

The Interactive Effects of Mothers' Reactions and Children's Temperament on 3- to 6-Year-Olds' Aggression

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The present study investigated the direct and interactive effects of children's temperament and mothers' reactions to hypothetical vignettes of children's aggression on 3- to 6-year-old children's overt aggression (OA) and relational aggression (RA). A total of 317 mothers of 3- to 6-year-old children and 26 teachers from eight day-care centers and kindergartens were contacted. Each mother reported her child's background, assessed her child's temperament and responded to the Mothers' Reaction to Hypothetical Vignettes of Children's Aggression (MRCA) scale. Children's OA and RA were assessed by teachers. Results showed that high levels of children's surgency predicted children's OA and RA. Although mothers' reactions did not predict children's OA and RA directly, significant interactions indicated that mothers' restrictive reactions were more strongly related to children's OA for children with high levels of surgency and low levels of effortful control. In addition, mothers' responsive reactions were more strongly related to children's OA for children with low levels of surgency. This study demonstrates that relative contributions of children's temperament and mothers' reactions differ according to the form of children's aggression. It also shows that certain types and levels of mothers' reactions to children's aggressive behavior can be critical for children with certain types and levels of temperament in developing children's overt aggression. The findings of this study can be applied to building early prevention and future intervention programs for young children's aggression.

Keywords: relational aggression, overt aggression, mothers' reactions to children's aggression, temperament

Introduction

Childhood aggression is significantly related to children's concurrent and future developmental problems such as peer rejection, poor academic achievement, delinquency, risky sexual behaviors, depression, and peer victimization (Coie & Dodge, 1998; Crick, 1996; Crick & Grotpeter, 1995). Therefore, the importance of identifying and determining predictive variables with potential risks for

developing children's aggression has been emphasized. Past studies have identified family factors and children's individual characteristics as two major variables strongly linked to development of children's aggression (e.g., Gershoff, 2002; Ladd & Pettit, 2002; Mize & Pettit, 1997; Sanson, Smart, Prior, & Oberklaid, 1993). These studies have proved that parenting variables and children's temperament both directly and jointly affect children's aggression.

Parental Influences and Children's Social Competence

Ladd and Pettit (2002) conceptualized two

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different types of parental influences, *indirect* and *direct*, that may have important implications for children's social competence. Mothers indirectly influence children's social competence with their patterns of behaviors such as parenting style (e.g., authoritarian, authoritative, and permissive styles) that describe parent-child interactions over a wide range of situations (Darling & Steinberg, 1993). When mothers indirectly influence their children, children transfer the behavioral and relationship patterns they have learned in the family context to peer domains (Werner, Senich, & Przepyszny, 2006). On the other hand, mothers also directly influence children's social competence by taking various roles such as designer,¹ mediator,² supervisor,³ and consultant⁴ to enhance and encourage positive peer interaction (Ladd & Pettit, 2002). A direct form of parental influence is undertaken specifically to achieve particular socialization goals, such as promotion of academic athletic or social competence (Mize & Pettit, 1997). Therefore, it involves domain-specific activities that are presumed to have primarily domain-specific effects (Darling & Steinberg, 1993).

Mothers' Reactions and Children's Aggression

Two forms of parental influences proposed by Ladd and Pettit (2002) can assist us in understanding the influence of mothers' behaviors on children's aggression. However, very limited numbers of studies have been done regarding mothers' direct influence. Updated studies have relied on investigating mothers' indirect influence on children's aggression. Evidence shows that mothers' parenting style (indirect influence) influences children's aggression. For example, children of mothers

who are warm, responsive and use low levels of coercion tend to be more socially competent and less aggressive with peers (McFadyen-Ketchum, Bates, Dodge, & Pettit, 1996; Mize & Pettit, 1997). The use of corporal punishments increased childhood aggressive behavior (Gershoff, 2002). Mothers' coercion and psychological control increased children's RA (Hart, Nelson, Robinson, Olsen, & McNeilly-Choque, 1998; Kuppens, Grietens, Onghena, & Michiels, 2009). Moreover, children's use of overt aggression (OA) and relational aggression (RA) was related to mothers' negative interaction styles and general discipline strategies (Campbell & Frabutt, 1999).

In the meantime, it is important to note that mothers' involvement in the way they react to situations of children's aggressive behavior can influence the development of children's aggression. Studies on children's social competence confirmed that children of mothers who engaged in roles such as designer, mediator, supervisor, and consultant in their children's peer interactions were more likely to be socially competent (Bhavnagri & Parke, 1991; Finnie & Russell, 1988; Laird, Pettit, Mize, Brown, & Lindsey, 1994; Russell & Finnie, 1990). Therefore, one can hypothesize that mothers' reactions to children's aggressive behaviors (direct influence) are associated with the level of children's aggression.

The present study particularly focused on the role of mothers as a supervisor for intervening in children's aggression. As a supervisor, mothers oversee and regulate children's ongoing interactions, activities, and relationships with peers (Ladd & Pettit, 2002). To measure mothers' involvement in aggressive situations, mothers' verbal and behavioral reactions to the hypothetical vignettes of children's overt and relational aggressive behavior situations were measured. Two variables, restrictive⁵ and

1 As a designer, mothers select physical environments that facilitate peer interactions.

2 As a mediator, mothers arrange for formal or informal peer contacts.

3 As a supervisor, mothers monitor and intervene in play with peers.

4 As a consultant, mothers provide information and advice on how to interact with peers.

5 Restrictive reaction involves mothers' strong force, coercion, and restrictions by criticizing, yelling, physically and psychologically punishing a child, demanding things of a child, and discouraging differing opinions.

responsive⁶ reactions, were created and examined to determine whether or not two forms of mothers' reactions to children's aggression predict children's OA and RA.

