bidirectional relationships with one another and (2) the positive, bidirectional relationships become weaker over time as adolescents become increasingly independent from their parents. No specific hypothesis was posed as to potential gender differences between these relationships due to the conflicting findings in the literature. To test these hypotheses, as well as to examine possible gender differences, data on perceived parental rejection, adolescents' depressive symptoms and aggression were collected from early adolescents from the general community. These longitudinal relationships were tested in structural equation models that estimated the initial associations and stability paths of perceived parental rejection and adolescents' depressive symptoms and aggressive behaviors when testing the reciprocal effects between these constructs.

Method

Participants

Data for this study were collected as part of a longitudinal research project entitled CONAMORE (CONflict And Management Of RELationships), with a one-year interval between each of the waves. At the first wave of the study, 940 early adolescents participated. These adolescents came from 12 different Dutch junior high and high schools in the Utrecht province of The Netherlands. The adolescent

population was comprised of 476 (50.6%) boys and 464 (49.4%) girls. The age of the adolescents ranged from 10 to 14 ($M = 12.4$, $SD = 0.58$) at the first wave of this study. Only those adolescents who had completed the depressive symptoms, aggression and perceived parental rejection questionnaires were included in this study. Sample attrition was 1.2% across waves. Missing values were estimated in SPSS, using the EM-procedure.

Data Collection Procedures

The adolescents who participated in this study filled in the questionnaires, which takes approximately 15 min, during the homeroom study period. Before the study, both adolescents and their parents received written information and were required to provide written informed consent. Written informed consent was also obtained for all the participating schools. Verbal instructions were given just prior to the testing to complement the written instructions printed above each questionnaire. At the end of the homeroom study period, the questionnaires were collected by the research assistant and returned to the researchers.

Questionnaires

Adolescents' Depressive Symptoms

The Children's Depression Inventory (CDI) is a widely utilized self-report questionnaire of depressive symptomatology in children and adolescents for ages of 8–18 years (Timbremont and Braet 2002). The questionnaire is composed of 27 items that review the various depressive symptoms categories such as mood, vegetative, cognitive and psychomotor disturbances. The questionnaire is scored on a three-point scale ranging from "not true", "a bit true" to "very true". Two sample questions are: "I am sad the entire day" and "Nothing is fun anymore". The CDI has strong internal consistency and validity in non-clinical populations (Saylor et al. 1984). In this study the Cronbach alphas for the CDI were .93/.89/.90/.90 for each wave respectively.

Adolescents' Aggression

The adolescents' aggression was measured by the Direct–Indirect Aggression Scale (DIAS) (Björkqvist et al. 1992). The direct aggression scale of the DIAS was used in this study. The questionnaire asks what the adolescent would do to a classmate when the adolescent was angry with the classmate. This is a measurement of how adolescents react to classmates when angry; hence, it is a situational measurement. However, it has been found that child and adolescent self-ratings of situational aggression is

significantly correlated with that of similar peer-rated reports, leading to the idea that self-ratings of aggression can be used to measure general child and adolescent aggression (Lagerspetz et al. 1998).

Reliability and construct validity have been shown to be strong (Carroll and Shute 2005; Owens 1996). The questions were scored on a scale from 1 (“never”) to 4 (“always”). Two sample questions are: “If I am mad or upset with someone in my class...” “...I will call him (or her) names” and “...I will kick or hit him (or her)”. The Cronbach alphas were .91/.89/.88/.88 for each wave respectively.

Perceived Parental Rejection

The criticism scale of the Level of Expressed Emotion questionnaire (LEE) was used to measure perceived parental rejection. In a previous study (Gerlsma and Hale 1997), it was stated that the LEE criticism factor is reflective of a person’s perception of being rejected by others, as formulated by interpersonal interaction theory (Coyne and Downey 1991). In this same study (Gerlsma and Hale 1997), it was demonstrated that the criticism factor was predictive of depressive symptoms in both psychiatric patients and healthy control persons. A recent study demonstrated that the criticism scale of the LEE

is also valid for adolescents from the general population and that the criticism factor was significantly correlated to adolescents’ depressive symptoms (Hale et al. 2007).

