AGGRESSIVE BEHAVIOR
Volume 41, pages 214–226 (2015)

Reactive and Proactive Aggression: Differential Links With Emotion Regulation Difficulties, Maternal Criticism in Adolescence

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Proactive and reactive functions of aggression are thought to manifest through different familial and emotional processes, even though they often co-occur. We investigated direct and indirect pathways through which maternal criticism and emotion regulation (ER) difficulties relate to reactive and proactive aggression in adolescence. Further, we examined how maternal criticism and emotion dysregulation interrelate, both concurrently and over time. Participants were 482 Dutch adolescents ($M = 15.03$, $SD = 0.45$, 57% boys) who self-reported on their ER difficulties, perceived maternal criticism, and reactive/proactive aggression. Cross-lagged panel modeling across four annual measurements revealed direct bidirectional links over time between maternal criticism and emotion dysregulation. Positive links over time from maternal criticism to proactive (but not reactive) aggression were also present. Emotion dysregulation and proactive aggression were linked only indirectly via maternal criticism. Gender did not significantly moderate these links. By revealing differential developmental pathways involving adolescents' ER and maternal criticism, the present study offers support for the dual function model of aggression. Aggr. Behav. 41:214–226, 2015.

Keywords: adolescents; longitudinal; maternal criticism; emotion regulation; reactive/proactive aggression

INTRODUCTION

Aggressive adolescents are at risk of experiencing other adjustment problems, including substance abuse, delinquency, personality disorders, and disruptions in family, school, and peer relations (Barnow, Lucht, & Freyberger, 2005; Johnson et al., 2000; Updegraff, Thayer, Whiteman, Denning, & McHale, 2005; White, Brick, & Hansell, 1993). Aggressive acts can differ in their developmental origins, serve various purposes, and have diverse consequences (Mullin & Hinshaw, 2007). It is thus important to differentiate between reactive and proactive functions of aggression. Reactive aggression is a defensive response linked to frustration or threat and is exhibited in reaction to provocation. Proactive aggression, in contrast, involves calculated efforts to obtain resources important for the self (Dodge, Harnish, Lochman, Bates, & Pettit, 1997). Youth's aggression emerges, at least in part, from the complex interplay between dispositional characteristics, such as emotion regulation (ER) abilities and social experiences with parents and peers (Rubin, Bukowski, & Parker, 1998). The current study aims to expand on previous knowledge in two ways. First, we examined concurrent and longitudinal associations between maternal criticism and emotion dysregulation in adolescence. Second, we investigated how youth's ER difficulties and parental factors, namely maternal criticism, link to specific reactive and proactive aggression problems in adolescence.

Prior research is generally consistent in finding that aggressive youth typically display both reactive and

Conflicts of interest: None.

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Received 5 November 2013; Revised 9 January 2015; Accepted 13 January 2015

DOI: 10.1002/ab.21583
Published online 3 Marh 2015 in Wiley Online Library (wileyonlinelibrary.com).

proactive aggression, rather than exclusively behaving one way or the other (Fite, Colder, & Pelham, 2006; Hubbard, McAuliffe, Morrow, & Romano, 2010; Pang, Ang, Kom, Tan, & Chiang, 2013; Vitaro, Barker, Boivin, Brendgen, & Tremblay, 2006; Xu, Farver, & Zhang, 2009). Some, however, see this function-based distinction as having too much conceptual convergence and thus question its utility (Bushman & Anderson, 2001). Although these subtypes have been shown to often co-occur (Vitaro & Brendgen, 2005), factor analyses have demonstrated that these functions emerge as two constructs (Dodge, 1991; Fite et al., 2006; Poulin & Boivin, 2000). Increasing evidence suggests that reactive and proactive aggression indeed have different antecedents and outcomes (see Hubbard et al., 2010; Kempes, Matthys, de Vries, & van Engeland, 2005; and Vitaro & Brendgen, 2005, for reviews). Most importantly, this distinction has implications for interventions, as different types of adolescent aggression seem to respond differently to clinical treatments (Barker et al., 2010). A deeper understanding of the underlying and related processes might ultimately lead to the development of treatments that more fully address both reactive and proactive aggressive behavior.

Parents are one of the most powerful influences upon children's and adolescents' functioning. Invalidating environments characterized by pervasive minimizing or dismissing of emotions have been linked to externalizing behavior problems, including aggression (e.g., Eisenberg et al., 2001; Frye & Garber, 2005; Gravener et al., 2012). Parental criticism, a type of invalidation, is characterized by feelings of hostility or resentment directed toward offspring (Peris & Hinshaw, 2003). Youth who frequently experience such criticism may not learn to associate negative consequences with undesirable behavior, making it unlikely for them to inhibit aggression (Fite et al., 2006). Nevertheless, relatively few studies have examined the differential links that invalidating parenting may hold with reactive and proactive aggression. Longitudinal research addressing these relations is especially scarce. To our knowledge, the only exception is a study by Vitaro, Barker et al. (2006), which found that hostile-coercive parenting in toddlerhood (17 months) predicted both reactive and proactive aggression in early childhood (72 months). Cross-sectionally, inconsistent parental discipline has been related to both functions of aggression in schoolchildren from the USA (Fite et al., 2006). Similarly, harsh parenting (i.e., use of physical punishment, verbal assaults, and punitive/non-reasoning strategies) was related to reactive and proactive aggression in schoolchildren from China (Xu et al., 2009). Thus, emerging evidence suggests that invalidating parenting is connected to both reactive and proactive aggression in childhood.

