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The Structure of Child and Adolescent Aggression: Confirmatory Factor Analysis of a Brief Peer Conflict Scale

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The Structure of Child and Adolescent Aggression: Confirmatory Factor Analysis of a Brief Peer Conflict Scale

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Abstract

The importance of simultaneous consideration of forms and functions in youth measures of aggressive behavior is well established. Competing models have presented these highly interrelated constructs as either independent (e.g., reactive or overt) or paired factors (e.g., reactive and overt). The current study examines these models in the context of assessing the viability of a new self-report measure, the Peer Conflict Scale – 20 Item Version. Confirmatory factor analyses were conducted on PCS 20 responses from 1,048 school-age youth living in the Gulf Coast region. Both models significantly improved upon one or two-factor alternatives, and demonstrated partial invariance across gender and grade. The models showed comparable levels of fit to the data, though some loadings for the independent factors model were non-significant. Results encourage use of the PCS 20 across research settings and developmental contexts, while also demonstrating the viability of a paired factors model of aggression.

Aggression, Psychometrics, Developmental Psychology, Confirmatory Factor Analysis, Multigroup Invariance Testing, Social Anxiety, Peer Conflict Scale

Introduction

Since the beginnings of psychological science, investigators have sought to characterize and classify aggressive acts to better understand the aggressor (Adler, 1964). Few other concepts so thoroughly permeate life as aggression. Over the course of the late 19th and early 20th centuries, researchers often described it as an inherent component of the human condition. William James, for example, characterized aggression as, "that aboriginal human neophobia, that pugnacity of which we all share the vestiges," and asserted its origins lie in, "inborn hatred of the alien and of eccentric and non-conforming men" (James, 1902, p. 338; see Geen, 1998). Freud transitioned through multiple theories about the bases of aggression, before arriving at a similarly innate explanation, with aggression originating from an organism's unconscious desire to return to an inorganic state ("The Death Drive"; Freud, 1922). Beginning in the late 1980's, and continuing over the past several decades, researchers have begun to conceptualize aggression as a multidimensional concept, varying according to the method and intent of behavior.

This thesis reviews current trends in aggression research, focusing on contemporary perspectives, and investigates the structure of a new measure, the Peer Conflict Scale - 20 Item Version (PCS 20). I begin by presenting a widely accepted definition of aggression drawing from the work of Buss, Berkowitz, and others. In the next section (*Functions of Aggression*), I review studies by Dodge, Coie, and others who were among the first to propose subtypes based on the function (i.e. intent) of the aggressive behavior. In *Forms of Aggression*, I provide an examination of work by Crick and Berkowitz, who suggested the existence of a relational form of aggression. The section *Form and Function Synthesis* presents an overview of how contemporary researchers have attempted to model both forms and functions of aggression in children. I review work by Little et al. (2003) whose factor model of aggression separates forms and function into unique (i.e., independent) constructs. As an applied example, I describe the

work of Marsee and colleagues (2008), who have investigated ways that combinatory (i.e., paired) form-function constructs might tease apart associations between anxiety and aggression. I review the origins of their measure, the Peer Conflict Scale (Marsee et al., 2007), as well as evidence for its validity and reliability in assessing aggression subtypes. Finally, (*The Present Study*) I set out the potential advantages of the PCS 20, in terms of how a shortened PCS may provide a similarly valid assessment while reducing participant burden (thereby increasing its research and or clinical utility in time-limited contexts). Additionally, I describe a possible limitation, in that shortening the assessment may influence the structural viability of the PCS in terms of obtaining the four subscales. Several hypotheses are proposed and tested. First, an adjusted version of the paired factors model proposed by Marsee et al. will demonstrate superior fit over unidimensional or bi-dimensional alternatives, as well as measurement invariance across grade and gender. Second, a modified version of the independent factors model (Little et al., 2003), will also show improved fit over alternatives, as well as measurement invariance across grade and gender. Third, based on the findings of Marsee, Weems, and Taylor (2008), the reactive relational subscale of the PCS is expected to show a unique association with social anxiety.