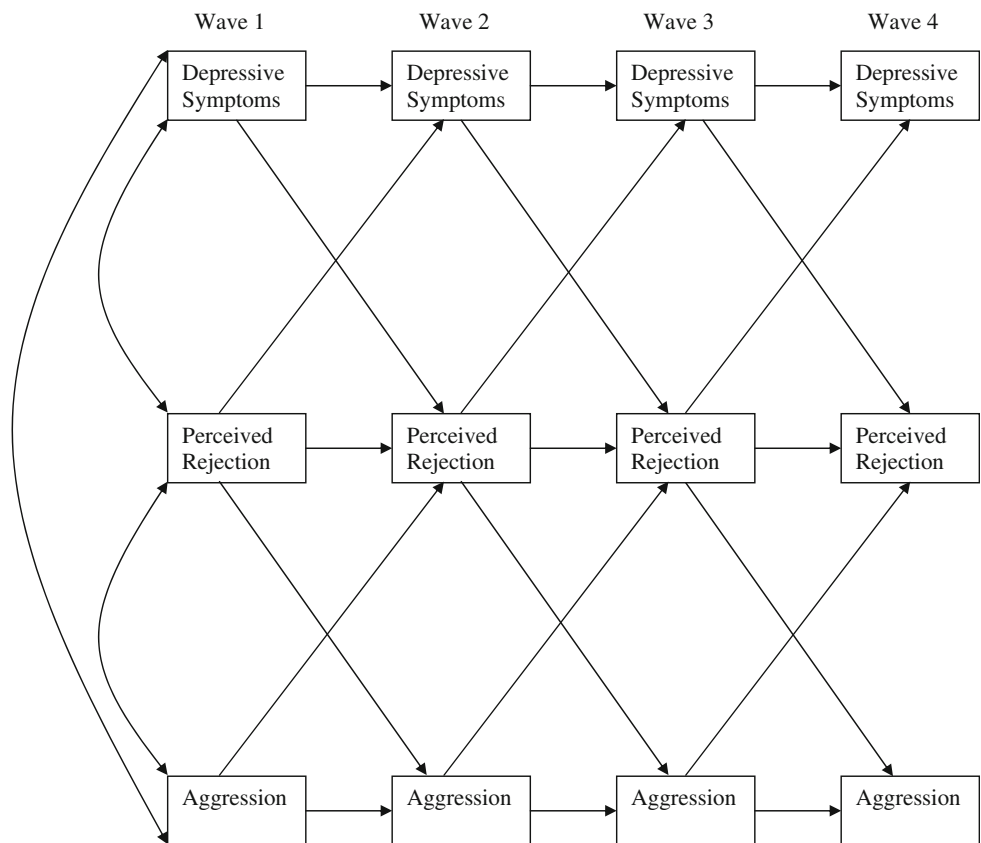
The questions were scored on a scale from 1 (“never”) to 4 (“always”). Two sample questions are: “My parents are very critical of me” and “My parents try to change who I am”. Reliability and construct validity have been shown to be strong (Gerlsma and Hale 1997; Hale et al. 2007). In this study the Cronbach alphas were .73/.72/.74/.77 for each wave respectively.

Data Analysis

To examine our hypothesis that bidirectional relationships exist between perceived parental rejection, adolescents’ depressive symptoms and aggression (see Fig. 1 for the conceptual model), structural equation modeling based on maximum likelihood estimation was performed in AMOS (Arbuckle and Wothke 2006).

The AMOS analyses were based on the assumption that associations are present between perceived parental rejection, adolescents’ depressive symptoms, and aggression. Bivariate correlations demonstrated that this assumption could be accepted: significant zero-order correlations exist among the relevant constructs (Table 1).

Fig. 1 Hypothesized relationships between perceived parental rejection, adolescents’ depressive symptoms and aggression



Several theoretically meaningful and nested models were designed in order to evaluate the hypothesized bidirectional model. Six models (Models 1, 2a, 2b, 3a, 3b, and 4) were tested, ordered hierarchically from a model with all hypothesized bidirectional effects to a model with no effects at all. The first model (Model 1) is the hypothesized bidirectional model, implying bidirectional effects between perceived parental rejection, adolescents' depressive symptoms and aggression. This model contains all paths between constructs, as well as stability paths between consecutive waves within constructs. The second model (Model 2) is a unidirectional model from perceived parental rejection to adolescents' depressive symptoms and aggression, based on the assumption that perceived parental rejection affects depressive symptoms and aggression and not vice versa. Model 2a contains paths from perceived parental rejection to adolescents' depressive symptoms and aggression. In addition, this model includes mutual paths between adolescents' depressive symptoms and aggression, allowing for co-occurrence between these constructs, as well as stability paths within all constructs. Model 2b does not include the mutual paths between adolescents' depressive symptoms and aggression. Model 3 is also a unidirectional model, but pertains to the reverse notion: the adolescents' depressive symptoms and aggression affect the perceived parental rejection and not vice versa. Therefore, in this model paths were drawn from adolescents' depressive symptoms and aggression to perceived parental rejection. Model 3a includes mutual paths between adolescents' depressive symptoms and aggression, whereas Model 3b excludes mutual paths between adolescents' depressive symptoms and aggression. The final model (Model 4) is a stability model; hence, no paths were drawn between perceived parental rejection, adolescents' depressive symptoms and aggression. In this model, paths were only drawn between consecutive waves within constructs. Chi-square difference tests were used to compare the models described, and to determine which model had the best fit to the data.

