Adolescent Aggression as Predicted from Parent—Child Relationships and Executive Functions

Author(s): Shameem Fatima and Hamid Sheikh

Source: *The American Journal of Psychology*, Vol. 129, No. 3 (Fall 2016), pp. 283-294
Published by: University of Illinois Press
Stable URL: http://www.jstor.org/stable/10.5406/amerjpsyc.129.3.0283
Accessed: 03-09-2016 10:33 UTC

Adolescent Aggression as Predicted from Parent–Child Relationships and Executive Functions

SHAMEEM FATIMA
COMSATS Institute of Information Technology, Lahore, Pakistan

HAMID SHEIKH
University of the Punjab

Previous research has emphasized the role of parent–child relationships (PCRs) in child and adolescent development. The present study extends the previous findings by examining the direct and mediated relationship between PCRs, executive functioning (EF), and adolescent aggression. Five hundred twelve adolescents of South Asian ethnic background, enrolled at the secondary and higher secondary levels (aged 13–19 years; 50% boys), participated in the study. The Parent–Child Relationship Scale (Rao, 2000), Aggression Scale (Mathur & Bhatnagar, 2004), and four tests from the Delis–Kaplan Executive Function System (Delis, Kaplan, & Kramer, 2001) were administered to measure the perceived quality of PCR, level of aggression, and EF, respectively, in participants. Pearson correlation coefficients revealed that perceived PCRs were related to EF and adolescent aggression among South Asian youth. Furthermore, multiple regression analyses using Baron and Kenny's (1986) guidelines showed that the influence of PCRs on aggression was partially mediated by EF. The findings suggest that PCRs and EF can be important factors to focus on in interventions aimed at preventing adolescent aggression in society.

KEYWORDS: parent–child relationship, executive functions, adolescent aggression

Adolescent aggression is a serious public health issue with potentially negative consequences for the well-being and the mental health of both victim and perpetrator (Tucker, Finkelhor, Turner, & Shattuck, 2013; Van Dyk, & Nelson, 2014). As a focus of this study, the parent–child relationship (PCR) has been emphasized as a context in which child development and healthy adjustment are supported (Bronfenbrenner, 1996). Many theorists, including Vygotsky (1980), Luria (1976), and their followers (Carlson, 2003; Lewis & Carpendale, 2009), have described the crucial role of environmental variables, particularly of PCR, in child development. Guided by these theoretical works, the current study analyzed the effects of PCRs on adolescent executive function (EF) and aggression development.

PCRs and Adolescent Aggression

There is evidence from previous studies that children who experience good PCRs, in the form of parental acceptance, parental emotional support, parent–child attachment, and parental responsiveness, are less likely to show aggression and adjustment problems (Deater-Deckard, Atzaba-Poria, &

American Journal of Psychology
Fall 2016, Vol. 129, No. 3 pp. 283–294 • © 2016 by the Board of Trustees of the University of Illinois

Pike, 2004; Jackson & Foshee, 1998; McCarty, Zimmerman, Digiuseppe, & Christakis, 2005; Ooi, Ang, Fung, Wong, & Cai, 2006). Conversely, unhealthy interaction of parents with their children in the form of abuse, punishment, and negative affect is observed to be related to aggression (Connor, Doerfler, Volungis, Steingard, & Melloni, 2003; Sim & Ong, 2005; Watson & Fischer, 2002). Additionally, several studies have described that children and adolescents who experience parent–child conflict (El-Sheikh & Elmore-Staton, 2004), parent–child hostility (Schulz, Waldinger, Hauser, & Allen, 2005), and maternal hostility (Romano, Tremblay, Boulerice, & Swisher, 2005) are at high risk for aggression. However, despite evidence that adolescents from the South Asian region are at highest risk of exposure to violence in their homes (Pinheiro, 2006), there is a dearth of research on PCRs in South Asian countries.

The impact of PCRs on aggression is particularly important during adolescence. When the child enters the critical stage of adolescence, both the parent and the adolescent are confronted with a possible developmental challenge in the form of conflict between parental authority and the adolescent's need for autonomy. As a result of this developmental challenge, the quality of the PCR may change, which in turn may affect youth adjustment (Doyle, Moretti, Brendgen, & Bukowski, 2004; Fuligni & Eccles, 1993). However, the transition to adolescence may be smooth if parents have had a loving, protective, and secure relationship with the child since his or her childhood. The interdependence theory of adolescent–parent relationships explains the constantly changing relationship between the parent and adolescent and indicates that a positive and successful PCR helps the adolescent gain autonomy yet continue to feel connected to his or her parents (Dacey & Kenny, 1997). Similarly, empirical work also supports the connection of parental acceptance and adolescent psychological autonomy with adolescent adjustment (Papp, Cummings, & Goeke-Morey, 2005). Another model, presented by Kobak and Esposito (2002), describes that in the context of a positive PCR, it becomes easier for both parents and adolescents to accommodate changes during adolescence.

Neurocognitive Pathway Linking PCR and Aggression

There can be several possible pathways through which parent–adolescent relationship may increase the likelihood of aggression in adolescents; the focus of the current study is on the neurocognitive pathway. The neurocognitive pathway posits that a poor PCR interferes with the proper development of neurocognitive functions in children (Glaser, 2000; Mezzacappa, Kindlon, & Earls, 2001; Smith, Landry, & Swank, 2006), and in turn, poorly developed executive functions, including poor planning, inhibition, and integration skills, make them vulnerable to aggressive behaviors because of their difficulty controlling aggressive impulses and solving interpersonal conflicts (e.g., Foster, Hillbrand, & Silverstein, 1993).

PCR and EF Development

The positive effect of a good-quality PCR on the structural refinement of the prefrontal cortex (Glaser, 2000) and on proper development of EF (Carlson, 2003; Lewis & Carpendale, 2009) is clear from theoretical work. Different empirical studies have also supported this link in children (e.g., Bernier, Carlson, & Whipple, 2010). Although evidence from diverse methodological studies also indicates the contribution of different parenting aspects in cognitive development during adolescence (Dornbusch, Ritter, Leiderman, Roberts, & Fraleigh, 1987; Hickman, Bartholomae, & McKenry, 2000; Leung, Lau, & Lam, 1998), the role of PCR, in particular, has not been studied in EF development during adolescence. It is important to study the association of PCR with EF development during this sensitive stage for two reasons: EF continues to develop until adolescence, and the nature of the PCR changes during adolescence (Doyle et al., 2004). Therefore, development of EF during adolescence appears to be vulnerable to environmental influences in general (Mezzacappa et al., 2001; Noble, Norman, & Farah, 2005) and to PCR in particular (Schroeder & Kelley, 2009).