Based on the pattern of prior findings, it is tempting to conclude that, contrary to a dual aggression perspective, these two forms of aggression may in fact share a common etiology. In the original dual model of aggression, Dodge et al. (1997) proposed that reactive and proactive aggression are completely independent functions that define two types of aggressors and occur in light of different developmental history. According to this model, reactively aggressive youth would show a history of physical abuse, while proactively aggressive ones would be exposed to aggressive role models in a family that values the use of aggression to resolve conflict or advance personal interests. Nevertheless, due to the aforementioned co-occurrence of reactive and proactive aggression (e.g., Fite et al., 2006; Hubbard et al., 2010), researchers now suggest that the dual aggression model should be approached in a dimensional manner instead of categorically (Merk, Orobio de Castro, Koops, & Matthys, 2005). Given this view, some researchers further suggest that both reactive and proactive aggression can relate to the same correlates via different developmental pathways (Fite et al., 2006; Vitaro, Barker et al., 2006). For example, substance use initiation relates to reactive aggression through peer rejection and to proactive aggression through association with delinquent peers (Fite, Colder, Lochman, & Wells, 2008). Thus, even in the case of substantial correlation between both functions and the presence of shared correlates, separate developmental pathways would support conceptual differentiation between reactive and proactive aggression (Merk et al., 2005; Vitaro, Brendgen, & Barker, 2006). It remains unclear, however, whether different underlying mechanisms link the same parental behavior to different functions of aggression.

It has been suggested that a third variable, such as youth's ER abilities, could act as the "missing link" explaining the long-term sequence between invalidating parenting and reactive aggression but not proactive aggression (Hubbard et al., 2010; Kempes et al., 2005). Frustration theory suggests that reactive aggression stems from an emotional and impulsive response to a perceived frustration (Berkowitz, 1962). Such behavior can indicate ER dysfunction (Mullin & Hinshaw, 2007), characterized by difficulties in awareness, understanding and acceptance of emotions, the access to adaptive strategies for dealing with emotions, or the ability to control behavior when experiencing high emotional arousal (Gratz & Roemer, 2004). In contrast, adolescents are not expected to experience emotional over-arousal when aggressing proactively (Hubbard et al., 2010). Indeed, reactive aggression, but not proactive aggression, has been commonly connected with emotional over-arousal, anger, or negative emotionality in childhood (Dodge et al., 1997; Vitaro, Barker et al., 2006; Xu et al.,

2009) and adolescence (Marsee & Frick, 2007). One exception is a cross-sectional study in which ER was related to both types of aggression (Orobio de Castro, Merk, Koops, Veerman, & Bosch, 2005). This research, however, was conducted with a clinical sample of 7–13 year-old boys referred for aggression problems and these findings may not be generalizable to normative populations.

With regard to proactive aggression, social learning theory (Bandura, 1973) suggests that criticizing or harsh parenting creates an environment in which coercive behavior is directly strengthened and perceived as functional (Patterson, DeBaryshe, & Ramsey, 1989). Yet, criticism may also undermine management of emotions and related behavior, due to a lack of emotional security (Eisenberg, Fabes, & Murphy, 1996; Gross & Levenson, 1993; Rosenthal, Polusny, & Follette, 2006). Emotional security has been proposed to affect ER in a few ways; for example, through subjective feeling states, overt behavioral expressions of emotion, physiological functioning, as well as cognitive appraisals and internal representations of family relations (see Davies & Cummings, 1994). Youth may not be clear about what behavior is expected in particular situations and how negative emotional states can be alleviated (Eisenberg, Fabes, & Murphy, 1996). Indeed, adverse family conditions, such as interparental discord, have been previously shown to lead to childhood psychopathology through decreased emotional security and increased reactivity (e.g. Cummings, Schermerhorn, Davies, Goeke-Morey, & Cummings, 2006; Davies & Cummings, 1998). Additionally, mothers seem to be engaged in youth's emotional development more than fathers (Klimes-Dougan et al., 2007). Hence, it seems reasonable that reactive aggression would directly and indirectly relate to mothers' criticizing behavior and to youth's ER dysfunction. Conversely, proactive aggression might not hold direct links to ER.

The cross-sectional nature of prior studies, and their strong focus on childhood, has resulted in a relative lack of knowledge about how negative parenting, youth's ER, and reactive/proactive aggression relate over time in adolescence. First, cross-sectional designs make it impossible to say anything about the direction of over-time associations. Not only can certain parental behavior impact youth's ER abilities and related reactive behavior (parent-effect), but adolescents, themselves, can be active agents (child-effect) in their emotion socialization by triggering particular responses from parents (Glatz, Stattin, & Kerr, 2011; Neumann & Koot, 2011; Trosper, Buzzella, Bennett, & Ehrenreich, 2009). Processes of parent–youth interaction can also be transactional (Kuczynski & Parkin, 2007). That is, youth who encounter non-supportive and critical reactions to their ER difficulties may be likely to remain emotionally aroused and may become more dysregulated in subsequent emotional situations (Eisenberg et al., 1996). This, consequently, may provoke further disapproval from parents. Nevertheless, the general consensus is to assume a unidirectional relation from parenting to ER (Fite et al., 2006; Ramsden & Hubbard, 2002; Roth & Assor, 2012; Walton & Flouri, 2010). To our knowledge, only one study (Eisenberg et al., 1999) examined and found a bidirectional relation over time between punitive parental reactions and children's (initially 4–6 years old) externalization of emotions (i.e., hostility, irritability, over-reactivity, and anger).

Second, while high correlations are found, the cross-sectional nature of prior studies hinders the understanding of the over-time relation between reactive and proactive functions of aggression. There are, however, some indications that reactive aggression is predictive of later proactive aggression in childhood, but not the other way around (Lansford, Dodge, Pettit, & Bates, 2002). This would suggest that reactive aggression precedes proactive aggression and follows a different developmental path (Vitaro, Brendgen, & Barker, 2006). It remains unclear, however, how these functions of aggression interact in adolescence.