Definition of Aggression

While debate continues, aggression is generally defined as an act performed with harmful intent (Berkowitz, 1993). Buss (1961) was among the first to encourage that researchers restrict investigations to behavior that harms\injures another individual (Baron & Richardson, 2004). This definition was later amended to specify that the individual must act with the *intent* to harm, given the importance of motive in aggression (Berkowitz, 1993; S. Feshbach, 1970). While psychologists continue to disagree over the finer points, most definitions reference both method

and intent (Harré & Lamb, 1983; Underwood, Galenand, & Paquette, 2001). Buss further argued that aggression may separate into subtypes according to the reward sought by the aggressor, namely instrumental and angry aggression (Buss, 1961). Contemporary research commonly refers to these as proactive and reactive *functions* of aggression, respectively (Dodge & Coie, 1987).

Functions of Aggression

Aggression may be considered proactive, when the individual engages in aggression to acquire resources, or reactive, when aggression is used as a defensive response to threat. Proactive aggression is described as the "cold-blooded" and utilitarian type, in that the action is motivated less by emotional arousal, and more by a desire to acquire resources. Alternatively, the "hot-blooded" reactive aggression may occur when perceived threat triggers a retaliatory response. While in each case the aggressive act is goal-oriented (resource gain in proactive, threat reduction in reactive), the functions of aggression are associated with inverse types of reinforcement. Proactive aggression is thought to develop as a conditioned response to positive reinforcement, whereas reactive aggression may result from negative reinforcement. Thus, despite their similarities, etiological explanations for these functions have varied in the literature (Dodge, Lochman, Harnish, Bates, & Pettit, 1997).

Previous work had noted that children may commit aggressive acts with (reactive) or without (proactive) provocation. However, Dodge and Coie (1987) were among the first to propose that proactive and reactive functions may represent two sides of the aggression "coin". This represented an important shift in research, in that aggression was no longer viewed as a unidimensional construct. Instead, Dodge and Coie (1987) suggested these functions may in fact be subtypes of aggression divided according to the goal of behavior. Subsequent research has

shown that construction of these goals may vary according to interpretation of social cues. For example, reactive aggressive children may over attribute hostility to ambiguous social stimuli, and thus be more likely to respond with an aggressive defense to threat. Early work suggested that both adults and children are more likely to respond aggressively to overtly intentional provocation (Dodge, Murphy, & Buchsbaum, 1984; Rule & Duker, 1973). However, Dodge and others noted that some aggressive children tended to interpret an offender's intentions as hostile, even when the provocateur's intent was ambiguous (Dodge, 1980). This "hostile attribution bias" (Nasby, Hayden, & DePaulo, 1980) was presumed to promote sensations of threat and fear that impel the body to act.

Attempting to isolate the reactive aggressive subtype, Dodge and colleagues theorized that investigation of biases in social interpretation might differentiate aggression in children. To test this, they conducted a series of studies with elementary school boys in various parts of the country. First, a teacher-rating instrument was developed including items deemed prototypical of either reactive or proactive aggressors. A similar sociometric measure was crafted, and both were administered to classrooms of boys in several sites across the country. Notably, these measures found modest support for popularity differences in reactive versus proactive children, suggesting their validity in predicting subtypes. Next, children were asked to observe videotaped vignettes depicting situations where a child is provoked by a peer whose intentions are either hostile, or ambiguous in nature (Dodge et al., 1984). In accordance with the original hypothesis, children who tended toward reactive aggression were more likely (than proactive or non-aggressive children) to attribute hostile intent to the ambiguous scenarios, and propose aggressive retaliatory responses. Further, a positive association ($p < .01$) was observed between errors in attributing hostile intent, and reactive aggression (Dodge & Coie, 1987).

Whereas reactively aggressive children might tend to negatively evaluate peer intentions, proactively aggressive may show similar deficits when evaluating the likely outcomes of their own behavior. Crick and Dodge (1996) hypothesized that proactively aggressive children might tend to overestimate benefits of aggressive responses, while underestimating the repercussions. Teachers of 624 elementary school children were asked to rate their students' use of proactive and reactive aggression. Children were then divided into groups designated as non-aggressive, reactive aggressive, proactive aggressive, and concurrently proactive and reactive aggressive. Similar to the work of Dodge and Coie (1987), assessment of hostile attribution bias was performed by asking children to respond to hypothetical vignette stories wherein a provocateur's intentions were ambiguous. An additional measure evaluated children's expectancies of response outcomes in these situations, their beliefs about the efficacy of aggressive behavior in general, and their goals during social interactions. Results indicated a significant main effect of proactive aggression on outcome expectations ($p < .05$) such that proactively aggressive children were more likely to anticipate positive outcomes from aggressive responses. Interestingly, proactively aggressive children were also more likely to select goals that enhanced self-efficacy (i.e., resource gain) over those that improved social relationships (Crick & Dodge, 1996).