EF and Aggression

Consistent with the mediation hypothesis (i.e., PCR $\rightarrow$ EF $\rightarrow$ adolescent aggression), deficits in EF are likely to be associated with poor inhibition and impulse control problems, resulting in acting out and aggressive tendencies, whereas well-developed EF is likely to be a protective factor against aggressive behavior. Several studies from clinical samples have found that adolescents and adults with poorly developed EF show higher levels of aggression than their counterparts having well-developed neuropsycho-

logical skills (Foster et al., 1993; Giancola, Mezzich, & Tarter, 1998; Séguin, Boulerice, Harden, Tremblay, & Pihl, 1999). In comparison to studies relying on data from clinical populations, Stanford, Greve, and Gerstle (1997) found problems with impulse control (inhibition) and verbal strategic processing in aggressive participants compared with nonaggressive participants in a normal population. It is also reasonable to presume that executive functions such as inhibition, flexibility, impulse control, and planning have possible relations with aggression because these regulatory abilities are likely to aid in inhibiting and controlling aggressive impulses, thinking of alternative explanations of behavior, and solving interpersonal conflicts. People with properly developed executive skills of planning and inhibition are presumed to manage and inhibit their inappropriate behavior and impulses in provoking situations. In contrast, people with lower levels of EF may often face relational problems during their interaction with others because of lack of inhibition of inappropriate offensive acts and words, resulting in aggressive encounters.

Prefrontal dysfunction theory explains the connection between EF and aggression during adolescence (Raine, 2002). The theory explains that the developing prefrontal cortex is overloaded by the early emergence of emotional and autonomy needs of early adolescence, leading to poor inhibitory control over aggressive impulses. Furthermore, despite the theoretical evidence that poorly developed EF is related to aggression among adolescents, research to date has largely focused on clinical samples from Western countries (Giancola, Moss, Martin, Kirisci, & Tarter, 1996) but overlooked samples from Asian countries.

By reviewing the three relationships between PCR, EF, and aggression (PCR–aggression, PCR–EF, and EF–aggression), we hypothesize that EF may mediate the link between PCR and adolescent aggression. Although the connection between the three variables is established theoretically as well as empirically, the mediating effect of EF on the link between PCR and adolescent aggression remains unknown. Also, this objective of the current study is guided by longitudinal research (Eisenberg et al., 2001). The researchers have found support for the meditational role of emotion regulation, later described as an alternative term for "emotional executive functions" (Ardila, 2008), between parenting characteristics and externalizing problems in children. Moreover, data from an early adolescent sample in another study have shown that effortful executive control mediated the relationship between positive parenting and externalizing problems (Eisenberg et al., 2005). Research to date has reported different executive abilities mediating the connection between different parenting or family aspects and child adjustment (e.g., Eisenberg et al., 2003; Fatima & Sheikh, 2014a; Grekin, Brennan, & Hammen, 2005) but has not studied its mediating role between PCR and adolescent aggression.

Research Gaps and Study Aims

Theoretical and empirical evidence suggests that EF development is susceptible to PCR in childhood years (e.g., Carlson, 2003; Glaser, 2000). However, whether continuously maturing EF remains vulnerable to unfavorable PCR during adolescence is unclear from past literature and awaits further research. Therefore, based on the growing literature of Western studies documenting the impact of PCR on EF development in children, the current study hypothesized that perceived PCR would be related to EF development in South Asian adolescents. Also, previous research suggests a mediating role of EF between different forms of parenting practices or family conditions and adolescent adjustment (e.g., Eisenberg at al., 2001; Fatima & Sheikh, 2014a). Therefore, guided by previous studies, this study aimed to examine the mediating role of EF between PCR and adolescent aggression in South Asian adolescents. The particular concern of the study was to address these questions on adolescence from a culturally diverse sample.

STUDY

METHOD

Sampling Strategy

Data were collected from a cosmopolitan city, Lahore, the second biggest city in Pakistan and fifth biggest city in South Asia, with a population of about 10 million people from diverse backgrounds. Primary sampling units were randomly selected secondary and higher secondary schools. The sampling design was a cluster sampling. First, the primary units (schools) were selected by random sampling from a list of public schools, and then the secondary units (sections) were randomly selected from each selected primary unit (one out of two or three sections). Finally, the tertiary units (students) were cluster sampled in each selected section.

Selection criteria included students having both parents alive, living with both parents, reading in secondary and higher secondary grades, and both boys and girls. Respondents having some reading difficulties, communication difficulties, or some neurological problems, or children of alcoholic parents, were excluded from the study. Nearly all students (95%) who were approached were eligible and willing to participate in the study. However, final data could be analyzed for only 93% of participants for various reasons (e.g., they could not complete all the tests).

Participants

The final sample consisted of 512 adolescents enrolled in grades 9–12 (secondary = 397, higher secondary = 115), including 255 boys and 257 girls from intact families. The age range of students was 13–19 years (mean age = 15.5 years, *SD* = 1.3). The sample consisted entirely of students with a South Asian ethnic background. Table 1 shows the demographic characteristics of the sample.

Measures

PCR was assessed by adolescents' report on the Parent–Child Relationship Scale (PCRS; Rao, 2000), designed to be used for ages 12–18 years. This 100-item measure assesses the perceived quality of PCRs as a full-scale PCR score by summing scores on all items tapping different dimensions of the PCR, including positive dimensions (i.e., protecting, loving, object reward, symbolic reward, demanding; e.g., item no. 1, "Is ready to help me all the time", item no. 8, "Is really interested in my affairs") and negative dimensions (i.e., indifferent behavior, object punishment, symbolic punishment, rejecting, and neglecting; e.g., item no. 50, "Behaves as if I am not there"). Items are rated on 5-point Likert scale (5 = *always,* 1 = *very rarely*). Participants respond separately for mother and father on each item. Items on negative subscales are reverse scored to calculate the full-scale PCR score. The total score for both parents is summed to yield a composite PCR score with a minimum of 200 and a maximum of 1,000.