Third, prior studies focused on childhood may not generalize to processes linking parental criticism and ER abilities to reactive/proactive aggression in adolescence (Morris, Silk, Steinberg, Myers, & Robinson, 2007). Increases in the intensity and frequency of (negative) emotions, emotional variability, and the emergence of several types of psychopathology are common in adolescence (Larson & Lampman-Petraitis, 1989; Moffitt, Caspi, Dickson, Silva, & Stanton, 1996; Neumann, Van Lier, Frijns, Meeus, & Koot, 2011; Neumann, van Lier, Gratz, Meeus, & Koot, 2010). Given the challenges faced in adolescence and the related risks, longitudinal links between invalidating parental behavior and youth's emotion dysregulation may be key factors for maladaptive development.

OVERVIEW AND PRESENT STUDY

The main goal of the present study was to comprehensively examine longitudinal relations between maternal criticism, youth's ER, and reactive and proactive aggression in adolescence. In general, our aim was to see whether there are differential developmental pathways to reactive and proactive aggression, which would support a distinction between reactive and proactive aggression and, in turn, the dual aggression model. To be more specific, we predicted concurrent associations and bidirectional relations over time between maternal criticism and adolescents' ER difficulties (Hypothesis

1). That is, we expected higher maternal criticism to predict higher subsequent ER difficulties, which would in turn predict higher criticism later on. We also expected positive relations, concurrently and longitudinally, between maternal criticism and both reactive (Hypothesis 2) and proactive aggression (Hypothesis 3). Furthermore, we predicted ER difficulties to be positively related to reactive aggression both concurrently and over time (Hypothesis 4). The links between ER difficulties and proactive aggression, if any, were expected to be smaller than the links between ER difficulties and reactive aggression. Based on previous research, we expected strong correlations between reactive and proactive aggression. Yet, due to the lack of previous research, no specific hypotheses were put forth for this particular study regarding the direction of these effects over time. Additionally, we assessed whether any indirect relations existed between maternal criticism, adolescents' ER difficulties, and reactive aggression. We also evaluated whether these indirect relations, if present, were driven by parent-effect or child-effects.

Finally, previous findings suggest that parental emotion socialization may depend on the offspring's gender (Morris et al., 2007; Zeman, Cassano, Perry-Parrish, & Stegall, 2006). For example, Ramsden and Hubbard (2002) found that the link from negative maternal expressiveness to ER only held for girls. In contrast, neither Eisenberg et al. (2001), nor Vitaro, Barker et al. (2006) found their results to be different for boys and girls. As empirical evidence is not consistent regarding the presence or direction of gender effects, we explored the possibility of gender moderation with no *a priori* expectations.

METHODS

Participants

Participants in this research responded as a part of the ongoing longitudinal RADAR-Young (Research on Adolescent Development and Relationships, young cohort) project. This Dutch prospective cohort consists of 497 adolescents and their families (283 boys and 214 girls). Participants were recruited from randomly selected Dutch schools. At the beginning of the project (2005), 95.2% of these adolescents identified themselves as Dutch and 10.8% belonged to low SES families. Due to purposeful oversampling, 206 (41.4%) of these adolescents were identified as being at risk for externalizing problems (see Neumann et al., 2011 for a more extensive description).

The current study used the last four out of the six waves of the annual questionnaire data as only these waves of data (collected in 2007–2010) included measures of ER difficulties. Only the adolescents who had participated in the project during these four waves could be involved in the current study, which led to 3% attrition. In general, according to multivariate analysis of variance, these drop-outs did not yield significant or substantial differences in background information (i.e., gender, age, parent's social economic status, and age of mothers) when compared to those who did participate in the study during these four waves ($F(5,455) = 1.66$, $p = .143$, $\eta^2_p = .018$). This resulted in the final sample consisting of 482 adolescents, 275 of whom were boys and 207 were girls. They were 15.03 years old on average (range: 13.68–17.56, $SD = 0.45$) at the time of the first measurement included in this study (heretofore referred to as W1; 2007).

Procedure

Before the study, both adolescents and their parents provided written informed consent. Trained research assistants arranged annual home visits with each family. During these visits, after receiving verbal and written instructions, the adolescents completed a large battery of questionnaires. With each visit, families received a financial reward equivalent to 150 US dollars. The study was approved by the ethical-medical committee of University Medical Centre Utrecht.

Measures

Aggression. The Self-Report of Aggression and Social Behavior Measure (SRASBM), developed by Morales and Crick (1998) and published in Linder, Crick, and Collins (2002) was used to obtain adolescents' self-reports of proactive and reactive aggressive behavior. Subscales include eight items assessing reactive aggression (e.g., "When I am not invited to do something with a group of people, I will exclude those people from future activities."), and eight assessing proactive aggression (e.g., "I have threatened to share private information about my friends with other people in order to get them to comply with my wishes."). Responses for all items range from 1 (*not at all true*) to 7 (*very true*). Reactive and proactive subscale scores were calculated by computing the sum of associated items. Previous research has supported the reliability and construct validity of these subscales (Bailey & Ostrov, 2008; Ostrov & Houston, 2008). In the present study, reliability as measured by Cronbach's alpha ranged from .84 to .87 across all four measurement points for reactive aggression and from .89 to .91 for proactive aggression.