Several studies on mothers' reactions to children's socially unskilled behavior showed that mothers' reactions differed according to the forms of misbehavior (Colwell, Mize, Pettit, & Laird, 2002; Harnish, 2011; Hasting & Rubin, 1999; Jung, 2003; Werner et al., 2006). In particular, when the qualities (dimensions) of mothers' reactions (intervention strategies) in relational and physical aggression situations were examined using the hypothetical vignettes, mothers were more likely to use power assertion⁷ (Colwell et al., 2002; Werner et al., 2006), rule violation strategies⁸ (Werner et al., 2006) and discussion⁹ (Colwell et al., 2002) for children's OA than for children's RA. However, mothers used encouragement strategies¹⁰ more frequently for children's RA than OA (Colwell et al., 2002). Mothers were more likely to inhibit children's OA by using their power. They were more likely to tell their children that they disobeyed the rules and that their behavior was unacceptable. In the meantime, mothers were more likely to encourage their children to get along with their peers more when their children

were engaged in RA as opposed to OA. A more recent study showed that certain types of mothers' reactions were significantly correlated to certain forms of aggression (Kim, Chung, Kwon, & Min, 2009). In this study, Kim and colleagues showed that mothers' power assertion toward OA vignette was negatively related to children's OA.

Findings of previous studies suggest that mothers' reactions to children's aggression are sensitive to the form of aggression, highlighting the importance of examining the influences of mothers' reactions on children's aggression separately for children's OA and RA. Just as mothers reacted differently for each form of aggression, different dimensions and levels of mothers' reactions may predict children's aggression in different patterns according to the aggression form. With this assumption, the present study examined the influence of mothers' reactions on children's aggression for both OA and RA.

Children's Temperament and Children's Aggression

In previous research, children's temperament has been recognized as another significant predictor of children's concurrent and prospective aggression (Sansan et al., 1993). Temperament is defined as a biologically based individual's differences in reactivity and self-regulation, as seen in the emotional, motor and attentional domains influenced over time by genes, environment and experience (Rothbart & Bates, 1998; Rothbart, Ellis, & Posner, 2004). The present study followed the definition of temperament proposed by Rothbart and colleagues and examined three broad dimensions of children's temperament: surgency-extraversion, negative affectivity, and effortful control.

Children with high levels of surgency show higher levels of impulsivity, are more interested in high intensity pleasure, are more active and show lower levels of shyness than those with low levels of surgency. According to research, aggressive children show higher levels of

6 Responsive reaction involves mothers involving in reasoning, modeling and offering gentle directions by responding to children's emotions, actively helping and teaching them in solving problems and making parental expectations explicit.

7 Power assertion is the extent to which the strategy involves attempts to change the target child's behavior.

8 Rule violation is the extent to which involves attempt to communicate clearly to target child that his/her behavior violated a social or moral rule.

9 Discussion is the extent to which the strategy involves direct communication between mother and child about the specific social problem and possible solutions to the problem.

10 Encouragement is the extent to which the strategy involves communication about the importance of engaging in positive play with peers (Werner et al., 2006).

activity and lower levels of response (Kim & Kim, 2007; Russell, Hart, Robinson, & Olsen, 2003; Woo, 2007). Children with high levels of surgency are more frequently involved in group play with peers and are more socially outgoing (Kochanska & Radke-Yarrow, 1992). However, these children are also more likely to exhibit externalizing behavior problems and to be at risk for engaging in aggressive behavior and subsequent peer rejection (Berdan, Keane, & Calkins, 2008; Gunnar, Sebanc, Tout, Donzella, & Van Dulmen, 2003; Schwartz, Snidman, & Kagan, 1996; Stifter, Putnam, & Jahromi, 2008a). In other words, children with high levels of surgency are more likely to behave aggressively than those with low levels of surgency (Rothbart & Putnam, 2002).

A negative affectivity is conceptually similar to neuroticism and is defined by high positive loadings for sadness, fear, anger/frustration, and discomfort and negative loadings for falling reactivity/soothability. Studies in the past have examined mid-level traits (e.g., anger and sadness) of negative affectivity in relation to children's aggression and proved that some traits of negative affectivity are strongly linked to development of children's aggression. For example, Karreman, de Haas, van Tuijl, van Aken, and Deković (2010) found that children's anger, fear, sadness and impulsivity predicted children's externalizing problem behaviors. Others reported children's level of irritability/fear as predictors of internalizing disorders and anger/frustration as predictors of externalizing disorders (Eisenberg, Cumberland, Spinard, Fabes, Shepard, Reiser, Murphy, Losoya, & Guthrie, 2001; Lengua, 2006). In addition, high levels of fear predicted internalizing disorders and low levels of aggression (Rothbart, 2004; Rothbart & Bates, 2006; Oldehinkel, Hartman, De Winter, Veenstra, & Ormel, 2004).

Effortful control is children's ability to self-regulate behavior and attention. It contains high positive loadings for inhibitory control, attentional control, low intensity pleasure, and perceptual sensitivity scales (Putnam & Rothbart, 2006). Effortful control is commonly identified

as children's ability to engage in subdominant responses by inhibiting the dominant response to a situation. Low levels of effortful control have been linked to the externalizing disorders (Eisenberg et al., 2001; Hill, Degnan, Calkin, & Keane, 2006; Oldehinkel et al., 2004). While children's low effortful control predicted higher risk for developing attention problems, aggressive behaviors, and destructive behaviors (e.g., Kochanska & Knaack, 2004; Olson, Sameroff, Kerr, Lopez, & Wellman, 2005), high levels of effortful control acted as a protective factor against aggressive behaviors (Eisenberg, Fabes, Nyman, Bernzweig, & Pinuelas, 1994; Lengua, 2006).