Construct validity of the scale has been established against the Bronfenbrenner Parent Behavior Questionnaire (r ranging from .29 to .58 for full scale and subscales, $p < .05$) and against the Children's Report of Parental Behavior Inventory (r ranging from .39 to .46 for full scale and subscales, $p < .05$). The test–retest reliability coefficient of the scale ranged from .77 to .87 for the boys' sample and .77 to .87 for the girls' sample over the 10 subscales (Rao, 2000). Before use in the study, the scale was translated into Urdu, adapted to be used with Pakistani adolescents, and psychometrically assessed for reliability and validity (Fatima & Sheikh, 2014b). In the current study, the internal consistency coefficient of the full scale ($\alpha = .87$) was found to be good.

Level of aggression was assessed by adolescents' report using the Aggression Scale (Mathur & Bhatnagar, 2004). The aggression scale is a 55-item measure including 30 positive items and 25 negative items, to be used with participants 14 years and older. Items were scored on a Likert-type 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Negative items were reverse scored before a composite score was computed. The total score thus represents level of aggression. The measure has

TABLE 1. Demographic Characteristics of the Sample

	Boys (n = 255)		Girls (n = 257)		Total (n = 512)	
	Mean	***SD***	**Mean**	***SD***	**Mean**	***SD***
Age, years	15.26	.96	15.74	1.46	15.8	1.3
Grade: secondary	n = 200		n = 197		n = 397	
Higher secondary	n = 50		n = 65		n = 115	
Parent education[a]	6.74 (7)	4.06	7.04 (7)	3.60	6.91 (7)	3.79
Parent occupation[b]	9.33 (9)	3.74	9.11 (9)	3.80	9.35 (9)	3.75
Parent income[c]	5.59 (5.5)	2.75	6.38 (6)	3.59	6.05 (6)	3.29

Note. *Number in parentheses shows median.*
[a]*Educational level from 0 (*no formal education*) to 8 (*postgraduate level*), for each parent and then summed for both parents.*
[b]*Occupational status from 0 (*unemployed*) to 10 (*senior professional job*), for each parent and then summed for both parents.*
[c]*Income categories from 1 (*less than 5,000 Pakistani rupees per month*) to 8 (*100,000 or more Pakistani rupees per month*), for each parent and then summed for both parents.*

been demonstrated to have good construct validity against an aggression questionnaire (.80 in boys and .78 in girls) and good retest reliability (.88 in boys and .81 in girls; Mathur & Bhatnagar, 2004). Before use in the study, the scale was also translated into Urdu and adapted to be used with a Pakistani population. The internal consistency of the measure as found in the current study was good (α = .86).

Executive functioning was assessed using four tests from the Delis–Kaplan Executive Cognitive Functioning System (D-KEFS; Delis, Kaplan, & Kramer, 2001) including the Trail Making Test (TMT), Design Fluency Test (DFT), Color Word Interference Test (CWIT), and Card Sorting Test (CST). The unique feature of the D-KEFS battery is that every test is independent of each other, and any number of D-KEFS tests in any combination can be used to tap executive functions depending on the nature and constraints of the study (Delis et al., 2001). Considering the Urdu-speaking population and time constraints of study, four performance tests were selected to minimize the language bias. Although the selected tests were considered to be performance tests, and there was no need to translate actual test material, test instructions had to be verbally administered. Therefore, instructions were translated into Urdu by following standard guidelines given by Brislin (1986), in stepwise procedure of forward translation and back translation by bilingual experts. Finally, back-translated instructions in English were compared with the original English instructions to check for connotational and grammatical equivalence between the two. No considerable discrepancy was found.

The TMT requires the examinee to join numbers and letters in five conditions: visual scanning (i.e., joining all number 3s), number sequencing (i.e., joining numbers only), letter sequencing (i.e., joining letters only), number–letter switching (i.e., joining numbers and letters alternately), and motor speed. Completion time in each condition was taken as the main dependent variable.

The DFT examines executive functioning by requiring the examinee to draw different designs using only four lines in three conditions: basic (to draw each time a different design using only filled dots), filter (to draw designs using only empty dots), and switch (to draw designs while switching between filled and empty dots). The examinee was given a practice session before each condition. The total number of correct designs drawn in 1 min was noted as the raw score in each condition.

The CWIT assesses the ability to inhibit a dominant response (i.e., reading a word) in favor of a novel response (telling the ink color) in four conditions: color naming, word reading, inhibition (telling the ink color of words that spelled out differently), and switching (switching between telling the ink color and reading the word). Completion time in each condition was noted as the raw score.

The CST assesses concept formation skill and problem-solving ability by having participants sort six cards into two sets based on some common feature. The cards can be sorted along a maximum of eight dimensions. Every sort is followed by a verbal description of sorting strategy that is scored between 0 and 4 points per accuracy and abstraction level of description (free description score). The present study used a composite of two scores: total confirmed correct sorts and total free description score.

A combined EF score based on these four tests was computed. Internal consistency of composite EF score was .84 in the present study.

A demographic sheet was also administered to participants to obtain information about the adolescent's age, gender, grade, and school. Questions were also included to assess parents' education, occupation, and income. Numerical values were assigned to educational categories and occupational status according to the Pakistan Bureau of Statistics (1998). Education levels were scored from: 0 (*no formal schooling*) to 8 (*postgraduate level*). Occupational status was scored from 0 (*nonskilled employment*) to 10 (*senior professionals*). For the measurement of parent's income, two questions determined the father's and mother's income.

Procedure

After obtaining approval from the heads of selected schools in the sample, researchers made contact with class teachers, and they were clearly informed about the nature, purpose, and approximate time duration of the data collection. Then, researchers conducted an introductory session with students with an aim of building rapport with participants to make them feel comfortable in the testing situation. Simultaneously, researchers sent consent letters to parents of students who were eligible and willing to participate in the study.

After the initial formalities were completed, data were collected in two sessions. In the first session, the PCRS and aggression scale were administered in booklet form in a group setting. Instructions were read aloud to the students. Written instructions were also given along with the scales. No time constraints were imposed. In the second session, four D-KEFS tests were individually administered to the partici-

pants in random order. The D-KEFS tests were administered by researchers at a private and comfortable place in the school (e.g., library or laboratory). Privacy of the setting was maintained throughout the D-KEFS testing. After data collection, participants, teachers, and school principals were cordially thanked for their participation.