After determining which model best represented the data of the total sample, we examined possible gender differences. This was done by testing the best fitting model in a multi-group analysis in AMOS. For these multi-group analyses, we compared several nested models. First, we tested a restricted model, in which all parameters were required to be equal across gender against a fully non-restricted model, in which all parameters were allowed to differ across boys and girls. We then systematically tested several partly restricted multi-group models. The best fitting gender model was examined in more detail. Significant differences between groups were investigated with critical ratio analyses, with values above 1.96 being significant.

Results

Descriptives

Table 1 provides the means, standard deviations, and bivariate correlations of perceived parental rejection, adolescents' depressive symptoms and aggression for all waves. The descriptive statistics are shown for the total group and for boys and girls separately. These findings offer a first impression as to the validity of our hypotheses. First, they confirmed that perceived parental rejection, adolescents' depressive symptoms and aggression are significantly related both concurrently and longitudinally, demonstrating considerable associations between these three constructs. Second, adolescents' depressive symptoms and aggression are consistently and significantly related both within time and over time, indicating substantial co-occurrence between these problem behaviors. Third, Table 1 shows various significant mean score differences between the early adolescent boys and girls. That is, girls score significantly higher on depressive symptoms than boys at the third and fourth waves, as well as scoring higher on perceived parental rejection at all four waves, and boys score significantly higher on aggression than girls at all four waves, as would be expected by previous research. In sum, these findings between perceived parental rejection, adolescents' depressive symptoms and aggression lend for the usefulness of further testing our hypotheses. Structural equation modeling was conducted to unravel the interrelations of these constructs.

Model Testing

Table 2 presents the results of the model testing as described in the data analysis section. The first goal was to evaluate the relative superiority of these models. We found our hypothesized bidirectional model (Model 1) had the best fit to the data as compared to the alternative models ($\chi^2(27) = 295.0, p < .01$). The stability model (Model 4), in which no associations are implicated between any of the constructs, but only within constructs over time, had the worst fit to the data ($\chi^2(48) = 503.1, p < .01$). Both Models 2 and 3 fitted the data significantly better than Model 4, but worse than Model 1. The fit of both unidirectional models slightly differed, in that Model 2 (perceived parental rejection to adolescents' depressive symptoms and aggression effects) has a somewhat better fit than Model 3 (adolescents' depressive symptoms and aggression to perceived parental rejection effects). Both Model 2 and Model 3 had a better fit to the data when additional paths between adolescents' depressive symptoms and aggression were incorporated, resulting in Model 2a ($\chi^2(36) = 427.7, p < .01$) and Model 3a

Table 1 Means, standard deviations, and bivariate correlations between perceived parental rejection, adolescents’ depressive symptoms and aggression for the total group (in bold) and boys and girls separately

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. Depressive symptoms W1	–	.44**	.33**	.27**	.27**	.22**	.19**	.26**	.41**	.23**	.15**	.12**
Boys		.33**	.25**	.19**	.24**	.21**	.12**	.24**	.48**	.27**	.17**	.12*
Girls		.62**	.46**	.39**	.36**	.27**	.32**	.31**	.31**	.19**	.14**	.15**
2. Depressive symptoms W2		–	.50**	.38**	.24**	.35**	.27**	.31**	.19**	.32**	.16**	.11**
Boys			.38**	.26**	.24**	.32**	.26**	.27**	.26**	.40**	.24**	.13**
Girls			.61**	.48**	.27**	.41**	.30**	.36**	.12**	.24**	.10**	.12**
3. Depressive symptoms W3			–	.49**	.18**	.20**	.37**	.27**	.13**	.15**	.22**	.09**
Boys				.35**	.21**	.17**	.35**	.22**	.24**	.20**	.30**	.12*
Girls				.58**	.21**	.29**	.45**	.34**	.06 ^{ns}	.16**	.21**	.15**
4. Depressive symptoms W4				–	.06^{ns}	.17**	.21**	.35**	.04^{ns}	.09**	.09**	.14**
Boys					.11*	.19**	.21**	.22**	.09 ^{ns}	.14**	.19**	.24**
Girls					.10 ^{ns}	.22**	.27**	.34**	.06 ^{ns}	.11*	.07 ^{ns}	.15**
5. Perceived rejection W1					–	.48**	.42**	.26**	.20**	.26**	.22**	.13**
Boys						.47**	.38**	.23**	.15**	.25**	.15**	.05 ^{ns}
Girls						.44**	.42**	.28**	.22**	.21**	.24**	.14*
6. Perceived rejection W2						–	.47**	.39**	.18**	.26**	.22**	.18**
Boys							.44**	.40**	.13**	.21**	.15**	.11**
Girls							.47**	.38**	.19**	.28**	.26**	.20**
7. Perceived rejection W3							–	.50**	.13**	.22**	.27**	.23**
Boys								.46**	.07 ^{ns}	.17**	.19**	.15**
Girls								.53**	.17**	.23**	.32**	.26**
8. Perceived rejection W4								–	.14**	.22**	.20**	.22**
Boys									.15**	.22**	.20**	.21**
Girls									.09 ^{ns}	.20**	.18**	.22**
9. Aggression W1									–	.56**	.39**	.38**
Boys										.53**	.35**	.36**
Girls										.56**	.41**	.32**
10. Aggression W2										–	.52**	.46**
Boys											.52**	.47**
Girls											.46**	.36**
11. Aggression W3											–	.60**
Boys												.58**
Girls												.57**
12. Aggression W4												–
Boys												
Girls												
Means	1.16	1.17	1.18	1.19	1.56	1.64	1.65	1.63	1.45	1.49	1.49	1.44
Boys	1.16	1.16	1.15	1.15	1.45	1.56	1.56	1.60	1.54	1.57	1.58	1.55
Girls	1.17	1.19	1.21	1.22	1.67	1.72	1.75	1.67	1.36	1.40	1.39	1.34
Standard Deviations	.26	.23	.24	.24	.54	.55	.57	.56	.49	.45	.45	.41
Boys	.30	.24	.23	.21	.55	.56	.58	.56	.57	.49	.48	.46
Girls	.21	.22	.25	.26	.52	.53	.55	.56	.38	.39	.39	.33