Studies that examined the relations between children's temperament and aggression have shown that some temperamental characteristics are more related to children's maladjustment behavior than other types of temperament. However, most studies have focused on children's OA or combined scores of OA and RA. The studies have not examined the effects of children's temperament on children's RA. In light of the previous research, the present study hypothesize that children's high levels of surgency and negative affectivity along with low levels of effortful control predict children's OA. As temperament is identified as one of the important predictors of problem behavior in young children, it is also important to discover whether or not certain types of children's temperament predict children's RA. Therefore, the second aim of the present study is to examine if certain levels of children's surgency, effortful control and negative affectivity significantly predict children's OA and RA.

Mothers' Reactions, Children's Temperament, and Children's Aggression

The third aim of the present study is to investigate interactive effects of mothers' reactions and children's temperament on children's aggression. Prior studies that examined interactive effects of temperament and parenting behaviors on the children's aggression show mixed outcomes for children with different

characteristics in identical situations (Bates & Pettit, 2007). Inconsistent parenting and the use of corporal punishment predicted externalizing problems and conduct problems for children who were high in impulsivity (Aucoin, Frick, & Bodin, 2006; Lengua, Wolchick, Sandler, & West, 2000). Colder, Lochman, and Wells (1997) demonstrated that active boys who were exposed to harsh discipline exhibited higher levels of aggression than those who were less active and fearful. For children low in positive emotionality, parental rejection predicted externalizing problems (Lengua et al., 2000). For fearful boys, harsh discipline predicted high levels of aggression (Colder et al., 1997). Maternal hostility and externalizing problems were also associated with children with poor effortful control and high irritable distress (Morris, Silk, Steinberg, Sessa, Avenevoli, & Essex, 2004). Moreover, high levels of maternal negativity such as hostility, rejection and intrusion and dysregulated temperament at age two significantly predicted externalizing behavior during preschool years (Rubin, Burgess, Dwyer, & Hastings, 2003).

In general, the effect of negative parenting styles increased among children with temperament vulnerabilities. With such evidence, it is possible to assume that mothers' reactions toward children's aggression may be interpreted differently for certain children. Certain types of mothers' reactions toward children's aggression may interact with certain types of children's temperament in predicting children's OA and RA. In this light, the present study examined the interactive effects of mothers' reactions and children's temperament on children's OA and RA. Separate analyses were conducted for OA and RA as it was assumed that contributions of dimensions of mothers' reactions, children's temperament and their interactions would differ by the type of aggression.

In sum, the present study examined direct and interactive effects of mothers' reactions and children's temperament on children's OA and RA. The findings of this research should bring practical implications for understanding and developing intervention programs for children

with aggressive behaviors.

Method

Participants

A total of 317 mothers of 3- to 6-year-old children and 26 teachers from eight day-care centers and kindergartens participated in the present study. All participants were living in Busan, Seoul, and Gyeonggi province, South Korea at the time of data collection. Eighty-one children were in the 3-year-old class, 130 children were in the 4-year-old class and 106 were in the 5-year-old class. However, because the survey was distributed during the second semester of the school year, participants of the study also included 6-year-old children. In terms of age, 23 children were 3-year-olds (10 boys and 13 girls), 97 were 4-year-olds (45 boys and 52 girls), 113 were 5-year olds (56 boys and 57 girls) and 84 were 6-year-olds. Children's age was calculated based on the first day of survey distribution, which was September 18, 2012. The average age of the children was 64.6 months ($SD = 10.27$). For birth order, 37.2% and 39.7% of children were the first and second child, respectively. Only 13% were the third child, and 60% were the only child.

From 478 surveys initially distributed, those that were incomplete or not returned were excluded in the analysis. Thus, a total of 317 surveys were analyzed. Among the 317 mothers who participated in the study, 156 (49.2%) were mothers of boys and 161 (40.8%) were mothers of girls. An average age was 35.97 ($SD = 3.41$) for mothers and 38.35 ($SD = 3.35$) for fathers. Most mothers were university graduates (71.6%); 17.4% were high school graduates, and 8.2% were graduate school graduates. Like mothers, 71.3% of the fathers finished college and 11.7% held graduate degrees, whereas 10.1% received only high school education. Almost half of the mothers (51.5%) and most of the fathers (94%) were employed. Almost 61% of total participants earned more than 4 million won per month, indicating that most participants

in this study came from low to middle class families.

Measures

Overt and Relational Aggression. All teachers assessed children's overt aggression (OA) and relational aggression (RA) using some parts of Preschool Social Behavior Scale (PSBS-T; Crick, Casas, & Mosher, 1997) that were translated in Korean. The original version consists of 25 items that assess preschool children's relational aggression (8), overt aggression (8), prosocial behavior (4), depressed affect (3), preschoolers' acceptance with same sex peers (1) and preschoolers' acceptance with opposite sex peers (1). For the present study, only the items that measure children's OA and RA were used. Two items from both OA and RA were excluded because these items cross-loaded on the factor analysis in prior research (Crick et al., 1997). Thus, six items for each aggression types that make up a total of twelve items were used. The response scale for each item ranged from 1 (*never or almost never true of this child*) to 5 (*always or almost always true of this child*). A mean score of each subscale was used to measure children's aggressiveness. Thus, higher scores (total of 5) indicated that the child was more like to be aggressive. Cronbach's alphas for OA and RA were .89 and .90, respectively.

Mothers' Reactions. All mothers responded to the Mothers' Reactions to Hypothetical Vignettes of Children's Aggression (MRCA) scale, a new scale developed by a researcher of the present study. To date, there is no scale for measuring mothers' reactions to children's aggression. First, hypothetical episodes were designed, and then the items were developed.