Coding and Preliminary Data Analysis

Before data analysis, raw scores from D-KEFS tests were converted into scaled scores according to the D-KEFS manual. Table 2 shows means and standard deviations of the primary D-KEFS variables. After scaled scores were obtained, a single composite score of EF was calculated through some stepwise calculations. First, an average of five conditions of TMT were calculated. Next, the composite scaled score equivalent of three conditions of DFT was calculated. Then, for CWIT, an average of 4 conditions was calculated. Last, for CST, the number of correct sorts and the verbal description score were averaged to compute a single composite score on CST. Finally, a composite of an average of five conditions on TMT, composite score of three conditions of DFT, an average of four conditions of CWIT, and an average of CST was computed for EF score to be included in the final analysis (Table 2).

Data Analysis Plan

To achieve the study goals, data were analyzed in SPSS. Descriptive statistics of means and standard deviations were calculated for study instruments. Then, correlations between four EF tests were calculated. To test the first and second goals of the study, first, Pearson correlations between study variables were calculated, and then mediation analyses were calculated according to Baron and Kenny's (1986) criteria in a series of four steps. At the first step, the aggression score was regressed onto PCR to predict aggression from PCR. At the second step, another regression analysis was computed to predict EF from PCR. At the third step, simultaneous regression

TABLE 2. Means and Standard Deviations of Standard Scores of D-KEFS Variables

	D-KEFS variables (standard scores)	*M*	*SD*	Range
TMT (completion time)	Condition 1: visual scanning	8.35	2.88	2–15
	Condition 2: number sequencing	6.46	2.20	1–13
	Condition 3: latter sequencing	6.87	2.39	1–14
	Condition 4: number–letter switching	6.62	2.89	1–14
	Condition 5: motor speed	8.09	2.90	2–15
	a. Average of 5 conditions TMT	**7.57**	**2.65**	**2–14**
DFT (correct design)	Condition 1: filled dots	7.85	2.72	1–19
	Condition 2: empty dots	7.02	2.71	1–17
	Condition 3: switching, filled/empty dots	7.07	2.41	1–16
	b. Composite scaled score of 3 conditions	**7.06**	**2.81**	**1–17**
CWIT (completion time)	Condition 1: color naming	5.88	2.80	1–17
	Condition 2: word reading	8.70	2.88	1–15
	Condition 3: inhibition	6.49	2.06	1–12
	Condition 4: inhibition/switching	7.09	2.73	1–14
	c. Average of 4 conditions CWIT	**7.04**	**2.61**	**1–14**
CST	Condition 1: correct sort	4.28	1.63	1–13
	Condition 1: description score	4.61	1.83	1–13
	d. Average of 2 individual CST scores	**4.45**	**1.72**	**1–13**
Composite EF	a + b + c + d (above 4 tests)	26.13	7.65	7–49

Note. *The bold type in every test is used to compute a composite EF score. CST = Card Sorting Test; CWIT = Color Word Interference Test; DFT = Design Fluency Test; EF = executive functioning; TMT = Trail Making Test.*

analyses were calculated to predict aggression from both PCR and EF. Standardized regression weight calculated at the first step to predict aggression from PCR was considered the total effect of PCR on aggression according to Baron and Kenny. After the EF was included in the regression equation at the third step, the effect of PCR on aggression was divided into two pathways. One pathway explained the direct effect of PCR on aggression, and the other pathway explained the indirect effect from PCR to EF and then from EF to aggression. At the fourth step, it was assessed whether the effect of PCR decreased (partial mediation) or become obsolete (full mediation), with EF still being the significant predictor in the third regression equation. Baron and Kenny (1986) recommended a Sobel test for assessing the significance of indirect effect. So the analysis was further supplemented by Sobel *z* test to compare the direct and indirect effects and to explain the type of mediation.

RESULTS

Descriptive statistics (means, standard deviations, and reliability coefficients) of study variables are presented in Table 3. Cronbach's α for all measures was very good, ranging between .84 and .87, supporting the internal consistency of the instruments. Correlations between four EF tests ranged between .42 and .30 and were found to be statistically significant at a stringent level ($\alpha < .001$). Next, correlations between PCR, EF, and aggression were calculated and presented in Table 3. All correlations were statistically significant.

The mediation effect was computed according to Baron and Kenny's (1986) guidelines, by calculating a series of multiple regressions (Table 4). At Step 1, aggression was regressed onto PCR. Results revealed that PCR was a negative predictor of aggression ($\beta = -.24$, $p < .001$). At Step 2, EF was regressed onto PCR, confirming that PCR was a significant predictor of EF ($\beta = .21$, $p < .001$; $B = .023$, $SE = .005$). At Step 3, when aggression was regressed simultaneously onto both PCR and EF, results showed EF to be the significant predictor of aggression ($\beta = -.26$, $p < .001$; $B = -.91$, $SE = .15$), while controlling for the effect of PCR. Mediation is evident from this regression equation, as the original correlation between PCR and aggression was reduced from –.24 to –.19 after inclusion of EF at the third step. This regression analysis was further supplemented by a Sobel *z* test to determine whether partial or full mediation was established and to compare the direct and indirect paths (Preacher & Leonardelli, 2003). For this calculation, regression coefficients were entered in MedGraph, Internet version (Jose, 2013) to yield a significant partial mediation (Sobel *z* value = –3.68, $p < .001$). The zero-order correlation between PCR

TABLE 3. Descriptive Statistics, *α* Reliability, and Correlation Coefficient of Study Variables

		No. of items	*M*	*SD*	*α*	Correlation index 1	2	3
1	Parent–child relationship	100	732.71	70.97	.87	—	.21*	–.24*
2	Executive functioning	4 scales	26.13	7.65	.84		—	–.30*
3	Aggression	55	188.89	27.02	.86			—

*p < .001.

TABLE 4. Regression Analyses Following Baron and Kenny's Guidelines to Show Mediation Effect

	Model 1: Aggression was regressed onto PCR			Model 2: EF was regressed onto PCR			Model 3: Aggression was regressed onto both PCR and EF		
Predictors	B	SE	β	B	SE	β	B	SE	β
PCR	–.09	.02	–.24*	.02	.005	.21*	–.07	.02	–.19*
EF	—	—	—	—	—	—	–.92	.95	–.26*
R^2	.06			.05			.12		
Model fit	$F(510, 1) = 29.42$*			$F(509, 1) = 18.34$*			$F(509, 1) = 34.15$*		

Note. *EF = executive functioning; PCR = parent–child relationship.*
*p < .001.