Despite evidence suggesting differences in cognitive components of reactive and proactive aggression, some have questioned the value in distinguishing between the two (Bushman & Anderson, 2001). This has continued despite the volume of research demonstrating that functions of aggression are differentially associated with concurrent and consequent maladjustment (Card & Little, 2006; Fite, Stauffacher, Ostrov, & Colder, 2008). Yet, the directionality and significance of these relationships has tended to vary in published research (Card & Little, 2006). In a meta-analysis, Card and Little (2006) effectively provide direction to

the tide of evidence relating reactive and proactive aggression to psychosocial issues. Their review includes 42 studies examining proactive and reactive aggression in normative samples of children under age 18. While zero-order correlations indicate that the functions share an association with most markers of poorer psychosocial adjustment, a review of semi-partial correlations (i.e., independent effects of each function) reveals important differences. Whereas reactive aggression was independently related to all indices, proactive aggression was not. After controlling for reactive aggression, the proactive function was significantly related to higher levels of delinquency and peer rejection, but lower levels of victimization (Card & Little, 2006). Card and Little (2006) effectively rebuke the arguments made by Bushman and Anderson (2001), who suggest it may be, "time to pull the plug," (p. 1) on the function dichotomy. In addition to aggression functions, contemporary research has provided evidence for an additional dimension that classifies aggression according to the form or manifestation of the aggressive behavior.

Forms of Aggression

While early literature primarily described aggression as an overt behavior, contemporary research suggests the existence of a separate relational form (Crick & Grotpeter, 1995). The overt form constitutes an act of aggression wherein the victim is made aware of the threat's source. Behaviors such as name-calling, verbal threats, or physical violence are described by overt aggression. A second form, originally referred to as, "indirect" aggression by Bjorkqvist and colleagues (Lagerspetz, Björkqvist, & Peltonen, 1988), constitutes covert behaviors such as spreading rumors or ostracizing victims with the goal of disrupting relationships and damaging reputations. The term "relational aggression" will be used here, due to its more common usage in literature and synonymy with "indirect aggression" (Archer & Coyne, 2005).

The overt form shows a strong unique association (i.e., beyond the effects of relational aggression) with more general externalizing problems (Card, Stucky, Sawalani, & Little, 2008). This is to be expected, as outright aggressive acts may be a symptom of a larger pattern of disruptive behavior. Further, overtly aggressive children are (in general) are more likely to have poor relationships with peers. They may be more frequently rejected by others, and be less accepted overall. Relatedly, overt aggression appears to uniquely predict current and future emotional dysregulation, delinquency, and attentional difficulties (Crick, Ostrov, & Werner, 2006; Zalecki & Hinshaw, 2004).

Noting that previous studies largely restricted aggression to overt forms, Feshbach (1969) proposed an alternate, "indirect social means of inflicting pain," (p. 1) which she operationalized as the exclusion or rejection of other children. In perhaps the first study of relational aggression, Feshbach observed children's behavioral responses when presented with an unfamiliar peer. She noted that girls were more likely to respond by engaging in a form of aggression incorporating distinctly social behaviors (e.g., ostracizing, excluding, gossiping) (N. D. Feshbach, 1969). Despite these early findings suggesting the presence of a relational form, research largely continued to explore aggression as a unidimensional concept (i.e., overt) (Lagerspetz et al., 1988). Decades later, following on the work of Feshbach (1969), Lagerspetz, Bjorkqvist, and colleagues (1988) asked a large group of Finnish children to complete a peer rating scale that assessed differences in "angry" response behaviors across genders. Factor analyses found good fit for a two-factor solution, with scale items tending to align into groups of overt or relational aggressive behaviors (Lagerspetz et al., 1988). Subsequent research by Cairns et al. (1989) attempted to parse out evidence for a relational form by examining gender differences in peer conflict. Content analysis of interviews with middle-school age children revealed that conflicts

between girls were more likely to center on themes of social alienation and ostracism (i.e., relational aggression), versus physicality and direct confrontation for boys (i.e., overt aggression) (Cairns et al., 1989).