Note: ** $p < .01$, * $p < .05$, ns = not significant; W1 = Wave 1, W2 = Wave 2, W3 = Wave 3, W4 = Wave 4; Total group, $N = 940$; Adolescent Boys, $n = 476$, Adolescent Girls, $n = 464$. Mean differences (Analyses of Variance) between boys and girls are significant at $p < .01$ for all variables, except for adolescents’ depressive symptoms at Wave 1 and Wave 2

($\chi^2(36) = 451.9, p < .01$) respectively. More precisely, the fit of Model 2 is stronger when the co-occurrence between adolescents’ depressive symptoms and aggression is taken into account, as compared to Model 3. Finally and

most importantly, our hypothesized bidirectional model (Model 1), showed the best fit to the data and fitted the data significantly better than the stability model ($\Delta\chi^2(21) = 208.1, p < .01$) and all of the unidirectional models

Table 2 Comparisons of theoretically competing models

Model	χ^2	df	<i>p</i>	Model comparisons	$\Delta\chi^2$	Δdf	<i>p</i>
1. Bidirectional	295.0	27	.00				
2a. Unidirectional	427.7	36	.00	1 versus 2a	128.7	9	.00
2b. Unidirectional	443.0	42	.00	1 versus 2b	148.0	15	.00
3a. Unidirectional	451.9	36	.00	1 versus 3a	156.9	9	.00
3b. Unidirectional	457.4	42	.00	1 versus 3b	162.4	15	.00
4. Stability	503.1	48	.00	1 versus 4	208.1	21	.00

Note: Model 1 = Bidirectional model; Model 2 = Unidirectional model perceived parental rejection to adolescents' depressive symptoms and aggression; Model 3 = Unidirectional model adolescents' depressive symptoms and aggression to perceived parental rejection (Models 2a and 3a: Mutual associations between adolescents' depressive symptoms and aggression included, Models 2b and 3b: Mutual associations between adolescents' depressive symptoms and aggression excluded); Model 4 = Stability model

($\Delta\chi^2(9) = 128.7$ and 156.9 for comparison to Model 2a and Model 3a respectively; $\Delta\chi^2(15) = 148.0$ and 162.4 for comparison to Model 2b and Model 3b respectively; all $p < .01$). It can therefore be concluded that we can accept our hypothesis that bidirectional relationships exist between perceived parental rejection, adolescents' depressive symptoms and aggression.

Bidirectional Model

The standardized parameter estimates, as shown in Table 3, indicate that the stability parameters of the constructs are considerable and increase over time, as adolescents become older. All the initial correlations at the first wave between perceived parental rejection, adolescents' depressive symptoms and aggression are significant ($r = .27$ between adolescents' depressive symptoms and perceived parental rejection, $r = .42$ between adolescents' depressive symptoms and adolescents' aggression, and $r = .22$ between perceived parental rejection and adolescents' aggression). Inspection of the hypothesized bidirectional relationships (regression paths) between the constructs reveals that a particular and unanticipated pattern emerges: adolescents' depressive symptoms consistently have a significant effect on perceived parental rejection ($\beta = .09$, $p < .01$; $\beta = .09$, $p < .01$; $\beta = .06$, $p < .05$), whereas perceived parental rejection, in turn, consistently affects adolescents' aggression ($\beta = .17$, $p < .01$; $\beta = .07$, $p < .01$; $\beta = .06$, $p < .05$). The only exception to this pattern is a significant effect from perceived parental rejection at wave 1 to adolescents' depressive symptoms at wave 2 ($\beta = .16$, $p < .01$).