ER difficulties. Adolescents self-reported on the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004), designed to assess clinically relevant problems in ER abilities. The scale consists of 36 items that measure lack of emotional awareness (e.g., "I pay attention to how I feel."), lack of emotional clarity (e.g.,

"I have difficulty making sense out of my feelings."), difficulties controlling impulsive behavior when distressed (e.g., "When I'm upset, I become out of control."), difficulties engaging in goal-directed behavior when distressed (e.g., "When I'm upset, I have difficulty focusing on other things."), non-acceptance of negative emotional responses (e.g., "When I'm upset, I become angry with myself for feeling that way."), and limited access to effective ER strategies (e.g., "When I'm upset, I know that I can find a way to eventually feel better."). Items are scored on a 5-point Likert scale ranging from 1 (*almost never*) to 5 (*almost always*). A total scale score was obtained by summing all the items, with higher scores indicating greater ER problems. The Dutch version of this scale has been previously validated in an adolescent sample (Neumann et al., 2010). In the current study, scale scores showed acceptable Cronbach's alpha reliability, ranging from .91 to .93 across all measurement points.

Maternal criticism. To measure mothers' expressed general criticism, we used the criticism scale of the Level of Expressed Emotion questionnaire (LEE; Cole & Kazarian, 1988). Adolescents rated five items (e.g., "My mother is critical of me") on a 4-point scale ($1 = untrue$, $4 = true$). Composite scale scores were computed by summing item scores, where higher scores indicated more expressed criticism. Reliability and construct validity of the Dutch version of this scale have been shown to be strong in prior studies (Hale, Raaijmakers, Gerlsma, & Meeus, 2007). Cronbach's alpha reliability in the current study ranged from .76 to .81 across time points.

Strategy of Analysis

We employed four-wave cross-lagged panel analyses to examine the longitudinal links between maternal criticism, adolescents' ER difficulties, and reactive/proactive aggression. The analyses were modeled with Mplus v6.0 (Muthen & Muthen, 2010). We analyzed a four-wave cross-lagged model including all four study variables. We used several indexes to determine model fit including the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). A CFI $\geq .90$, RMSEA $\leq .05$, and SRMR $\leq .05$ indicate a model's acceptable fit to the data (Kline, 2011). The model included correlations between the variables at each wave, cross-lagged paths, and 1 and 2-year stability paths between consecutive measurement points. The cross-lagged paths were further examined to determine the direction of the links between maternal criticism and adolescents' ER. The possible existence of indirect effects (Hayes, 2009; Zhao, Lynch, & Chen, 2010) was also examined. In this analysis, all the indirect paths were estimated simultaneously, including those from maternal criticism to reactive aggression, through adolescents' ER (parent-effect), from adolescents' ER to reactive aggression, through maternal criticism (child-effect), and from maternal criticism to adolescents' ER, through reactive aggression, as well as the reversed pathways. Corresponding pathways for proactive aggression were also calculated.

For each research variable, a maximum of 13.7% of cases ($N = 66$) were missing. The pattern of missing values was evaluated with Little's (1988) MCAR test. Although this very stringent test yielded significant result ($\chi^2(19{,}705) = 20567.37$, $p < .001$), the Chi-square (χ^2)/degrees of freedom (*df*) ratio of 1.04 indicated a good fit between sample scores with and without imputation (Bollen, 1989). Therefore, the missing data were accounted for by the use of full information maximum likelihood (FIML) estimation. All models in the analysis were corrected for non-normal distributions by applying maximum likelihood estimation with robust standard errors (MLR).

Furthermore, we tested whether the longitudinal cross-lagged effects were time-invariant by constraining cross-lagged paths between maternal criticism, adolescents' ER, reactive and proactive aggression at the first interval (W1–W2) to be equal to the corresponding paths in the other intervals of the model (W2–W3 and W3–W4).

RESULTS

Descriptive Statistics

Table I shows means and standard deviations of the variables in the current study and Table II shows bivariate correlations. In general, all the variables correlated in a positive direction (Table II) and yielded significant coefficients with sizes ranging from small to large (.16–.77; Cohen, 1988). To be more specific, within-wave correlations between maternal criticism and ER difficulties produced quite large coefficients (.40–.47). Corresponding correlations between maternal criticism and reactive, as well as proactive, aggression were medium (.23–.32 and .27–.34, respectively). Whereas ER difficulty showed medium-strength correlations with reactive aggression (.29–.33), it yielded smaller correlation coefficients for links with proactive aggression (.16–.29). All these synchronous correlations were relatively stable over time. Additionally, reactive and proactive aggression exhibited high correlations (.42–.77), as was expected.

Multivariate repeated measures analysis of variance with maternal criticism, adolescents' ER, and reactive and proactive aggression revealed that there were statistically significant differences in the mean scores between boys and girls ($F(6{,}359) = 16.04$, $p < .001$,

TABLE I. Means and Standard Deviations for Adolescents' Emotion Regulation Difficulties (ER), Maternal Criticism (CR), and Adolescents' Reactive (RA), and Proactive (PA) Aggression per Wave and Gender

				Boys		Girls	
Variable		*M*	SD	*M*	SD	*M*	SD
1.	ER1	2.16	0.56	2.05	0.45	2.30	0.66
2.	ER2	2.17	0.58	2.05	0.46	2.30	0.69
3.	ER3	2.17	0.59	2.08	0.49	2.27	0.66
4.	ER4	2.21	0.61	2.13	0.51	2.27	0.67
5.	CR1	1.78	0.56	1.81	0.51	1.72	0.63
6.	CR2	1.81	0.56	1.82	0.49	1.74	0.63
7.	CR3	1.78	0.59	1.85	0.57	1.68	0.59
8.	CR4	1.77	0.57	1.82	0.53	1.71	0.62
9.	RA1	1.85	0.93	1.94	0.94	1.67	0.83
10.	RA2	1.83	0.95	1.93	0.98	1.66	0.86
11.	RA3	1.78	0.95	1.88	0.96	1.65	0.82
12.	RA4	1.72	0.90	1.80	0.94	1.62	0.83
13.	PA1	1.38	0.68	1.42	0.65	1.29	0.62
14.	PA2	1.42	0.69	1.49	0.73	1.29	0.57
15.	PA3	1.38	0.68	1.43	0.69	1.29	0.53
16.	PA4	1.35	0.65	1.45	0.74	1.24	0.52

Note. The average scores for all scales are presented here. For subsequent analyses, summed scale scores were used.