Arguably, the overt form originally studied by researchers may lack social utility for girls, who are commonly stereotyped as being less "aggressive" compared to boys. Crick and Grotpeter (1995) suggest that children are most likely to engage in aggressive behavior that disrupts peers gender-specific social goals. Boys, whose peer groups place value in dominance and resource acquisition, are therefore more likely to engage in overt physical and verbal aggression. However, this explicit, instrumental behavior may be less useful for girls, whose peer groups emphasize the importance of social and relationship issues (Block, 1983). Crick and Grotpeter (1995) proposed that girls might be more likely to engage in "relational aggression," described as harmful manipulation of peer relationships. The authors asked 491 school children to complete a peer nomination instrument containing several descriptive statements thought to represent either relational or overt aggression. Children were presented with a class roster and asked to nominate up to three classmates for each item. Analyses of responses found that distinct factors representative of overt and relational aggression accounted for 24 and 14% of variance, respectively. Results showed that relationally aggressive children were at greater risk of depression, loneliness, and social isolation, while also tending to report more dissatisfaction with their peer relationships. Relatedly, these children were more likely to be poorly accepted by peers, or experience outright rejection (Crick & Grotpeter, 1995).

Initial identification of the relational subtype began a shift in research towards dimensional investigations, linking subtypes of relational versus overt aggression to psychopathology. As demonstrated in a meta-analysis by Card, Stucky, Sawalani, and Little

(2008), in the years following the work of Crick and colleagues, research continues to suggest that overt and relational aggression predict different types of maladjustment. Notably, overt aggression appears to more strongly predict constructs linked to emotional dysregulation, such as conduct problems, whereas relational aggression often demonstrates a stronger association with internalizing problems (Card et al., 2008). Thus as with the functions of aggression there appear to be unique links to the two forms.

Form and Function Synthesis

Research exploring the unique nature of forms and functions has done much to advance the field. However, the vast majority of these studies have restricted themselves to investigations of either forms or functions. Little et al. (2003) suggest that due to their shared variance, any investigation restricted to a single dimension of aggressive behavior (e.g., form) will ultimately be confounded by effects from the unmeasured construct (function). Thus, the two may interact to mask each other's predictive ability (Type II error), or misrepresent associations altogether (Type I error). Ultimately, Little et al. (2003) propose that when considered independently, forms and functions may demonstrate previously unexposed relationships with commonly studied correlates. Further, the authors hypothesized the well-documented high positive correlation between functions may in fact be non-existent (or even negative) when considered separately from form. Little and colleagues suggested that a novel "multiform, multifunction" model (Figure 1), constituting eight latent factors of aggression could be used to separate forms and functions. Two of these factors, overt and relational forms, draw from direct or "pure"