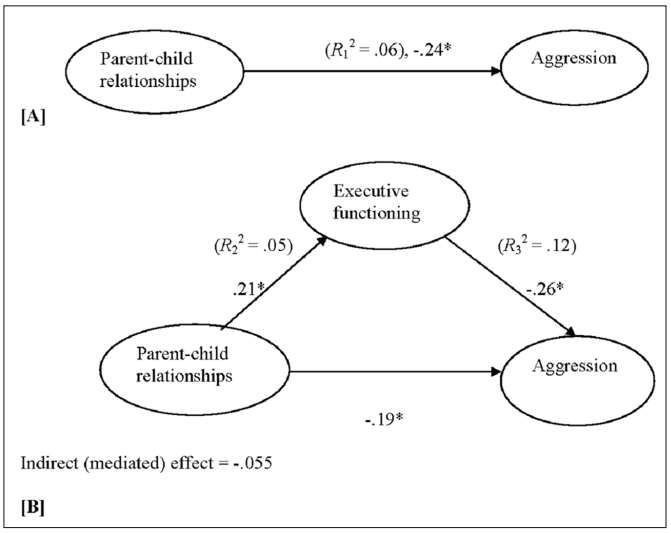

FIGURE 1. **[A]** illustrates the total effect of parent-child relationship on aggression. **[B]** illustrates the mediation effect. Parent-child relationship is shown to effect aggression partially through executive functions. Values shown are standardized regression coefficients.
*$p < .001$

and aggression was reduced yet remained significant, which explains that EF mediates the association, but the type of mediation is partial (Figure 1). Partial mediation was also supported from the ratio of direct (–.19) and indirect paths (–.055); the direct path was large.

DISCUSSION

The primary aim of the present research was to investigate the direct and mediated associations between PCR, EF, and aggression in South Asian adolescents. The study was guided by Vygotsky's model (1980) and his followers' work (e.g., Carlson, 2003; Lewis & Carpendale, 2009) describing the impact of social factors and, in particular, of PCR in child and adolescent development. However, the study addressed these crucial questions using a culturally diverse sample. For assessing the direct and mediated relations between variables, Pearson correlations and Baron and Kenny's (1986) criteria were followed. Thus, the present study found a positive association between PCR and EF. However, it was found that both the PCR and EF were negatively associated with aggression.

The first aim of the study was to predict EF from PCR. The study found a significant association between PCR and EF, which aligns with existing theoretical (e.g., Lewis & Carpendale, 2009) and empirical work (Bernier et al., 2010). It is worth noting that although consistent with findings from Western samples, the current finding is particularly important given the cross-cultural differences in parenting across Asian and Western cultures (Nomura, Noguchi, Saito, & Tezuka, 1995). To the best of our knowledge, this is one of the first studies to examine the association of PCR with EF in a non-Western sample from a developing country such as Pakistan. This finding can be explained in another way: As the maturation of EF continues through adolescence, its development may become susceptible to critical environmental factors. Therefore, on transition to adolescence, development of regulatory capacities, inhibitory skills, and cognitive flexibility, which are the products of this stage, may be compromised in the context of unfavorable PCR.

At the third step of the regression analyses, adolescent aggression was simultaneously predicted from PCR and EF. Both factors negatively predicted adolescent aggression. Aggression has been consistently reported to be negatively associated with good PCR in previous studies (e.g., Fatima & Sheikh, 2009; Harrist & Ainslie, 1998). Similarly, several studies have also found EF to be a negative predictor of aggression (Cauffman, Steinberg, & Piquero, 2005; Foster et al., 1993; Séguin et al., 1999; Séguin, Arseneault, Boulerice, Harden, & Tremblay, 2002). Findings from the current study also support the hypothetical explanation of neurocognitive differences between aggressive and nonaggressive adolescents. Poor cognitive flexibility as assessed from switching on TMT, DFT, and CWIT may facilitate aggression by making the participant stick to one explanation of the event while remaining blind to all other explanations. Because of reduced inhibitory skill—an executive ability assessed from DFT and CWIT—adolescents may become unable to inhibit aggressive impulses. Also, because of poorly developed problem-solving ability, as assessed from CST, adolescents may also become unable to solve interpersonal conflicts. Succinctly, it appears difficult for a person with poorly developed executive skills to manage his or her behaviors in a meaningful way during interactions with others, leading to interactional problems and aggressive behaviors.

Finally, results from three series of regression analyses and supplemented by a Sobel *z* test duly supported the mediational hypothesis, indicating that effects of PCR on aggression are partly indirect

and explained through EF. The findings describe that perceived quality of parent–adolescent relationships affects EF development during adolescence, which in turn significantly influences aggressive behavior. The findings from the current study are in line with a previous study by Eisenberg at al. (2001), which observed effortful control (an executive ability) mediating the association between positive parenting and externalizing tendencies in children. The present findings contribute to this previous knowledge by adding that EF continues to mediate the connection between PCR and acting out tendencies (aggression) while the transition from childhood to adolescence occurs. Notably, although there was a reduction in total effect of PCR on aggression from –.24 to –.19 in the third regression model, the effect of PCR remained a significant predictor. That suggests that although EF partially explains this effect, the larger driving force on aggression is PCR.

Other possible models could also be tested in the current study. For example, PCR could mediate the link between EF and aggression, or aggression could mediate the link between EF and PCR. The model in the current study seems justified in different ways, however. First, PCRs are transforming during adolescence as a function of conflict between the adolescent's need for autonomy and parental monitoring (Dacey & Kenny, 1997; Doyle et al., 2004) and may become critical enough for the late-developing prefrontal cortex to be vulnerable to problems in the PCR (Schroeder & Kelley, 2009). Additionally, according to prefrontal dysfunction theory, the late-developing prefrontal cortex is overloaded by the early emergence of social, emotional, and autonomy needs of early adolescents, making them vulnerable to aggressive behaviors because of their poorly developed inhibitory processes (Raine, 2002). Conversely, adolescents with proper EF development as facilitated by a good PCR can manage their violent impulses. It has been found that smooth, loving, and supporting relationships help in a successful transition toward adolescence, as supported by the levels-of-processing model (Kobak & Esposito, 2002). Moreover, although the direction of the relationship can be opposite from adolescent aggressive behavior to affect the PCR, parents are the more powerful agents in controlling the relationship with their children (Kochanska & Aksan, 2004). Empirical support to the current neurocognitive model is provided by Eisenberg and colleagues (2001). The researchers tested this model in children, whereas the current study extended this model to assess the sample of adolescents. These researchers found support for the direct model for the association of parental warmth and emotional expressivity with externalizing problems through regulatory skills but could not find support for the reverse model for the causal effects of children's functioning on parenting.