Twenty hypothetical vignettes that depict frequently occurring aggression situations among Korean children were first developed based on the prior studies (Hasting & Rubin, 1999; Harnish, 2011; Jung, 2003; Kim & Kim, 2007; Kim et al., 2009; Lee, 1992; Mills & Rubin, 1990, 1992; Werner et al., 2006) and interviews with two educators with more than six

years of teaching experience. Educators were asked to share common situations of children's aggression that frequently occur in 3- to 6-year-old children's classrooms. Three professionals in the field of child studies reviewed these episodes and selected six episodes. Six episodes were examined and revised by two educators. A total of four episodes that depict children's OA and RA were selected. These episodes were again reviewed by two other professionals in the field of child studies for face validity. Both professionals agreed that the selected hypothetical vignettes depicted common aggressive acts of children ages 3 to 6. An example of OA and RA vignettes is presented below:

Overt aggression: For the past three days, you went to pick up your child from school. Each time, you saw your child grabbing his/her friend's toy and pushing his/her friend.

Relational aggression: For the past three days, you went to pick up your child from school. Each time, children were playing outside. Your child was also playing with his/her friend. When another child walked up to your child and asked if he/she could play with them, your child ignored him/her and said, "Let's do something else!" and walked away with his/her friend.

An extensive literature review, interviews, and pilot study (refer to pilot study section for more detail) were conducted to develop items for the MRCA scale. A total of 56 statements were initially extracted from previous relevant studies (Hasting & Rubin, 1999; Jung, 2003; Kim & Park, 2006; Kim & Kim, 2007; Kim et al., 2009; Lee, 1992; Mills & Rubin, 1990, 1992; Werner et al., 2006). Then, two educators were interviewed to explore for other possible reactions of mothers to children's aggression. They were asked to recall what they heard from mothers during the parent-teacher meeting sections and they described how mothers responded to aggression at home. As a reference

in categorizing the scale items, Parenting Behavior Questionnaire (PBQ) and Dimensions of Discipline Inventory (DDI) were used (Coolahan, McWyan, Fantuzzo, & Grim, 2002; Straus & Fauchier, 2007). Fifty-six statements were initially categorized under the subsets of DDI. The categories or items judged to be irrelevant to mothers' reactions to children's aggression were eliminated. A total of 16 items were chosen. Final subsets of MRCA scale included mothers' extent to explain, teach, use physical and psychological aggression, penalty, and deprivation of privileges, corporal punishment, and understand.

An exploratory factor analysis (EFA) was used to bring intercorrelated variables together under more general, underlying variables. Half of the participants ($n = 148$; 78 boys; 70 girls) were randomly selected using SPSS random selection procedure. The 16-item MRCA scale was then subjected to an exploratory factor analysis (EFA) using maximum likelihood extraction method with direct oblimin rotation with number of factors set to two. EFA for overt aggression vignettes were conducted first. The results of the scree plot suggested that between two and three factors would be optimal. The solution of three-factor model was rejected as the third factor contained two items with the eigenvalue of less than 1. When a two-factor model was examined, one item ("I would firmly tell my child that his/her behavior was unacceptable") was eliminated as it yielded the lowest communality (.11) with a factor loading of .29. Items with loadings greater than .40 were retained. A total of fifteen items remained and they accounted for 45.9% (OA vignettes) and 50.2% (RA vignettes) of total variance.

Confirmatory Factor Analysis was conducted to investigate and test the validity of the model. The following goodness-of-fit indices were used to assess the degree of fit between the model and the sample: χ^2 , Incremental Fit Index ($IFI > .95$ excellent; Schreiber, Nora, Stage, Barlow, & King, 2006), the Comparative Fit Index ($CFI > .90$ acceptable, $> .95$ excellent; Bentler & Bonett, 1980) and the Root Mean Square Error of Approximation ($RMSEA < .08$ acceptable,

$< .05$ excellent; Brown & Cudeck, 1993). For this study, fifteen items were used to measure mothers' reactions to hypothetical vignettes of children's OA and RA. CFA was conducted for both types of aggression. The model was shown as an adequate fit for the current study's data (OA: $\chi^2 (df = 87) = 166.1$; $IFI = .93$; $CFI = .92$; $RMSEA = .07$; RA: $\chi^2 (df = 87) = 139.6$; $IFI = .95$; $CFI = .95$; $RMSEA = .06$).

Nine items measured mothers' restrictive reaction (e.g., I would spank my child with my hands) and six items measured mothers' responsive reaction (e.g., I would help my child to solve the problem) to children's aggressive behavior episodes. The reaction scale for each item ranged from 1 (*never or almost never true*) to 5 (*always or almost always true*). Mean scores of each subscale were used to measure the extent of mothers' restrictive and responsive reactions toward hypothetical vignettes of children's OA and RA. A higher score in each subset indicates the higher tendency of reacting in a respective style. Cronbach's alpha for restrictive reaction and responsive reaction to OA episodes were .87 and .83, respectively. Cronbach's alpha for restrictive reaction and responsive reaction to RA episodes were .89 and .86, presenting high internal consistency.

Temperament. Each mother reported on her child's temperament using Children's Behavior Questionnaire very short form. This scale was developed based on the longer version of the CBQ (Rothbart, Ahadi, & Hershey, 1994; Rothbart, Ahadi, Hershey, & Fisher, 2001). The scale was translated and some wordings were corrected to make it more applicable for children in South Korea. The scale consists of 36 items that were divided into three broad dimensions: Surgency (e.g., "Seems always in a big hurry to get from one place to another"), negative affectivity (e.g., "Is very difficult to soothe when he/she has become upset") and effortful control (e.g., "When drawing or coloring in a book, shows strong concentration"). The response scale of each item ranged from 1 (*extremely untrue of your child*) to 7 (*extremely true of your child*). When the child has not been observed in

the situation described, parents could choose option 8 (*Not Applicable*). Cronbach's alpha for surgency, negative affectivity and effortful control were .61, .70, and .74, respectively.

Procedure

Pilot Study. A pilot study was conducted prior to the main study in order to check the reliability of questionnaires and appropriateness of the total length of the survey. The pilot study was conducted in one day-care center located in Seoul. A total of 50 surveys were distributed to mothers of 50 children (boys = 25; girls = 25) and three teachers of 3-, 4- & 5-year-old classes. Fifteen children were from the 3-year-old class, 17 were from the 4-year-old class and 18 were from the 5-year-old class. Each mother was asked to report on her children's temperament using the MRCA scale. Teachers were asked to fill-out the PSBS-T for each child.