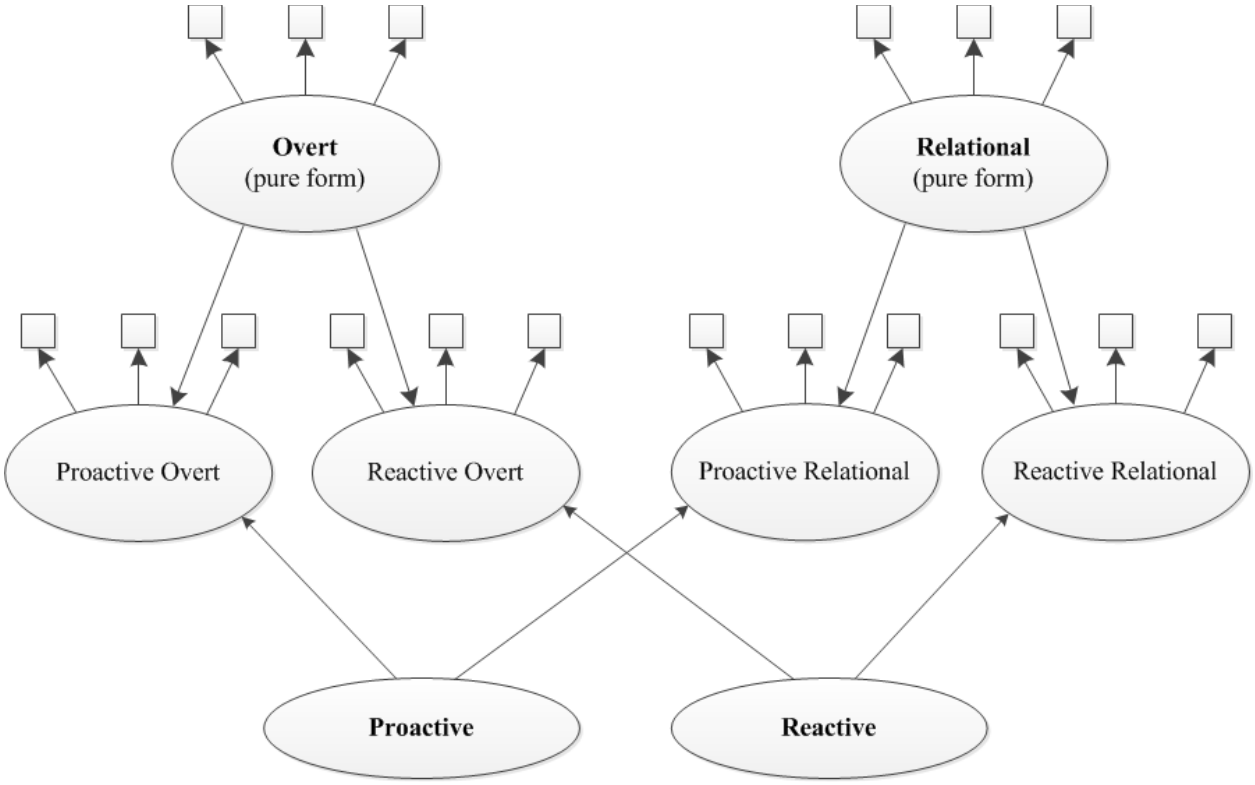

Figure 1. Little et al. (2003) model of independent forms and functions.

measurements, that is, items that only include reference to form (e.g., overt: "I'm the kind of person who often fights with others"). Four others represent the "cross-products" of form and function such as reactive-overt aggression, while the remainder constituted indirectly measured functions. Linguistically, it is difficult to operationalize "pure" function (i.e. intent of aggressive behavior without method). For example, an aggression item could be developed referencing form, "I spread rumors about others," (relational) or form and function, "I spread rumors about others to become popular," (proactive-relational), but function (i.e., intent) without form (method) cannot be represented. Therefore, aggression functions were included as second-order (i.e. indirectly measured) factors.

Little et al. anticipated that each of four form and function constructs would draw information from observed cross products between the two (e.g., reactive-overt: "When I'm hurt by someone, I often fight back"; (Little et al., 2003). Constructs were assessed using a 36-item

self-report measure containing items adapted from work by Crick, Dodge, and colleagues (Crick & Grotpeter, 1995; Dodge & Coie, 1987). Items were rated along a 4-point scale from "*not at all true*" to "*completely true*". Several additional constructs thought to be associated with aggression (including frustration intolerance, hostility, victimization, social influence, and social confidence) were assessed, and anticipated to show differential associations with forms and functions. Measures were translated into German and completed by 1,723 grade school students in suburban Berlin, Germany (mean age 11.2). Preliminary results validated the aggression measure's structure by confirming the homogeneity of item pools, as well as overall validity. Subsequent analyses were performed using structural equation modeling with parceled indicators (due to the unidimensionality of item groups). Model fit was examined using structural equation modeling. The hypothesized eight-factor model showed the best fit [$x^2(129, N = 1723) = 932.0$; RMSEA = .061; NNFI = .946, IFI=.955], as well as significant improvement over alternate two and three factor models (both $p < .01$). Factor loadings showed that item groupings aligned well with the factors proposed in the original model (reactive overt, reactive relational, proactive overt, proactive relational, 'pure' relational, 'pure' overt, proactive, reactive). The authors report average item variance greater than 58%, with all indicators significant ($p < .01$). Measure invariance was tested across age cohort (grades 5-7 vs. grades 8-10), ethnicity, and gender and showed adequate equivalence across groups.