The study has several methodological strengths over earlier studies in discovering neurocognitive processes relating PCR to adolescent aggression. First, assessment of EF was made by using a valid, standardized, and reliable test battery rather than a test of general cognitive skills. Second, the current study collected data from a large sample of South Asian adolescents from the fifth biggest city in South Asia, increasing the generalizability of the findings. Third, the current sample is not restricted to a clinical population; rather, the study represents normal functioning adolescents living in homes. Previously, issues of normal community adolescents were not given due consideration, particularly, in the Asian region, the population group that is more prone to violence exposure at home (Pinheiro, 2006). Fourth, in the present study PCR quality was measured from the adolescent's perspective because adolescents' self-reports are of great importance to understanding PCRs, as suggested by previous researchers. Finally, in accordance with the recommendations by Rothbaum and Weisz (1994), the present study has considered multiple aspects of PCR to gain a complete understanding of the construct.

Nevertheless, interpretation of current findings should be done with caution because of the cross-sectional design of this study. Cross-sectional design does not allow us to make causal inferences. As far as mediation is concerned, Holmbeck (1997) argues that the association of predictor to outcome variable through mediator may not necessarily be causal, and the same can be said for indirect effects. Also, Baron and Kenny (1986) described significant correlations between predictor, mediator, and criterion variables to be necessary requirements for mediation. Another limitation is the role of shared genetics between parents and children. EF is a construct that has been shown to have some degree of overlap between parents and children. Therefore, it is difficult to fully trust that the results implicating parenting in EF are truly due to the environment or the shared genes.

However, this question goes beyond the scope of this study and can be comprehensively studied by biologists. Also, a comparative effect of EF as a mediator between PCR and aggression across childhood and adolescence remains a question awaiting the attention of future researchers.

In sum, this study makes a contribution to current knowledge by testing neurocognitive route mechanisms associating PCRs with aggressive behavior. Findings support and further extend the impact of PCRs on EF and aggression development in a nonclinical, non-Western sample. Findings imply the necessity of interventions aiming to improve the relationship of parents with their growing adolescents from South Asia, where family violence rates are the highest. Policies can be implemented to provide parents with training to recognize the sensitivity of this stage and the importance of EF in real-life situations. Parents can be trained to implement some useful strategies to improve or at least facilitate the proper development of EF because evidence suggests that EF can be promoted through training (Diamond & Lee, 2011). Aggression prevention programs should be designed in a way to provide training to both parents and adolescents, for their emotional grooming and adjustment.

NOTES

This study was funded by Higher Education Commission, Pakistan, under the Indigenous 5000 Ph.D. Fellowship Program. The research was conducted as part of Ph.D. work.

Address correspondence about this article to Shameem Fatima, Department of Humanities and Social Sciences, COMSATS Institute of Information Technology, 116-D, Izmir Society, Lahore, Pakistan (e-mail: shameem_pu@hotmail.com, shameemfatima@ciitlahore.edu.pk).

REFERENCES

Ardila, A. (2008). On the evolutionary origins of executive functions. *Brain and Cognition, 68,* 92–99. Retrieved from http://dx.doi.org/10.1016/j.bandc.2008.03.003

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173–1182. Retrieved from http://dx.doi.org/10.1037/0022-3514.51.6.1173

Bernier, A., Carlson, S. M., & Whipple, N. (2010). From external regulation to self-regulation: Early parenting precursors of young children's executive functioning. *Child Development, 81*(1), 326–339. Retrieved from http://dx.doi.org/10.1111/j.1467-8624.2009.01397.x

Brislin, R. W. (1986). The wording and translation of research instruments. In W. J. Lonner & J. W. Berry (Eds.), *Field methods in cross-cultural research* (pp. 137–164). Beverly Hills, CA: Sage.

Bronfenbrenner, U. (1996). Foreword. In R. B. Cairns, G. H. Elder, & E. J. Costello (Eds.), *Developmental science* (pp. ix–xvii). Cambridge, UK: Cambridge University Press.

Carlson, S. (2003). Executive function in context: Development, measurement, theory, and experience. *Monographs of the Society for Research in Child Development, 68,* 138–151. Retrieved from http://dx.doi.org/10.1111/j.1540-5834.2003.06803012.x

Cauffman, E., Steinberg, L., & Piquero, A. R. (2005). Psychological, neuropsychological and physiological correlates of serious antisocial behavior in adolescence: The role of self control. *Criminology, 43(1),* 133–175.

Connor, D. F., Doerfler, L. A., Volungis, A. M., Steingard, R. J., & Melloni, R. H. Jr. (2003). Aggressive behavior in abused children. *Annals of the New York Academy of Sciences*, *1008,* 79–90. Retrieved from http://dx.doi.org/10.1196/annals.1301.009

Dacey, J., & Kenny, M. (1997). *Adolescent development.* Boston, MA: McGraw-Hill.

Deater-Deckard, K., Atzaba-Poria, N., & Pike, A. (2004). Mother– and father–child mutuality in Anglo and Indian British families: A link with lower externalizing problems. *Journal of Abnormal Child Psychology, 32*(6), 609–620. Retrieved from http://dx.doi.org/10.1023/B:JACP.0000047210.81880.14

Delis, D. E., Kaplan, E., & Kramer, J. H. (2001). *Delis Kaplan Executive Function System.* New York, NY: The Psychological Corporation.

Diamond, A., & Lee, K. (2011). Intervention shown to aid executive function development in children 4–12 years old. *Science, 333,* 959–964. Retrieved from http://dx.doi.org/10.1126/science.1204529

Dornbusch, S., Ritter, P., Leiderman, P. H., Roberts, D., & Fraleigh, M. (1987). The relation of parenting style to adolescent school performance. *Child Development, 58,* 1244–1257. Retrieved from http://dx.doi.org/10.2307/1130618

Doyle, A. B., Moretti, M. M., Brendgen, M., & Bukowski, W. (2004). *Parent–child relationships and adjustment in adolescence: Findings from the HBSC cycle 3 and NLSCY cycle 2 studies.* Technical Report to Division of Childhood and Adolescence, Public Health Agency of Canada. Retrieved from http://www.phac-aspc.gc.ca/dca-dea/publications/pcr-rpe/index.html

Eisenberg, N., Gershoff, E. T., Fabes, R. A., Shepard, S. A., Cumberland, A. J., Losoya, S. H., . . . Murphy, B. C. (2001). Mothers' emotional expressivity and children's behavior problems and social competence: Mediation through children's regulation. *Developmental Psychology, 37*(4), 475–490. Retrieved from http://dx.doi.org/10.1037/0012-1649.37.4.475.