$\eta^2_p = .15$). However, neither the multivariate test of the test occasion ($F(12,351) = 0.90, p = .544, \eta^2_p = .03$), nor the test of interaction between the test occasion and the gender group ($F(12,351) = 1.39,\ p = .170,\ \eta^2_p = .05$) yielded significant differences. After further analysis, univariate tests revealed that statistically significant gender differences were present for all four study variables. As can be seen in Table I, girls consistently scored higher on ER difficulties ($F(1,362) = 16.27$, $p < .001$, $\eta^2_p = .04$) and maternal criticism ($F(1,362) = 4.82$, $p = .029$, $\eta^2_p = .01$) than boys, but boys scored higher on reactive ($F(1,362) = 8.23$, $p = .004$, $\eta^2_p = .02$) and proactive ($F(1,362) = 9.12$, $p = .003$, $\eta^2_p = .03$) aggressive behavior than girls.

Cross-Lagged Panel Modeling

Equality constraints were imposed to see whether the cross-lagged paths were time-invariant. Imposing them did not lead to a significantly worse Satorra–Bentler Chi-square model fit (Satorra, 2000) for the model ($\Delta\chi^2 SB = 14.58$, $\Delta df = 24$, $p = .932$). Hence, all the cross-lagged paths could be constrained to be invariant over time.

When all the cross-lagged paths and constraints were included, the model showed good fit ($\chi^2 SB(64) = 71.16$,

TABLE II. Bivariate Correlations for Adolescents' Emotion Regulation Difficulties (ER), Maternal Criticism (CR), and Adolescents' Reactive (RA), and Proactive (PA) Aggression per Wave

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	ER1	—															
2.	ER2	.69	—														
3.	ER3	.56	.71	—													
4.	ER4	.52	.60	.71	—												
5.	CR1	.40	.35	.33	.30	—											
6.	CR2	.35	.41	.43	.36	.61	—										
7.	CR3	.32	.36	.46	.40	.57	.68	—									
8.	CR4	.27	.31	.42	.47	.51	.53	.66	—								
9.	RA1	.33	.25	.26	.20	.32	.25	.28	.22	—							
10.	RA2	.25	.29	.27	.20	.28	.23	.26	.17	.72	—						
11.	RA3	.23	.23	.29	.26	.24	.20	.26	.19	.60	.62	—					
12.	RA4	.21	.23	.31	.31	.22	.16	.28	.26	.56	.58	.49	—				
13.	PA1	.29	.23	.26	.16	.27	.26	.28	.21	.76	.55	.49	.47	—			
14.	PA2	.21	.27	.24	.16	.29	.27	.29	.26	.59	.76	.48	.42	.63	—		
15.	PA3	.21	.21	.25	.21	.25	.24	.29	.23	.46	.45	.77	.49	.54	.51	—	
16.	PA4	.20	.21	.25	.29	.24	.17	.27	.34	.47	.45	.48	.77	.50	.50	.49	—

Note. All correlations $p \leq .01$.

$p = .252$, CFI = .997, RMSEA = .015, SRMR = .027). Significant paths and standardized coefficients for the final models of reactive and proactive aggression are displayed in Figure 1. Unstandardized coefficients and standard errors for all the stability and cross-lagged paths of the final model can be found in Table III.

Direct effects. The cross-lagged panel model with significant direct effects is displayed in Figure 1. We first examined the direction of longitudinal links between maternal criticism and adolescents' ER difficulties. We found that higher scores on adolescents' ER difficulties were predictive of higher perceived maternal criticism in each subsequent year. Conversely, higher scores on maternal criticism predicted more ER difficulties in the next measurement wave. Hence, in line with Hypothesis 1, these results indicated the presence of bidirectional effects between adolescents' ER and perceived maternal criticism.

Maternal criticism was associated with both forms of aggression within the time points. We were then interested in the longitudinal links between maternal criticism and reactive and proactive aggression, respectively. Examination of the cross-lagged paths (Table III) revealed that, in contrast to Hypothesis 2, none of the longitudinal links between maternal criticism and reactive aggression yielded significant results. Maternal criticism, however, was linked with proactive aggression. Namely, in line with Hypothesis 3, higher scores on perceived maternal criticism were predictive of more proactive aggression in the subsequent measurement wave.

Adolescents' ER showed significant links with both forms of aggression within time points. We then investigated whether direct over-time relations were present between adolescents' ER and reactive or proactive aggression. None of the direct cross-lagged paths linking adolescents' ER difficulties with aggression were statistically significant (Table III). Hence, no support was found for the predicted (Hypothesis 4) link between adolescents' ER and reactive aggression, nor was such a link present for proactive aggression.

Both functions of aggression also exhibited significant links within time points. Although we had not made specific hypotheses regarding the direction of over-time associations, we observed longitudinal links between reactive and proactive aggression. Namely, higher scores of reactive aggression predicted higher scores of proactive aggression in subsequent waves.