Before the pilot study, the researcher was concerned about the length of the survey in obtaining accurate answers from participants. In the pilot study, 36 (70%) surveys were returned and none of these surveys had missing or repetitively filled out answers. As the return rate was not as low as expected, the researcher confirmed that the length of the survey was manageable for the mothers. Cronbach alpha scores for each scale ranged between .6 and .9.

Main Study. Eight day-care centers and kindergartens located in Busan, Seoul, and Gyeonggi province were contacted. Data was collected between September 18, 2012 and October 10, 2012. Two separate packets—one packet containing description of the survey, questionnaires for mothers (CBQ very short form and MRCA scale), a present for compensation, and another packet containing teachers' questionnaires (PSBS-T)—were delivered to each child-care center. Then, homeroom teachers distributed the packets to the mothers. Each child was given a serial number prior to the study. Teachers were instructed not to press mothers to return the packets but to remind them that their responses would be used

only for this study and their personal information would be kept confidential. Mothers were told to not return the survey if they did not wish to participate. Once mothers returned the survey, teachers completed the PSBS-T for the specific child. Teachers kept the completed PSBS-T and mothers' survey together. Thus, each child received ratings from both the mother and the teacher. From the 478 surveys initially distributed, those that were incomplete or not returned were excluded in the analysis. A total of 317 responses were used for analysis.

Results

Hierarchical multiple regression using SPSS was conducted to estimate direct and interactive effects of the mothers' reactions variables (restrictive reactions, responsive reactions) with the three temperament variables (surgency, effortful control, negative affectivity) in predicting the two criterion variables (OA and RA). Logarithmic transformation was used to stabilize the variance of the sample and the predictors were centered to minimize the multicollinearity problem. For overt aggression (OA), Durbin-Watson was 1.52 and variance inflation factor (VIF) statistic of all predictors ranged from 1.01 to 1.51. For relational aggression (RA), Durbin-Watson was 1.67 and variance inflation factor (VIF) statistic of all predictors ranged from 1.00 to 1.27, all within an acceptable range (O'Brien, 2007).

The correlations among the variables are presented in Table 1. The temperament dimensions were not correlated with each other. The mothers' reactions to hypothetical vignettes of OA ($r = -.45$) and RA ($r = -.32$) were moderately correlated. Children's OA and RA were moderately correlated ($r = .72$). These correlations suggest that the variables within the domain (i.e., temperament, mothers' reactions, and aggression) were not redundant.

For both analyses, variables were entered into each hierarchical model following the recommendations of Aiken and West (1991) and Cohen and Cohen (1983). Children's gender and

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Table 1
Intercorrelation among Variables Included in the Study

	1	2	3	4	5	6	7	8	9
1. SG	1.00								
2. NA	-0.08	1.00							
3. EC	0.04	0.00	1.00						
4. REST (OA)	.14*	.19**	-.29***	1.00					
5. RESP (OA)	0.00	-0.05	.43***	-.45***	1.00				
6. REST (RA)	0.10	.125*	-.29***	.81***	-.36**	1.00			
7. RESP (RA)	-0.04	-0.05	.40***	-.39***	.82***	-.32***	1.00		
8. OA	.26***	0.01	-.15**	.17**	-.16**	.12*	-.16**	1.00	
9. RA	.18**	0.05	-0.03	.13*	-0.06	0.08	-0.04	.72***	1.00

Note. $N = 317$. SG = Surgency, NA = Negative Affectivity, EC = Effortful Control, REST (OA) = Restrictive Reaction to Hypothetical Vignettes of Overt Aggression, RESP (OA) = Responsive Reaction to Hypothetical Vignettes of Overt Aggression, REST (RA) = Restrictive Reaction to Hypothetical Vignettes of Relational Aggression, RESP (RA) = Responsive Reaction to Hypothetical Vignettes of Relational Aggression, OA = Children's Overt Aggression, RA = Children's Relational Aggression

* $p < .05$, ** $p < .01$, *** $p < .001$

age were entered in step 1 as control variables. Mothers' restrictive and responsive reactions variables were entered in step 2 and children's temperament dimensions were added in step 3. In step 4, all interaction terms were entered. Finney, Mitchell, Cronkite, and Moos, (1984) and Aiken and West (1991) suggest interaction terms be dropped from the equation and to estimate the first order effects if the study was exploratory. Since the aim of the present study was to explore whether or not the interactive terms predicted outcome variables, a step-down hierarchical examination was performed. This approach starts with the full equation containing all linear effects and all possible interactions between mothers' reactions variables and temperament variables. Nonsignificant highest order terms in the equation (interaction effects) were than omitted (Aiken & West, 1991). The significant interactions were probed using the techniques outlined by Aiken and West (1991). The effect of mothers' reactions variables on outcome variables were estimated at 1SD below the mean (low) at the mean (medium) and 1SD above the mean (high) on the temperament variables (see Figure 1 to 3)

Overt Aggression (OA)

As shown in Table 2, the entire group of variables significantly predicted children's OA ($F = 12.64$, $df = 9,307$, $p < .001$). It predicted a total of 27% of the variance in children's OA. Children's surgency significantly predicted children's OA. There were a total of three out of six significant interactions. Children's scores on surgency and effortful control interacted with mothers' restrictive reactions to predict OA. Mothers' restrictive reactions were more strongly related to overt aggression for those with high scores on surgency and low scores on effortful (Figure 1 & 2). Children's scores on surgency moderated the relation between mothers' responsive reactions and OA such that mothers' responsive reactions were more strongly related to OA for children with low scores on surgency than those with moderate or high scores (Figure 3). The relative contribution was in the order of Surgency ($\beta = .27$, $t = 5.06$, $p < .001$), Restrictive x Surgency ($\beta = .18$, $t = 3.23$, $p < .01$), Responsive x Surgency ($\beta = .16$, $t = 2.96$, $p < .05$), and Restrictive x Effortful Control ($\beta = -.13$, $t = -2.42$, $p < .05$) (Table 2).