Eisenberg, N., Valiente, C., Morris, A. S., Fabes, R. A., Cumberland, A., Reiser, M., . . . Losoya, S. (2003). Longitudinal relations among parental emotional expressivity, children's regulation, and quality of socioemotional functioning. *Developmental Psychology, 39*(1), 2–19. Retrieved from http://dx.doi.org/10.1037/0012-1649.39.1.3

Eisenberg, N., Zhou, Q., Spinrad, T. L., Valiente, C., Fabes, R. A., & Liew, J. (2005). Relations among positive parenting, children's effortful control, and externalizing problems: A three-wave longitudinal study. *Child Development, 76*(5), 1055–1071. Retrieved from http://dx.doi.org/10.1111/j.1467-8624.2005.00897.x

El-Sheikh, M., & Elmore-Staton, L. (2004). The link between marital conflict and child adjustment: Parent–child conflict and perceived attachments as mediators, potentiators, and mitigators of risk. *Development and Psychopathology, 16,* 631–648. Retrieved from http://dx.doi.org/10.1017/S0954579404004705

Fatima, S., & Sheikh, H. (2009). Aggression in adolescents as a function of parent–child relationship. *Pakistan Journal of Psychology, 40,* 3–14.

Fatima, S., & Sheikh, H. (2014a). Socioeconomic status and adolescent aggression: The role of executive functioning as a mediator. *American Journal of Psychology, 127,* 419–430. Retrieved from http://dx.doi.org/10.5406/amerjpsyc.127.4.0419

Fatima, S., & Sheikh, H. (2014b). Translation and adaptation of parent–child relationship scale into Urdu language. *Journal of Behavioral Science. 24*(1), 98–114.

Foster, H. G., Hillbrand, M., & Silverstein, M. (1993). Neuropsychological deficit and aggressive behavior: A prospective study. *Progress in Neuropsychopharmacological and Biological Psychiatry, 17*(6), 939–946. Retrieved from http://dx.doi.org/10.1016/0278-5846(93)90021-J

Fuligni, A. J., & Eccles, J. S. (1993). Perceived parent–child relationships and early adolescents' orientation toward peers. *Developmental Psychology, 29*(4), 622–632. Retrieved from http://dx.doi.org/10.1037/0012-1649.29.4.622

Giancola, P. R., Mezzich, A. C., & Tarter, R. E. (1998). Executive cognitive functioning, temperament, and antisocial behavior in conduct-disordered adolescent females. *Journal of Abnormal Psychology, 107*(4), 629–641. Retrieved from http://dx.doi.org/10.1037/0021-843X.107.4.629

Giancola, P. R., Moss, H. B., Martin, C. S., Kirisci, L., & Tarter, R. E. (1996). Executive cognitive functioning predicts reactive aggression in boys at high risk for substance abuse: A prospective study. *Journal of Alcoholism: Clinical and Experimental Research, 20,* 740–744. Retrieved from http://dx.doi.org/10.1111/j.1530-0277.1996.tb01680.x

Glaser, D. (2000). Child abuse and neglect and the brain: A review. *Journal of Child Psychology and Psychiatry, 41*(1), 97–116. Retrieved from http://dx.doi.org/10.1111/1469-7610.00551

Grekin, E. R., Brennan, P. A., & Hammen, C. (2005). Parental alcohol use disorders and child delinquency: The mediating effects of executive functioning and chronic family stress. *Journal of Studies on Alcohol, 66*(1), 14–22. Retrieved from http://dx.doi.org/10.1002/jts.20652

Harrist, A. W., & Ainslie, R. C. (1998). Marital discord and child behavior problems: Parent–child relationship quality and child interpersonal awareness as mediators. *Journal of Family Issues, 19*(2), 140–163. Retrieved from http://dx.doi.org/10.1177/019251398019002002

Hickman, G. P., Bartholomae, S., & McKenry, P. C. (2000). Influence of parenting style on the adjustment and academic achievement of traditional college freshmen. *Journal of College Student Development, 41*(1), 41–54.

Holmbeck, G. N. (1997). Toward terminological, conceptual and statistical clarity in the study of mediators and moderators: Examples from the child clinical and pediatric psychology literature. *Journal of Consulting and Clinical Psychology, 65*(4), 599–610. Retrieved from http://dx.doi.org/10.1037/0022-006X.65.4.599

Jackson, C., & Foshee, V. (1998). Violence-related behaviors of adolescents: Relations with responsiveness and demandingness. *Journal of Adolescent Research, 13,* 343–359. Retrieved from http://dx.doi.org/10.1177/0743554898133006

Jose, P. E. (2013). *MedGraph-I: A programme to graphically depict mediation among three variables: The Internet version, version 3.0.* Wellington, NZ: Victoria University of Wellington. Retrieved from http://pavlov.psyc.vuw.ac.nz/paul-jose/medgraph/ medgraph.php

Kobak, R., & Esposito, A. (2002). Levels of processing in parent–child relationships: Implications for clinical assessment and treatment. In L. Atkinson (Ed.), *Attachment and psychopathology.* New York, NY: Cambridge University Press.

Kochanska, G., & Aksan, N. (2004). Development of mutual responsiveness between parents and their young children. *Child Development, 75*(6), 1657–1676. Retrieved from http://dx.doi.org/10.1111/j.1467-8624.2004.00808.x

Leung, K., Lau, S., & Lam, W. L. (1998). Parenting styles and academic achievement: A crosscultural study. *Merrill–Palmer Quarterly, 44,* 157–172.

Lewis, C., & Carpendale, J. (2009). Introduction: Links between social interaction and executive function [Special issue on social interaction and the development of executive function]. *New Directions in Child and Adolescent Psychiatry, 123,* 1–16. Retrieved from http://dx.doi.org/10.1002/cd.232

Luria, A. R. (1976). *Cognitive development: Its cultural and social foundations*. Cambridge, MA: Harvard University Press.

Mathur, G. P., & Bhatnagar, R. K. (2004). *Aggression scale.* Agra, India: Rakhi Prakashan.