Figure 2 shows the standardized estimates of the bidirectional model. To enhance interpretability and clarity of the results, only the significant regression paths and their coefficients are presented.

Gender Differences in the Bidirectional Model

We then performed multi-group model analyses in AMOS to examine possible gender differences in the bidirectional model. Results of the multi-group model analyses are shown in Table 4. Systematic model comparisons revealed that the unrestricted model had the best fit for the data (see Table 4). That is, a model that allows all parameters to differ between adolescent boys and girls has a significantly better fit to the data than any other model in which all or some parameters are restricted to be equal across boys and girls. The statistical fit of the unrestricted, bidirectional model was moderate but acceptable (comparative fit index, CFI = .91; normative fit index, NFI = .90; root mean square error of approximation, RMSEA = .08) (Klein 2005).

Standardized parameter estimates of the unrestricted gender model are shown in Table 3 and the significant regression paths, as compared to the findings of the total adolescent sample, are shown in Fig. 2. Inspection of the critical ratios revealed that certain parameters significantly differed between boys and girls. These differences in parameters are presented in bold in Table 3. There are several differences in stability of the constructs; girls' depressive symptoms from the first to second wave and from the third to fourth wave were significantly more stable compared to boys' (c.r. = -3.25 and 2.22 respectively), whereas boys' aggression was more stable from the third to fourth wave compared to girls' (c.r. = -3.00). Second, the initial correlation between perceived parental rejection and depressive symptoms was significantly higher for girls than for boys (c.r. = 2.02), and the initial correlation between depressive symptoms and aggression was higher for boys (c.r. = 2.65). Third, two regression paths were significantly different between boys and girls: that the prediction of boys' aggression at the first wave to depressive symptoms at the second wave was stronger than for girls' (c.r. = 3.23), and the prediction of girls' perceived parental rejection at the second wave to aggression at the third wave was stronger than for boys' (c.r. = 2.20). It should be noted that for the total group the path from adolescents' aggression at the first wave to adolescents' depressive symptoms at the second wave was not significant.

Discussion

While it was hypothesized that perceived parental rejection, adolescents' depressive symptoms and aggression would influence one another in a bidirectional fashion, the findings of this study only found bidirectional effects between adolescents' depressive symptoms and perceived parental rejection at the first two waves of the study. However, during all four waves of the study, an interesting

Table 3 Parameter estimates^a of the bidirectional model for the total adolescent sample and for adolescent boys and girls

Standardized path	Bidirectional model	Multi-group model	
	Total sample	Boys	Girls
<i>Stability paths</i>			
Depressive symptoms W1 → W2	.40**	.22**	.61**
Depressive symptoms W2 → W3	.75**	.79**	.75**
Depressive symptoms W3 → W4	.73**	.58**	.76**
Perceived rejection W1 → W2	.46**	.46**	.41**
Perceived rejection W2 → W3	.74**	.65**	.83**
Perceived rejection W3 → W4	.79**	.84**	.76**
Aggression W1 → W2	.54**	.52**	.53**
Aggression W2 → W3	.72**	.68**	.72**
Aggression W3 → W4	.89**	.96**	.73**
<i>Initial correlations</i>			
Depressive symptoms W1 ↔ Perceived rejection W1	.27**	.24**	.36**
Depressive symptoms W1 ↔ Aggression W1	.42**	.49**	.30**
Perceived rejection W1 ↔ Aggression W1	.22**	.18**	.22**
<i>Regression paths</i>			
Depressive symptoms W1 ↔ Perceived rejection W2	.09**	.10*	.12**
Depressive symptoms W1 ↔ Aggression W2	-.05 ^{ns}	-.03 ^{ns}	-.02 ^{ns}
Perceived rejection W1 ↔ Depressive symptoms W2	.16**	.21**	.09*
Perceived rejection W1 ↔ Aggression W2	.17**	.18**	.12**
Aggression W1 ↔ Depressive symptoms W2	-.01 ^{ns}	.13**	-.10**
Aggression W1 ↔ Perceived Rejection W2	.03 ^{ns}	.01 ^{ns}	.03 ^{ns}
Depressive symptoms W2 ↔ Perceived rejection W3	.09**	.10**	.09*
Depressive symptoms W2 ↔ Aggression W3	-.04 ^{ns}	-.03 ^{ns}	-.07 ^{ns}
Perceived rejection W2 ↔ Depressive symptoms W3	.02 ^{ns}	.01 ^{ns}	.04 ^{ns}
Perceived rejection W2 ↔ Aggression W3	.07**	.01**	.15**
Aggression W2 ↔ Depressive symptoms W3	-.04 ^{ns}	-.03 ^{ns}	.02 ^{ns}
Aggression W2 ↔ Perceived rejection W3	.05 ^{ns}	.03 ^{ns}	.07 ^{ns}
Depressive symptoms W3 ↔ Perceived rejection W4	.06*	.01 ^{ns}	.08*
Depressive symptoms W3 ↔ Aggression W4	-.04 ^{ns}	-.09*	.00 ^{ns}
Perceived rejection W3 ↔ Depressive symptoms W4	.01 ^{ns}	.06 ^{ns}	.01 ^{ns}
Perceived rejection W3 ↔ Aggression W4	.06*	.04 ^{ns}	.07 ^{ns}
Aggression W3 ↔ Depressive symptoms W4	-.02 ^{ns}	.08 ^{ns}	-.05 ^{ns}
Aggression W3 ↔ Perceived rejection W4	.02 ^{ns}	.07 ^{ns}	-.02 ^{ns}