Table 2
Hierarchical Regression Model Predicting Children's Overt Aggression (n = 317)

Predictors	Model 1		Model 2		Model 3		Model 4	
	B	β	B	β	B	β	B	β
Intercept	.06		.06		.06		.04	
Gender	-.11	-.32***	-.10	-.31***	-.09	-.28***	-.10	-.29***
Age	.00	.20***	.00	.19***	.00	.19***	.00	.20***
Restrictive Reaction			.03	.12*	.02	.08	.02	.09
Responsive Reaction			-.03	-.08	-.03	-.09	-.03	-.08
Surgency					.06	.23***	.07	.27***
Effortful Control					-.01	-.05	-.02	-.08
Negative Affectivity					.01	.04	.01	.02
Restrictive Reaction								
x Surgency							.07	.18***
x Effortful Control							-.06	-.13***
Responsive Reaction								
x Surgency							.07	.16**
F	27.10***		16.87***		15.15***		12.64***	
R ²	.15		.17		.23		.27	
ΔR ²	.15		.03		.05		.04	
Adj. R ²	.14		.17		.21		.25	

*p < .05, **p < .01, ***p < .001

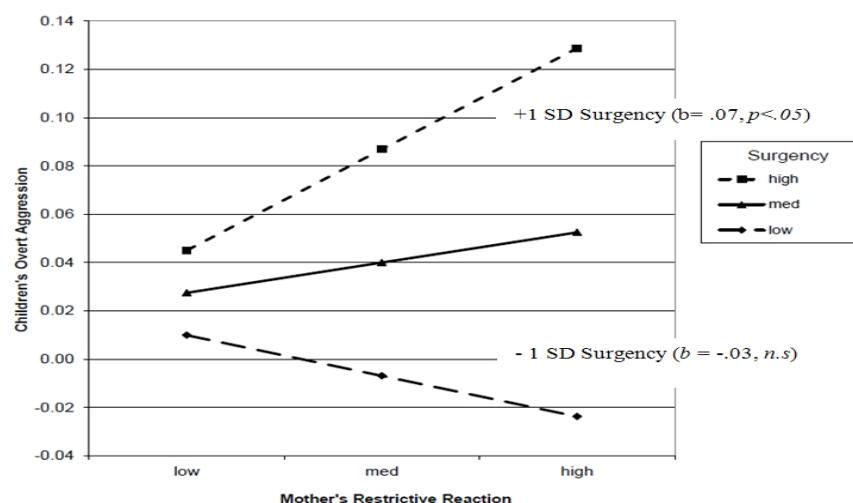


Figure 1. Interaction between mothers' restrictive reaction and children's surgency predicting overt aggression. Simple slopes are unstandardized regression coefficients

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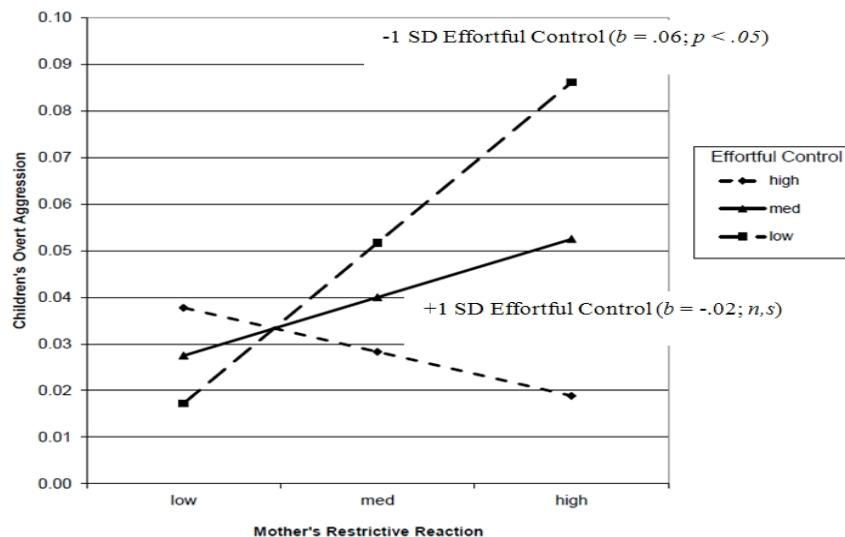


Figure 2. Interaction between mothers' restrictive reaction and children's effortful control predicting overt aggression. Simple slopes are unstandardized regression coefficients.

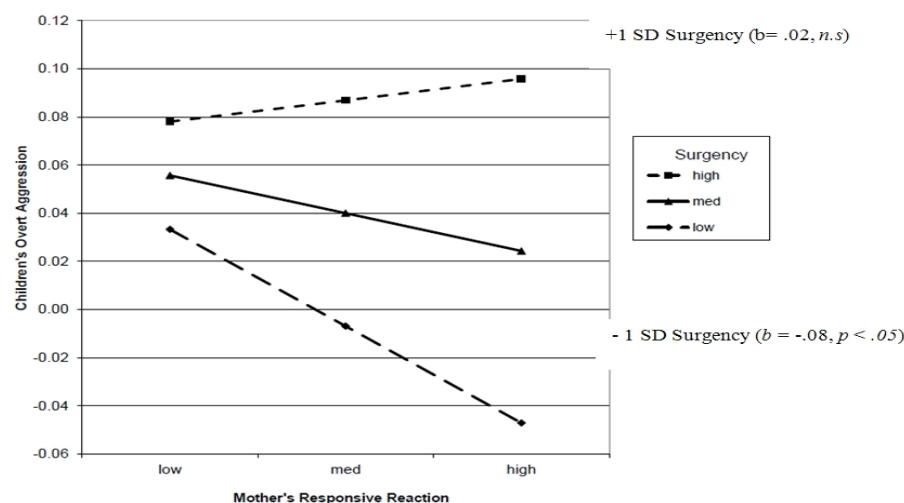


Figure 3. Interaction between mothers' responsive reaction and children's surgency predicting overt aggression. Simple slopes are unstandardized regression coefficients.