Little et al. (2003) also examined the unique correlates of each of the four factors after controlling for age cohort, gender, and ethnicity. Hierarchical linear regressions showed that all forms and functions were positively associated with negative (coercive) influence, suggesting that peer coercion may be a common tactic across dimensions of aggression. Significant positive associations with frustration and hostility were found for overt, relational, and reactive, but not

proactive aggression. Self-report of victimization appeared to differentiate overt and relational aggression, which showed significant negative and positive correlations (respectively). Notably, relationally aggressive youth were also less likely to rate themselves as social competent, suggesting that they may not believe such methods are effective. Lastly, reactive and overt aggression, but neither instrumental nor relational, were associated with antisocial behavior (Little et al., 2003).

Fite and colleagues (2008) re-examined the Little et al. (2003) model in an American sample using confirmatory factor analyses. Little et al.'s (2003) original measure was completed by 69 youth (66% male, 73% Caucasian) aged 11 to 15 living in western New York. Unlike in the original research, the authors oversampled children with disruptive behavior disorders, ensuring that aggressive youth would be included. Convergence difficulties resulted from a combination of model complexity and small sample size, necessitating the use of subscale means rather than parceled indicators as done by Little et al. (2003). Residual variances of instrumental and reactive aggression were held equivalent to further simplify the model. The resulting model, though less parsimonious than that of Little et al. (2003), was a good fit to the data, χ^2 (6) = 14.51, CFI = .97, $p < .05$. Similar to the original work, while overt and relational forms of aggression were positively correlated, a negative association (though non-significant) was observed between proactive and reactive functions. Further, and in accordance with Little et al. (2003), reactive and overt aggression were uniquely associated with antisocial behavior (Fite, Colder, Lochman, & Wells, 2008).

Marsee et al. (2008) further contributes to the literature by presenting one of the earliest uses of the *Peer Conflict Scale (PCS)*. Drawing from earlier scales of forms and functions of aggression, the PCS represents a second-generation instrument, in that it is designed to account

for limitations observed in the previous aggression measures (Marsee & Frick, 2007). Unlike previous measures, PCS items are crafted to capture both the harm and intent aspects referred to in common definitions of aggression. For example, Marsee et al. (2011) note that items in the measure developed by Little et al. (2003) may not adequately capture intentions behind aggressive behavior. Specifically, items are restricted to aggression for gain (proactive) (i.e., "To get what I want, I…") or as an angry response (i.e., "When I am mad at others, I…"). However, research has described a wide range of reasons for aggression, such as dominance, impulsivity, and sadism (Frick & Marsee, 2006; Marsee et al., 2011). Whereas Little et al. (2003) do well to assess the harm component, other commonly used measures omit this aspect altogether (e.g., K. Brown, Atkins, Osborne, & Milnamow, 1996).

The PCS captures both method of harm (form) and intent (function) through each of four "cross-product" (e.g., reactive overt) subscale. Ten items represent each cross product subtype: proactive-overt (e.g., "I start fights to get what I want"), proactive relational ("I gossip about others to become popular"), reactive overt ("When someone hurts me, I end up getting into a fight"), and reactive relational ("If others make me mad, I tell their secrets"). Item responses are made along a four-point rating scale ranging from 0 ("not at all true") to 3 ("definitely true"). Subscales for form-function constructs are calculated by summing scores from subtype item groups. Alternately, individual form or function scores may be calculated by summing scores from items containing those constructs.