Note: ^aPath coefficients (Parameter estimates) are standardized Beta values. ** $p < .01$, * $p < .05$, ns = not significant; W1 = Wave 1, W2 = Wave 2, W3 = Wave 3, W4 = Wave 4; Total group, $N = 940$; Adolescent Boys, $n = 476$, Adolescent Girls, $n = 464$. Significant differences in coefficients between boys and girls are indicated in bold

pattern occurred, namely that adolescents’ depressive symptoms predicted perceived parental rejection and perceived parental rejection predicted adolescents’ aggression. This pattern, that decreased slightly as the early adolescents grew older, also was generally the same for the early adolescent boys and girls. In sum, it was demonstrated that perceived parental rejection, adolescents’ depressive symptoms and aggression influence one another in a quite specific pattern. While this study produced many significant results, we will limit our discussion to the most salient findings of the effects that perceived parental rejection,

adolescents’ depressive symptoms and aggression had on one another. Attention will first be given to the initial correlations and stability path findings before returning to the regression path findings.

Cross-Sectional Relationships Between and Stable Relationships Within the Constructs

As was noted in Table 3, all the initial correlations between perceived parental rejection, adolescents’ depressive symptoms and aggression were significant for both early

Fig. 2 Significant regression-paths (and their coefficients) between perceived parental rejection, adolescents’ depressive symptoms and aggression for the bidirectional model. *Note:* The coefficients outside of the brackets are for the entire adolescent population. The coefficients for the boy adolescents are noted inside the brackets and are indicated in bold, and the coefficients for the girl adolescents are indicated in italics. -- represents a non-significant coefficient

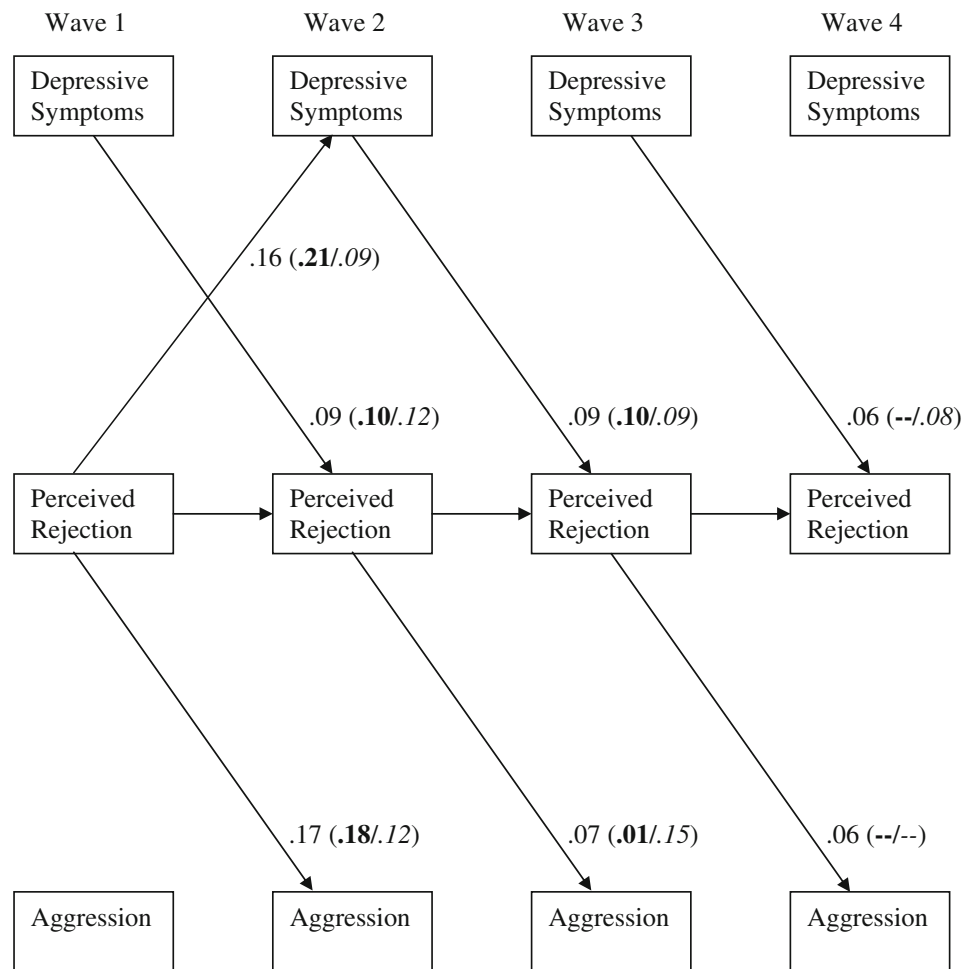


Table 4 Comparisons of nested multi-group models for adolescent boys and girls and the fit statistics for the unrestricted model