Indirect effects. After establishing the direct paths in the models, we aimed to learn whether any indirect links were involved in the relation between maternal criticism, ER and reactive/proactive aggression. None of the indirect paths involving reactive aggression reached statistical significance (*std. coefficient* range: −.002–.005,

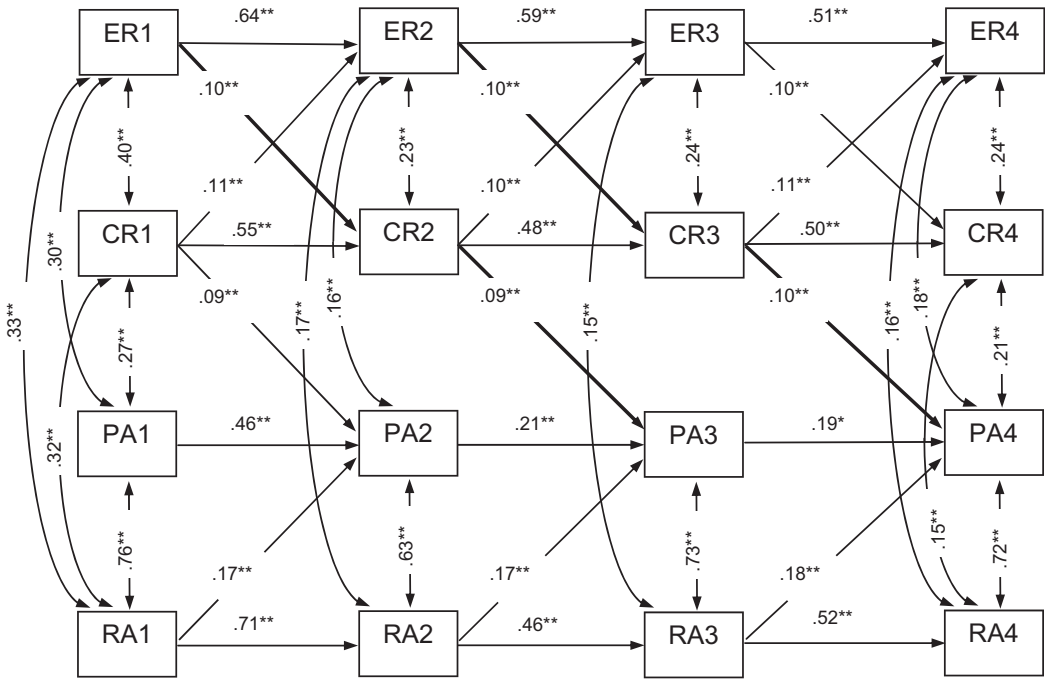

Fig. 1. Cross-lagged panel model examining relations between adolescents' emotion regulation difficulties (ER), maternal criticism (CR), proactive aggression (PA), and reactive aggression (RA). ***Note.*** **Cross-lagged paths were constrained over time. Only significant 1-year paths are reported. Lines in bold depict significant indirect paths.** $^{*}p \leq .05$. $^{**}p \leq .01$.

TABLE III. Unstandardized Coefficients and Standard Errors for Stability and Cross-Lagged Paths in Models Examining Relations between Adolescents' Emotion Regulation Difficulties (ER), Maternal Criticism (CR), Reactive (RA), and Proactive (PA) Aggression

	W1–W2		W2–W3		W3–W4	
Variable	*B*	SE	*B*	SE	*B*	SE
Stability paths						
ER	0.66**	0.04	0.58**	0.06	0.53**	0.07
CR	0.55**	0.04	0.51**	0.05	0.48**	0.05
RA	0.71**	0.06	0.48**	0.06	0.49**	0.07
PA	0.45**	0.09	0.21**	0.08	0.18*	0.08
Cross-lagged paths						
ER to CR	0.02**	0.00	0.02**	0.00	0.02**	0.00
CR to ER	0.72**	0.16	0.72**	0.16	0.72**	0.16
ER to RA	0.01	0.01	0.01	0.01	0.01	0.01
CR to RA	0.13	0.07	0.13	0.07	0.13	0.07
ER to PA	0.00	0.01	0.00	0.01	0.00	0.01
CR to PA	0.18**	0.06	0.18**	0.06	0.18**	0.06
RA to ER	0.09	0.10	0.09	0.10	0.09	0.10
RA to CR	−0.01	0.01	−0.01	0.01	−0.06	0.01
PA to ER	−0.05	0.13	−0.05	0.13	−0.05	0.13
PA to CR	0.04	0.02	0.04	0.02	0.04	0.02
RA to PA	0.13**	0.03	0.13**	0.03	0.13**	0.03
PA to RA	−0.03	0.07	−0.03	0.07	−0.03	0.07

Note. W1, Wave 1. Cross-lagged paths are constraint to be equal over time.
*$p \leq .05$,
**$p \leq .01$.

p's $> .093$). However, one indirect pathway involving proactive aggression yielded significant results. Specifically, the paths from ER to proactive aggression, through maternal criticism (*std. coefficient* range: .009–.010, p's range: .017–.020) were significant. The reverse paths from proactive aggression to ER, through criticism (*std. coefficient* = .007, p's $> .068$) were not. Additionally, none of the ER-mediated paths from maternal criticism to proactive aggression, or from proactive aggression to criticism reached significance (*std. coefficient* range: −.001–.000, p's $> .725$). The same was true for the indirect paths from maternal criticism to ER through proactive aggression and their reversed counterparts (*std. coefficient* = −.001, p's $> .725$). In general, there appeared to be small but significant indirect effects between adolescents' ER and proactive (but not reactive) aggression, via maternal criticism.