Extant research conducted with both community and clinical samples has suggested the subscales of the PCS are internally consistency and appropriately capture form-function constructs (Crapanzano, Frick, & Terranova, 2010; Marsee & Frick, 2007; Marsee et al., 2008; Marsee, 2008). In a test of the PCS' internal structure, Marsee et al. (2011) examined data from

855 adolescents (between 12 and 19 years). Youth were drawn from local high schools (n = 166), detention centers (n = 158), and a non-secure residential treatment center (n = 531). Consistent with past findings, the four PCS subscales were highly correlated with one another (r = .45 to r = .77, all $p < .001$). Confirmatory factor analysis (CFA) via Mplus was used to form and evaluate factor structures (Version 6; Muthén & Muthén, 2011). Drawing from the methods of Little et al. (2003) as well as a priori assumptions about the PCS' internal factor structure, the authors chose to test one, two, and four factor models. Model fit was evaluated using the chi-square fit-statistic, the root-mean-square error of approximation (RMSEA; Browne & Cudeck, 1992) and the comparative fit index (CFI; Bentler, 1990). Initial analyses of the uni-dimensional model found it to be a poor fit to the data, χ^2 (151, 848) = 1530.809, CFI = .785, RMSEA = .104 according to generally accepted values (Browne & Cudeck, 1992; Hu & Bentler, 1999). Slightly better fit was observed in the bi-dimensional model, $\Delta\chi^2$ (1, 848) = 257.371, $p < .001$, though this was improved further in the four-factor model, $\Delta\chi^2$ (3, 848) = 267.244, $p < .001$ [overall: χ^2 (154, 848) = 758.588, CFI = .906, RMSEA = .068] (Figure 2). Notably, loadings for each item were significant at the $p < .01$ level. Additional analyses contrasted the factor structure among gender and sample source groups (i.e., high school, detention, residential). Fully-constrained models failed to show invariance across either dimension, however, inspection of modification indices revealed that variance across either group was attributable solely to Item 25. Subsequent analyses using partially-constrained models (i.e., constrained loadings and thresholds for Item 25) showed no significant difference from unconstrained models for either gender or sample source, supporting the PCS' invariance (Marsee et al., 2011).

While initial findings on the PCS are encouraging, it is conceivable that a shortened version could have improved utility among researchers and clinicians. The past decade has seen