Model	χ^2	df	p	Model comparisons	$\Delta\chi^2$	Δdf	p
1. Restricted model	889.0	118	.00				
2. Model a	510.8	84	.00	2 versus 1	378.2	34	.00
3. Model b	443.5	75	.00	3 versus 2	67.3	9	.00
4. Model c	395.1	72	.00	4 versus 3	48.4	3	.00
5. Unrestricted model	358.8	54	.00	5 versus 4	36.3	18	.00
Fit statistics for the unrestricted model				$\chi^2 = 358.8, df = 54, p = .00; CFI = .91/NFI = .90/RMSEA = .08$			

Note: Model a = 1st partly restricted model: stability paths, correlations, and regression paths are fixed between the models for boys and girls; Model b = 2nd partly restricted model: correlations and regression paths are fixed; model c = 3rd partly restricted model: only regression paths are fixed between the groups

adolescent boys and girls. Additionally, girls’ initial correlation between depressive symptoms and perceived parental rejection was significantly stronger than for boys’, whereas boys’ initial correlation between depressive symptoms and aggression was significantly stronger than for girls’. While this may seem to lend support to the idea that perceived parental rejection affects both early adolescent boys and girls in a differential manner, one should interpret this result in combination with the regression

paths findings; a point that will be discussed in the following section.

As to the stability paths, the stability of the adolescent girls’ depressive symptoms was significantly stronger at the first to second wave, as well as at the third to fourth wave than boys’. When the girls’ stability at the third to fourth wave is taken together with the findings of significantly higher scores at these two waves (Table 1), then it might be concluded that these findings are reflective of the sharp rise

in the development of depressive symptoms in adolescent girls at around 15 years of age (approximately when the third wave data were collected) that continues on through late adolescence (Hankin et al. 1998).

The aggression stability paths, while growing in strength during adolescence, only significantly differed between adolescent boys and girls at the third to fourth wave. It has been noted that there has been a steady rise in the prevalence of adolescent girls' aggression, as compared to boys', in recent years (Graves 2007). It could be speculated that this increase in the prevalence of adolescent girl aggression results in a similar stability of aggression growth in early adolescent boys and girls and only differs from one another in later adolescence. However, the mean aggression scores of the adolescent boys were significantly higher than that of the adolescent girls at all four waves, in agreement with findings of previous studies that adolescent boys display more aggression than girls (e.g., Kashani et al. 1999). In other words, while boys scored higher on aggression than girls at all four waves, a difference in the stability of the growth of aggression only occurred at the last waves of the study. Since many previous studies have based their findings only on mean score differences, future studies of the growth of adolescents' aggression, and adolescents' problem behaviors in general, might provide finer distinctions if stability path analyses are also conducted. Finally, it is interesting to note that while early adolescent girls had significantly higher perceived parental rejection scores than boys at all four waves, that the stability of these scores did not significantly differ between them. While these score differences are in agreement with previous studies (Akse et al. 2004; Hale et al. 2005), the stability of the growth of these scores is similar for both adolescent boys and girls.

Longitudinal Relationships Between The Constructs

As was just stated, the only bidirectional effect was found for adolescents' depressive symptoms and perceived parental rejection at the first two waves. However, during all waves of the study unidirectional effects were found: adolescents' depressive symptoms predicting perceived parental rejection and perceived parental rejection predicting adolescents' aggression. As can be seen in Fig. 2 and Table 3, this same pattern also applied to early adolescent boys and girls, with the exception of perceived parental rejection to adolescents' aggression between the third to fourth wave (which was not significant for either gender) and adolescents' depressive symptoms to perceived parental rejection between the third to fourth wave (which was significant for girls but not for boys). Additionally, boys and girls did not significantly differ from one another, with the exception of perceived parental rejection to aggression between the second to third wave. Finally,

the results of the regression paths, for both the adolescent group as a whole and the boy and girl groups, indicated that the strength of the prediction of perceived parental rejection, adolescents' depressive symptoms and aggression to one another became weaker over the subsequent waves.