Gender differences. Finally, we examined whether longitudinal relations between adolescents' ER difficulties, perceived maternal criticism, and reactive/proactive aggression differed depending on adolescents' gender. Constraining cross-lagged paths within each gender to be equal over time did not lead to significant deterioration of the Satorra–Bentler Chi-square (Satorra, 2000) model fit ($\Delta\chi^2$SB = 63.39, $\Delta df = 48$, $p = .067$). Thus, time-invariant constraints were imposed within the separate model for each gender. We checked for gender differences by comparing multi-group models, where the parameters were allowed to vary between boys and girls, to models where the relevant parameters were constrained to be equal across the groups. These constraints were applied for correlations between the variables at each wave, 1- and 2-year stability paths between consecutive measurement points, and cross-lagged paths. Including all the constraints between the groups did not lead to a significantly lower Satorra–Bentler Chi-square model fit ($\Delta\chi^2$SB = 34.31, $\Delta df = 32$, $p = .358$). Therefore, no support existed for gender differences in the longitudinal associations between the maternal criticism, adolescents' ER and reactive/proactive aggression.

DISCUSSION

Using a stringent longitudinal design, we examined how ER difficulties, maternal criticism, and both reactive and proactive aggression relate in adolescence. First, we found bidirectional relations over time between maternal criticism and adolescents' emotion dysregulation (Hypothesis 1). Furthermore, we discovered that maternal criticism and reactive aggression were positively related to one another within time points, but the longitudinal links we predicted were not present (Hypothesis 2). In contrast, we confirmed that more maternal criticism predicted more proactive aggression in adolescence (Hypothesis 3). Unexpectedly, although adolescents' ER difficulties showed positive, concurrent associations with

both reactive (Hypothesis 4) and proactive aggression, significant longitudinal associations were not present. There were, however, indirect child-driven pathways linking ER difficulties and proactive aggression via maternal criticism. We also found both concurrent and longitudinal associations between the functions of aggression, with reactive aggression predicting later proactive aggression. Thus, in support of the dimensional approach to the dual function aggression model (Dodge, 1991; Merk et al., 2005), overall we found differential reactive/proactive aggression-related pathways in adolescence, albeit in different ways than we expected.

We extend prior knowledge on the associations between perceived maternal criticism and adolescents' ER difficulties by showing their reciprocal nature. Specifically, more expressed maternal criticism was connected with more ER difficulties at the subsequent measurement and vice-versa. This finding is in line with the transactional theory of longitudinal parent–child interactions (Kuczynski & Parkin, 2007). Other studies have previously shown that various dimensions of negative parenting are related to youth's ER in childhood (e.g., Chang, Schwartz, Dodge, & McBride-Chang, 2003; Eisenberg & Fabes, 1994; Ramsden & Hubbard, 2002) and adolescence (Neumann & Koot, 2011). Additionally, adolescents' hyperactivity and impulsivity can predict later maternal coldness and rejection (Glatz et al., 2011). Reciprocal relations similar to our findings were previously observed in younger children (Eisenberg et al., 1999). To our knowledge, ours is the first study examining the bidirectionality between maternal criticism and ER in adolescence, thus extending evidence for a child-driven process to this new developmental period.

When examining whether maternal criticism predicted specific aggression problems, we found that the hypothesized over-time associations between maternal criticism and reactive aggression were not present. Yet, we found direct over-time links between perceived maternal criticism and proactive aggression. The lack of links between criticism and reactive aggression is in line with some of the previous research on maternal responses to reactive (and proactive) aggression (Werner, Senich, & Przepyszny, 2006). However, it stands in contradiction to other studies examining how negative parenting relates to behavioral problems in childhood (Fite et al., 2006; Vitaro, Barker et al., 2006; Xu et al., 2009). These previous studies were conducted with younger samples, however, and contained different measures of invalidating parenting. Nevertheless, the finding that maternal criticism predicted later proactive aggression is in line with social learning theory (Bandura, 1973). Frequent maternal expressions of criticism might create a family environment in which youth come to view coercive behavior as acceptable and functional. This may lead to the expectation of positive outcomes from aggression and thus enforce similar coercive behavior in youth. This finding also corresponds to previous research showing that harsh negative parenting relates to proactive aggression (Vitaro, Barker et al., 2006), as well as that maternal criticism relates to offspring's aggression, more generally (Frye & Garber, 2005; Gravener et al., 2012).

Although concurrent associations existed between adolescents' ER difficulties and reactive aggression, corresponding over-time relations were not present. This finding is in line with some of the previous research on the relations between caregivers' negative emotionality, children's ER, and more general externalizing problems (McCoy & Raver, 2011). Yet, it contradicts most studies examining how negative parenting and ER relate to general behavioral problems in childhood (Chang et al., 2003; Eisenberg et al., 1999; Ramsden & Hubbard, 2002) and adolescence (Neumann et al., 2010). The absence of the predicted cross-lagged effects in our study could be explained by differences in participant age or choice of measures of behavioral problems, in comparison to previous studies. Given the lack of previously discussed links between maternal criticism and reactive aggression, however, it could also be attributed to the process of overlapping development, with no priority of parent- or child-effects. In other words, it is possible that maternal criticism and youth's ER relate to reactive aggression in tandem. Such a notion is evidenced by the relative stability and strength of the synchronous correlations in the model, indicating that relations between the constructs were fairly consistent. Moreover, younger children are more reactively aggressive, while adolescents tend to more often plan aggression and hide their intent (Connor, Steingard, Cunningham, Melloni, & Anderson, 2004). This may mean that reactive aggression manifests earlier in developmental history and becomes relatively stable by adolescence (Card & Little, 2006). It could be speculated that while the examined longitudinal associations unfold separately during childhood, maternal criticism and youth's ER relate to reactive aggression simultaneously in adolescence. In any case, the absence of over-time links between reactive aggression and criticism or ER, respectively, does not contradict a distinction of proactive and reactive aggression with respect to their etiological pathways (Dodge, 1991).