Relational Aggression (RA)

Following the step-down procedure proposed by Aiken and West (1991), all interaction terms were dropped from the model and multiple regressions were re-conducted excluding the

interaction effects. As shown in Table 3, the final model predicted 8% of the variance in children's OA ($F = 3.64, df = 7,309, p < .001$). Children's surgency ($\beta = .18, t = .317, p < .05$) significantly predicted children's RA. Children's high score on surgency significantly predicted

Table 3
Hierarchical Regression Model Predicting Children's Relational Aggression (n = 317)

Predictors	Model 1		Model 2		Model 3	
	B	β	B	β	B	β
Intercept	.09		.09		.09	
Gender	-.03	-.08	-.03	-.07	-.02	-.06
Age	.03	.18**	.00	.18**	.00	.18**
Restrictive Reaction			.02	.06	.01	.04
Responsive Reaction			.00	-.01	.00	-.01
Surgency					.04	.18***
Negative Affectivity					.01	.06
Effortful Control					.00	-.01
F	6.44**		3.58**		3.64**	
R^2	.04		.04		.08	
ΔR^2	.04		.00		.03	
Adj. R^2	.03		.03		.06	

* $p < .05$, ** $p < .01$

high level of children's RA. Neither of the mothers' reactions nor interactions significantly predicted children's RA (Table 3).

Discussion

The present study was designed to examine the direct and interactive effects of mothers' reactions and children's temperament on children's OA and RA. In total, 317 mothers and 26 teachers of 3- to 6-year-olds were recruited and they responded to survey questionnaires.

The result of the study revealed that relative contributions of children's temperament and mothers' reactions dimensions differed for children's OA and RA. Consistent with past research, children's surgency predicted children's OA (Rothbart et al., 1994). Children's surgency also predicted children's RA. Meanwhile, all dimensions of mothers' reactions did not directly predict children's OA and RA. The findings regarding the three interactive effects of children's temperament and mothers' reactions dimensions on

children's OA indicate that the effects of mothers' reactions on children's OA differ according to the level of children's surgency and effortful control.

Direct Effects of Children's Temperament and Mothers' Reactions

Results of the present study on the effects of children's temperament on children's aggression were partly consistent with the previous finding. The present study found that children's high levels of surgency predict both children's OA and RA. This result is consistent with a previous study that showed children's shyness and activity levels to be strong and consistent related variables to children's physical aggression (Rothbart & Bates, 2006). Children with high levels of surgency are very active. They can be characterized as children who constantly explore their environment while disregarding rules and regulations (Berdan et al., 2008). Children with high levels of activity tend to be less stable, less cooperative, more likely to interrupt peer relationships and be involved in peer conflict

(Hong, 2001). They are also known to have difficulty in regulating their distress when faced with disappointment and to use aggressive strategies to overcome such barriers (Rothbart & Putnam, 2002). As a result, these children have a higher potential to use aggression as ways to reveal their discomforts (Fabes & Eisenberg, 1992).

The finding of the present study is interesting as it suggests high levels of children's surgency as the predictor for children's RA. Not many studies have reviewed children's RA in relation to children's temperament. Thus, it is hard to provide evidence-based explanations for this particular finding. How is it possible that children with high levels of surgency are both overtly and relationally aggressive? Although children with high levels of surgency are shown to be at risk for showing aggressive behaviors, existing researches have also shown that children with high levels of surgency are very social with peers (Kochanska & Radke-Yarrow, 1992; Rimm-Kaufman & Kagan, 2005). This may be due to the fact that children with high levels of surgency are more active, less shy, and are more easily adaptable to new places. In other words, they are more likely to portray the characteristics that are favorable to peers than those with low level of surgency. Relational aggression includes behaviors such as social exclusion, ignorance, teasing, or spreading rumors, that harms others through damage to their peer relationships (Crick & Grotpeter, 1995; Crick et al., 1997). Therefore, children's relational aggressive acts are more effectively displayed when peers take part. For this reason, children at the preschool age who are relationally aggressive tend to have a certain amount of social capital (Crick et al., 1999b). Although the link is not yet scientifically proven, the evidence of past studies may help us to derive into conclusion that children with high levels of surgency are more likely to display relational aggression as they possess more outgoing characteristics (lower level of shyness and high level of sociability).

Contrary to the previous findings, children's scores on effortful control and negative affectivity did not directly predict children's OA.

Such findings are remarkable as children's level of effortful control and negative affectivity were shown to be related to children's disruptive behaviors (Barkley, 1997; Moffitt, 2003; Eisenberg et al., 2001; Gilliom & Shaw, 2004; Karreman et al., 2010; Morris et al., 2004; Terranova, Morris, & Boxer, 2008). Perhaps, children's level of effortful control and negative affectivity may have been a less salient influence than was children's level of surgency. However, it is important to consider the compositions of the variables used in the present study. It the past studies, some mid-level traits (such as irritability, fear and anger) of negative affectivity have been appointed as significant predictors of children's aggression (Bates & Pettit, 2007; Lengua, 2006). In the meantime, the present study used an average score of children's level of sadness, fear, anger/frustration, discomfort, and falling reactivity to measure children's negative affectivity. Therefore, although no significance were found in this study, there are possibilities that some mid-level traits of children's negative affectivity and effortful control predict children's OA and RA. Thus, there is a need for more future studies in this area.