As was stated in the introduction, we hypothesized that perceived parental rejection, adolescents' depressive symptoms and aggression would have bi-directional effects on one another. However, it would appear that a specific unidirectional effects model better explains our data, with adolescents' depressive symptoms having an influence on perceived parental rejection and this perceived parental rejection, in turn, leading to adolescents' aggression. While previous studies have found perceived parental rejection to be related to adolescents' depressive symptoms (Dallaire et al. 2006; MacPhee and Andrews 2006; Magaro and Weisz 2006) and adolescents' aggression (Heidgerken et al. 2004; Simons et al. 1989), no study has specifically examined these three specific constructs in a long-term longitudinal design. Hence, when examining these constructs only in pairs (i.e., depressive symptoms—perceive parental rejection or perceive parental rejection—aggression) bidirectional effects occur, whereas when these three constructs are examined as a whole so that a clearer pattern can be seen of two unidirectional effects models that work in tandem: adolescents' depressive symptoms affecting perceived parental rejection which, in turn, affects adolescents' aggression. Such specific effects cannot be examined when global measures of adolescent problem behaviors are employed (e.g., Conger and Simons 1997; Spoth et al. 2006) or when the study is a cross-sectional or a short-term longitudinal design (e.g., Heidgerken et al. 2004; Newman et al. 2007).

In way of an illustration of the abovementioned, if this study used a cross-section design, the initial correlation findings that were significantly stronger for early adolescent girls than for boys would be interpreted as a bidirectional gender difference, whereas the longitudinal, multi-group model regression paths demonstrate that the effects are unidirectional and quite similar for both girls and boys. In way of another example, if this study employed a two-wave short-term longitudinal design, we would conclude that depressive symptoms and perceived parental rejection have a bidirectional relationship to one another, such as the findings of Nolan et al. (2003), as opposed to finding that, as adolescents grow older, this relationship is unidirectional when adolescents' aggression is included in the model. Furthermore, global measures of adolescent problem behaviors may have resulted in bidirectional effects with perceived parental rejection whereas the inclusion of depressive symptoms and aggression as specific constructs in the model reveals their individual contributions. Finally, the diminishing effects of these

relationships over time would not be apparent in a cross-sectional or short-term longitudinal design.

Limitations

Certain limitations of this study should be noted. One possible limitation is that the research sample was only comprised of adolescents from the general population and only used adolescent self-reports of depressive symptoms and aggression, therefore it should be stated that these findings are not equivalent to studies of adolescents with diagnosed psychiatric depressive and aggressive disorders. Nevertheless, research in community populations can provide insight into developmental issues relevant to the clinical setting (e.g., Hale et al. 2005).

Additionally, since this study only used the adolescents' self-reports of perceived parental rejection, as opposed to parental questionnaires, it is possible that some would hold that the regression path findings are artificially inflated. However, in a recent study of children's and adolescents' perceived parental rejection and depressive symptoms, the authors stated that their findings "argues against an artifactual interpretation that the experience of depression taints the child's report of parental behaviors creating spurious correlations between depressive symptoms and all forms of perceived parenting" (Magaro and Weisz 2006, p. 873).

Moreover, while many studies have assumed that parents are better reporters of their own upbringing behaviors than adolescents are, Dekovic et al. (2005) has noted two compelling reasons why adolescent reports may in fact be a better representation. First, parents have been found in research to have a strong positive bias of their own upbringing behaviors and parental reports have been shown to have less agreement with outside observers than adolescent reports have (Cook and Goldstein 1993). Second, the subjective experience of being "brought up" has more influence on adolescent development (Steinberg et al. 1992) and is more strongly related to adolescent adjustment and mental health than parents' reports of their upbringing behaviors (Gesac and Schwalbe 1986). Dekovic et al. (2005) underscore the importance of the adolescent's perception of being "brought up" in relation to the adolescent's problem behaviors by quoting Gesac and Schwalbe (1986): "It is our *perception* of others' attitude or behavior which are more consequential for our own attitudes and behavior than the actual attitudes or behavior of others" (p. 42, italics ours). Therefore, in light of our findings, we would suggest that our use of adolescent reports of perceived parental rejection is justified. Still it is possible that the employment of a multi-informant method could also have been used to study differences in adolescent and parent reporting of perceived parental rejection, as

well as adolescents' depressive symptoms and aggression. Furthermore, the use of other informants, such as teachers and clinicians, can also be employed in helping to unravel the relationship between adolescents' problem behavior and perceived parental rejection (e.g., Garber et al. 1997).

Conclusion

The findings of this study demonstrated that perceived parental rejection, adolescents' depressive symptoms and aggression can be viewed as two unidirectional effects models that work in tandem: adolescents' depressive symptoms predicting perceived parental rejection and, in turn, this perceived parental rejection predicting adolescents' aggression. Bidirectional effects only occurred between adolescents' depressive symptoms and perceived parental rejection at the first two waves of the study. As predicted, the model effects diminished over time as the adolescents grew older and became more independent of their parents. And finally, the model effects were similar for both adolescent boys and girls.

Acknowledgements This study was funded by the Research Center Adolescent Development at Utrecht University.

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