McCarty, C. A., Zimmerman, F. J., Digiuseppe, D. L., & Christakis, D. A. (2005). Parental emotional support and subsequent internalizing and externalizing problems among children. *Journal of Developmental and Behav-*

ioral Pediatrics, 26, 267–275. Retrieved from http://dx.doi.org/10.1097/00004703-200508000-00002

Mezzacappa, E., Kindlon, D., & Earls, F. (2001). Child abuse and performance task assessments of executive functions in boys. *Journal of Child Psychology and Psychiatry, 42*(8), 1041–1048. Retrieved from http://dx.doi.org/10.1111/1469-7610.00803

Noble, K. G., Norman, M. F., & Farah, M. J. (2005). Neurocognitive correlates of socioeconomic status in kindergarten children. *Developmental Science, 8*(1), 74–87. Retrieved from http://dx.doi.org/10.1111/j.1467-7687.2005.00394.x

Nomura, N., Noguchi, Y., Saito, S., & Tezuka, I. (1995). Family characteristics and dynamics in Japan and the United States: A preliminary report from the family environment scale. *International Journal of Intercultural Relations, 19*(1), 59–86. Retrieved from http://dx.doi.org/10.1016/0147-1767(94)00024-R

Ooi, Y. P., Ang, R. P., Fung, D. S. S., Wong, G., & Cai, Y. (2006). The impact of parent–child attachment on aggression, social stress and self-esteem. *School Psychology International, 27*(5), 552–566. Retrieved from http://dx.doi.org/10.1177/0143034306073402

Pakistan Bureau of Statistics. (1998). *Census report of Pakistan* (Tech. Rep. No. 160). Islamabad: Population Census Organization Statistics Division, Government of Pakistan.

Papp, L. M., Cummings, E. M., & Goeke-Morey, M. C. (2005). Parental psychological distress, parent–child relationship qualities, and child adjustment: Direct, mediating, and reciprocal pathways. *Parenting, 5,* 259–283. Retrieved from http://dx.doi.org/10.1207/s15327922par0503_2

Pinheiro, P. S. (2006). *World report on violence against children*. Geneva, Switzerland: United Nations Secretary-General's Study on Violence Against Children. Retrieved from www.unicef.org/lac/full_tex(3).pdf

Preacher, K. J., & Leonardelli, G. J. (2003). *Calculation for the Sobel Test: An interactive calculation tool for mediation tests*. Retrieved from http://www.people.ku.edu/~preacher/sobel/sobel.htm

Raine, A. (2002). The role of prefrontal deficits, low autonomic arousal, and early health factors in the development of antisocial and aggressive behavior in children. *Journal of Child Psychology and Psychiatry, 43*(4), 417–434. Retrieved from http://dx.doi.org/10.1111/1469-7610.00034

Rao, N. (2000). *Parent Child Relationship Scale*. Agra, India: National Psychological Corporation.

Romano, E., Tremblay, R. E., Boulerice, B., & Swisher, R. (2005). Multilevel correlates of childhood physical aggression and prosocial behavior. *Journal of Abnormal Child Psychology, 33*(5), 565–578. Retrieved from http://dx.doi.org/10.1007/s10802-005-6738-3

Rothbaum, F., & Weisz, J. R. (1994). Parental caregiving and child externalizing behavior in nonclinical samples: A meta-analysis. *Psychological Bulletin, 116*(1), 55–74. Retrieved from http://dx.doi.org/10.1037/0033-2909.116.1.55

Schroeder, V. M., & Kelley, M. L. (2009). Associations between family environment, parenting practices, and executive functioning of children with and without ADHD. *Journal of Child and Family Studies, 18*(2), 227–235. Retrieved from http://dx.doi.org/10.1007/s10826-008-9223-0

Schulz, M. S., Waldinger, R. J., Hauser, S. T., & Allen, J. P. (2005). Adolescents' behavior in the presence of interparental hostility: Developmental and emotion regulatory influences. *Development and Psychopathology, 17*(2), 489–507. Retrieved from http://dx.doi.org/10.1017/S0954579405050236

Séguin, J. R., Arseneault, L., Boulerice, B., Harden, P. W., & Tremblay, R. E. (2002). Response perseveration in adolescent boys with stable and unstable histories of physical aggression: The role of underlying processes. *Journal of Child Psychology and Psychiatry, 43*(4), 481–494. Retrieved from http://dx.doi.org/10.1111/1469-7610.00039

Séguin, J. R., Boulerice, B., Harden, P. W., Tremblay, R. E., & Pihl, R. O. (1999). Executive functions and physical aggression after controlling for attention deficit hyperactivity disorder, general memory, and IQ. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 40*(8), 1197–1208. Retrieved from http://dx.doi.org/10.1111/1469-7610.00536

Sim, T. M., & Ong, L. P. (2005). Parent physical punishment and child aggression in a Singapore Chinese preschool sample. *Journal of Marriage and Family, 67*(1), 85–98. Retrieved from http://dx.doi.org/10.1111/j.0022-445.2005.00007

Smith, K. E., Landry, S. H., & Swank, P. R. (2006). The role of early maternal responsiveness in supporting school-aged cognitive development for children who vary in birth status. *Pediatrics, 117*(5), 1608–1617. Retrieved from http://dx.doi.org/10.1542/peds.2005-1284

Stanford, M. S., Greve, K. W., & Gerstle, J. E. (1997). Neuropsychological correlates of self-reported impulsive aggression in a college sample. *Personality and Individual Differences, 23,* 961–965. Retrieved from http://dx.doi.org/10.1016/S0191-8869(97)00120-7

Tucker, C. J., Finkelhor, D., Turner, H., & Shattuck, A. (2013). Association of sibling aggression with child and adolescent mental health. *Pediatrics, 132*(1), 79–84. Retrieved from http://dx.doi.org/10.1542/peds.2012-3801

Van Dyk, T. R., & Nelson, T. D. (2014). Peer victimization and child physical health: The moderating role of pessimism. *Journal of Pediatric Psychology, 39*(4), 469–480. Retrieved from http://dx.doi.org/10.1093/jpepsy/jst147

Vygotsky, L. S. (1980). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Watson, M., & Fischer, K. (2002). *Pathways to aggression through inhibited temperament and parental violence*. Harvard Graduate School of Education. Retrieved from www.gse.harvard.edu/news/features/fischersummary.html