Mothers' reactions did not directly predict children's OA and RA. The present study's inability to find a relation between mothers' reactions and aggression could have been due to number of factors. First, it is possible that mothers' reactions toward children's aggression do not have a strong effect on the development of children's aggression. In other words, the influence of mothers' reactions on children's aggression may not be as strong as the influence of mothers' parenting style on children's aggression. Second, the method of using survey questionnaires may have brought some limitations in finding the true effect of mothers' reactions on children's aggression. Perhaps, using other methods such as observation to measure mothers' reactions to children's aggression may result in different findings. Since there is no previous evidence that showed no effect of mothers' reactions on children's aggression using other methodologies, it is still too early to conclude that mothers' reactions

have no direct effect on the development of children's aggression.

Overall, the results regarding the direct effects of children's surgency on children's OA and RA supports the notion that temperament uniquely predicts maladjustments, and that children's temperament is more strongly related to children's aggression than parenting behaviors (Rothbart & Bates, 1998). This finding suggests the possibilities that children in high or low levels of certain characteristics may be more likely to portray certain behaviors than others. Replication of the finding on the relationship between children's surgency and RA is needed as no prior studies have examined or explained this effect.

Interactive Effects of Children's Temperament and Mothers' Reactions

Interactive effects of mothers' reactions and children's temperament were investigated to differentiate the children most strongly affected by different types of mothers' reactions toward children's aggressive behavior. Out of six interactions examined, three interactions predicted children's OA.

The level of surgency and effortful control moderated the relation between mothers' restrictive reactions and children's OA. Mothers' restrictive reactions were more strongly related to children's OA for children with high levels of surgency and children with low levels of effortful control. This finding is supported by a prior study that showed a stronger association between maternal hostility and child externalizing problems among children with low levels of effortful control than high levels of effortful control (Morris et al., 2004). Similar results were found by another study, which showed that poor self-regulation at age two predicted greater extent of externalizing behavior at age four when mothers were more intrusive and hostile (Rubin et al., 2003). It is possible that children with high scores on surgency and low scores on effortful control are less likely to focus on positive affect in the presence of mothers' negative reactions. It is less likely that they have

positive interactions or supportive relationships with others that may help to mitigate the impact of mothers' negative reactions. In addition, since children with high levels of surgency and low levels of effortful control have difficulty in regulating their emotions and behaviors on their own, their behaviors may depend more on adult's behaviors. While children experience mothers' negative reactions every time they misbehave, it is less likely that they learn positive socialization skills from their mothers.

The level of children's surgency also moderated the relation between mothers' responsive reactions and children's OA. Mothers' reactions to provide reasoning, modeling, and gentle directions during children's OA situations were more effective in decreasing children's OA for those with low levels of surgency. One possible reason is that the level of children's impulsivity is negatively related to children's ability to self-regulate (Rothbart & Bates, 1998). Since children with low levels of surgency are better at regulating themselves, mothers' less assertive ways of responding to the children's overt aggressive behaviors may have been effective enough to decrease the level of children's OA. Another reason may be due to the fact that these children are more likely to avoid potentially difficult situations (Rothbart & Bates, 1998). With such efforts, children with low levels of surgency may become more quickly alerted to the mothers' disapproval of their misbehavior than those with high levels of surgency. However, since previous studies have not yet examined children's aggression in relation to the low level of children's surgency and mothers' responsive reactions, one should be careful in making generalizations solely based on this study.

There were a number of limitations of this study. For the present study, the MRCA scale was developed to measure mothers' reactions to hypothetical vignettes of children's OA and RA. Since the scale was developed particularly for the present study, its validity and reliability should be re-tested using different samples. The present study conducted confirmatory factor analysis and computed Cronbach's alpha for

each type of reactions. The reliability and validity of the scale was acceptable. However, the results would be further strengthened by future studies re-testing for scale's reliability and validity.

In addition, the study relied exclusively on questionnaire measures that increase the likelihood of method bias. This method was used because it was convenient and was popularly used by previous studies. Past studies have evidenced adequate reliability and validity for teacher assessments of children's aggression (Crick, 1996; Crick & Grotpeper, 1995). In addition, previous studies on mothers' social cognition and direct responses and strategies to children's misbehavior have used hypothetical episodes (Rubin & Mills, 1990; Werner et al., 2006). However, different findings may result if other methods are implemented. Since the present study was the first to look at the interactive effects of mothers' reactions and children's temperament on children's aggression, future studies should attempt to replicate the study using a different methodology.

Despite the limitations mentioned above, the results of the study add to the limited amount of research studying the interactive effects of predictors on children's development. The present study was the first study to provide findings regarding the direct and interactive effects of children's temperament and mothers' reactions on children's aggression. Although mothers' reactions did not show direct effects on children's OA and RA, interactive effects were found for predicting children's OA. Such results suggest the importance of considering both the direct and interactive effects of variables when explaining children's behavior.

In addition, the significant interaction effects on children's OA investigated in this study bring important implications for developing intervention programs or parent training programs. In the process of developing an MRCA scale for the present study, a researcher learned that a surprising number of mothers were not aware of how to respond to children's aggression when they actually encounter the situation. Mothers' use of hostile and punitive

forms of strategies on children's OA may be due to their aim to stop children's behaviors. However, it may also be because they simply do not know how to respond in a more efficient manner. In this case, the findings of the present study provides new information that it is recommended for mothers to consider both the situation and children's characteristics when responding to the actual conflict situations.

In summary, the present study demonstrates the criticality for examining the effects of mothers' reactions and children's temperament on children's aggression. Previous studies have only focused on investigating mothers' indirect influence on children's aggression, heavily focusing on overt form of aggression. The present study also revealed that the relative contributions of predictors differ according to the aggression type. Children's level of surgency directly predicted both OA and RA. The interactive effect of children's temperament and mothers' reactions were only present for children's OA. Since the present study was the first study to examine the direct and interactive effects of mothers' reactions and children's aggression, findings should be considered as introductory information that recommends for future studies to be conducted in this area.

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