Although there were no direct over-time relations between adolescents' ER difficulties and proactive aggression, indirect longitudinal pathways existed through maternal criticism. Perceived maternal criticism mediated the paths from ER difficulties to later proactive aggression. Such a sequence of events seems to indicate a child-driven process. Although such a finding is different from those in previous research, it is understandable in light of the notion that youth living in an environment

supportive of coercive behavior would exhibit proactive aggression (Patterson et al., 1989). After all, it is possible that adolescents' impaired regulatory abilities and expressions of emotional overarousal might provoke criticism from the mother. In turn, such criticism would fail to teach youth adaptive regulatory strategies and provide a relational model based on coercive behavior. It should be noted, however, that these indirect links yielded only small effect sizes and thus should be interpreted with caution.

Higher reactive aggression predicted higher proactive aggression later on. This finding is in line with previous research on younger children indicating that reactive aggression predicted later proactive aggression, but not the other way around (Lansford et al., 2002). Given that reactive aggression is believed to appear earlier in life than proactive aggression and to be more stable over time (Card & Little, 2006), it is not surprising that reactive aggression would precede and predict proactive aggression. It has been suggested that behaving in a reactively aggressive manner might teach one that aggression can be rewarding. Such discovery may then reinforce the aggressive behavior and provoke instances of proactive aggression (Merk et al., 2005).

Regarding gender differences, boys in the present study were more aggressive than girls, while girls experienced more ER difficulties and more maternal criticism than boys. Gender did not moderate the over-time relations between ER difficulties, maternal criticism, and reactive/proactive aggression. The observed gender differences in mean scores might reflect differential socialization experiences; in particular, aggressive behavior in boys might be more readily tolerated than in girls (Vitaro, Barker et al., 2006). Correspondingly, it seems more acceptable for women to report experiencing greater emotional intensity than men (Gross & John, 1998). The lack of moderation effects here indicates that the developmental order of ER, criticism, and aggression in adolescence may not differ between boys and girls.

Limitations and Future Directions

The current study has several strengths, including a large sample and a strict longitudinal design that controlled for all possible associations between the variables. It does, however, have limitations. First, only adolescent self-report data were included. Nevertheless, adolescents are likely to be the best experts on how they perceive maternal behavior and mothers may lack insight into how youth interpret their actions. Only adolescents themselves have direct knowledge of their own emotions and can differentiate between reactive or proactive motives. Having said this, adolescents experiencing ER difficulties and exhibiting reactive aggression may not possess enough self-awareness to successfully reflect on such issues (Hubbard et al., 2010). Thus, future research could utilize observational or multiple-source measurements in order to achieve a more objective understanding.

Second, there are some methodological differences between the present research and past studies that could impede comparison and interpretation. This was mainly the case for the results of reactive aggression. For example, compared to previous investigations (Chang et al., 2003; Eisenberg et al., 1999), the current study utilized a measure of more generally expressed maternal criticism instead of parental reactions to their children's negative emotions or behavior. Whereas social learning theory (Bandura, 1973) suggests that proactive aggression occurs due to a generally reinforcing environment, frustration theory (Berkowitz, 1962) suggests that reactive aggression manifests itself in response to a specific perceived threat. It is plausible that results would differ had we measured frequent or a real-time criticism in response to particular aggressive acts. Furthermore, it is possible that a heightened sensitivity to specific negative emotions and subsequent inability to regulate these emotions, and not overall ER difficulties, would be related to reactive aggression. Since such qualities were not assessed in the present study, additional research is required to examine the interplay between these components.

A number of other family and situational factors could also affect youth's aggressive behavior, especially in adolescence. Such influences could include fathers' behavior, family socio-economic status, bully/victim status, and adolescents' association with deviant peers or substance use. Although including all the possible variables influencing adolescents' aggression is not possible within a single study, future research could benefit from including other covariates.

Practical Implications

These findings suggest that parenting may constitute an important component in interventions with adolescents experiencing ER difficulties or exhibiting proactive aggression. The bidirectionality in the present results highlights the importance of comprehensive interventions that simultaneously target multiple aspects of the problem. This would suggest that proactive aggression treatments could benefit from parent training programs. For example, "The Coping Power" (Lochman & Wells, 2004) or "The Adolescent Transitions" (Dishion, Andrews, Kavanagh, & Soberman, 1996) interventions aim to prevent the development of antisocial and delinquent behavior via parents' improved family management.

This study may also have important implications for interventions specifically targeting reactive aggression.

For example, "The Anger Control Program" (Feindler, 2006) focuses on teaching adolescents how to modify aggressive and impulsive behavior when faced with aversive or stressful situations. In contradiction to previous beliefs, based on the current findings, it seems that the development of reactive aggression could be relatively more independent from ER abilities in adolescence than in childhood. This, in turn, may suggest the importance of early interventions for reactively aggressive children, as well as a need for further research on predictors of reactive aggression in adolescence. Furthermore, interventions targeting reactive aggression may benefit from inclusion of additional components serving as prevention of later proactive aggression.

CONCLUSION

The current study expands previous knowledge on the function-based distinction between reactive and proactive aggression. By revealing differential developmental pathways involving adolescents' ER and maternal criticism, the present study offers novel support for the dual function model of aggression. Furthermore, the findings suggest that maternal criticism is reciprocally related to emotion dysregulation and is linked to increased proactive aggression in adolescence. These findings suggest that the differentiation between reactive and proactive aggression is important, useful, and deserving of further research attention.

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