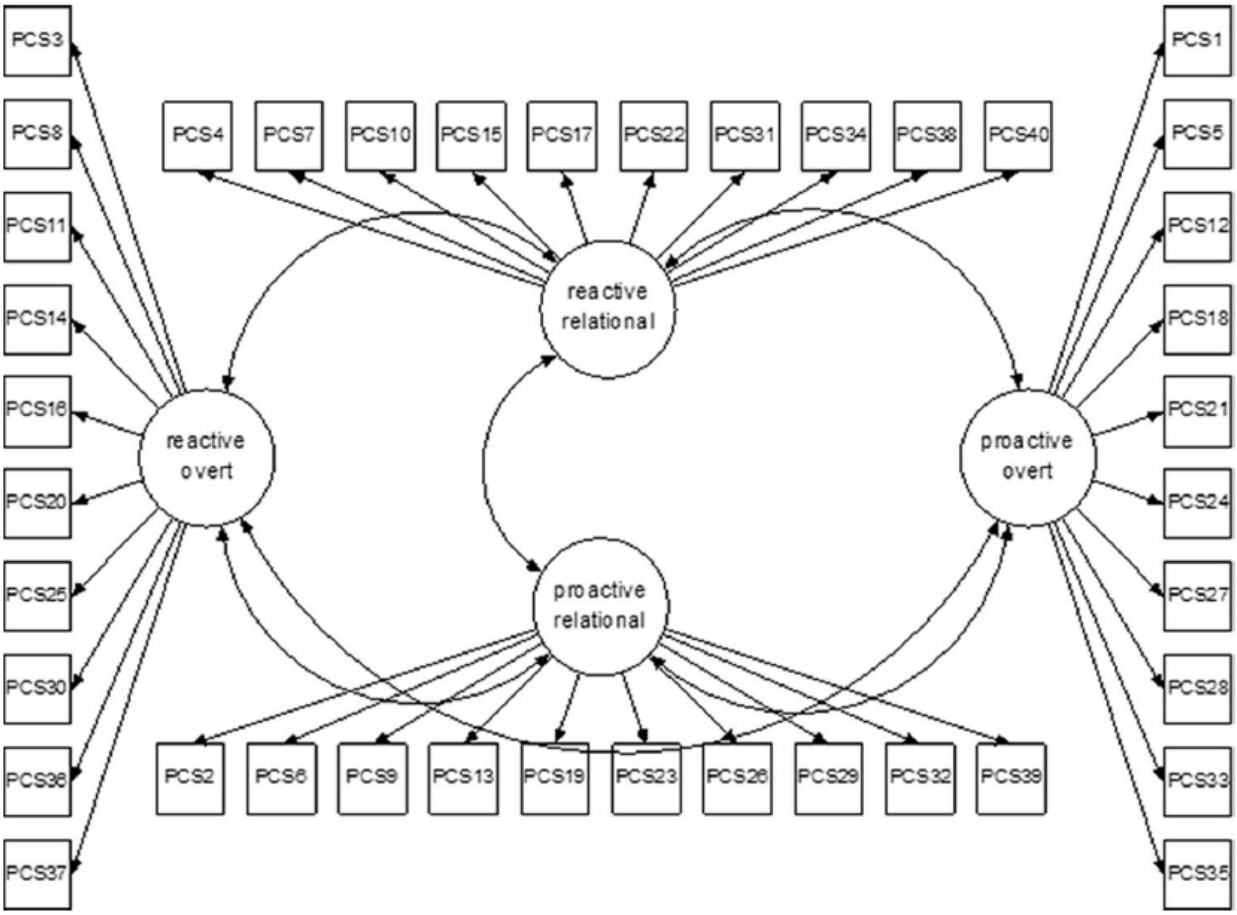

Figure 2. Paired factors model of Peer Conflict Scale (Marsee et al., 2011).

a strong shift toward investigations focusing on in situ observation and intervention in areas such as school systems (Rones & Hoagwood, 2000; Weems, Scott, et al., 2010). The time constraints imposed by these settings often require that researchers use highly efficient measures (i.e., brief, yet sensitive ;Ebesutani et al., 2012; Levitt, Saka, Hunter Romanelli, & Hoagwood, 2007). Shortened measures provide the investigator with additional flexibility, as the reduced cost to experimenter and participant alike broaden their utility (Gosling, Rentfrow, & Swann Jr, 2003; Robins, Hendin, & Trzesniewski, 2001). In addition, shorter questionnaires have been shown to increase response rates (Edwards et al., 2002), and may have similar psychometric properties (Shrout & Yager, 1989).

To that end, Marsee and colleagues have developed the Peer Conflict Scale – 20 Item Version (PCS 20), an abbreviated version of the original for screening in school settings (Scott, Lapré, Marsee, & Weems, 2014). Conceptual consideration and empirical findings were used to shorten each of the original four subscales (described above) from 10 to five items. Only one study has employed this shortened version (Scott et al., 2014), and found that a latent factor of aggression using the four subscales was associated with lower academic achievement and elevated PTSD symptoms. However, empirical evidence in support of the PCS 20's factor structure is lacking. Research in this area is critical for future use, as the PCS 20's shortened item count may not fully identify the four components of aggression. For example, the model proposed by Marsee et al. (2011) would limit each aggression factor to just five indicators, sometimes considered at or near the minimum recommended for confirmatory factor analyses (Kline, 2013). Research is thus needed to test whether the PCS 20 maintains the factor structure and measurement invariance (across age and gender) found for the full 40 item version. Establishing invariance across age and gender is important for measuring aggression given the theoretical differences in aggression in boys and girls and to facilitate understanding age differences in the manifestation of aggression. This is because mean differences across groups may alternately result from true differences or different measurement properties across the groups (Horn & McArdle, 1992). Thus, the current thesis proposes to examine the structure of the PCS 20, as well as the invariance of its factors across age and gender.

The Present Study

Conceptualizations of aggression have rapidly grown from unidimensional to multidimensional, multifaceted interpretations considering the motivation behind the aggressive act (function), as well as the nature of the act itself (form). Separate investigations of forms or

functions have consistently revealed that each may play an important role in characterizing associations between aggression and psychopathology (Card & Little, 2006; Card et al., 2008). Despite a conceptual and empirical basis for studying forms and functions in tandem, research exploring these cross products of aggression has been limited. Drawing from the evidentiary base developed by Little et al. (2003), the Peer Conflict Scale builds on existing support for a multidimensional view of aggression, while addressing the shortcomings of previous measures. An abbreviated version may reduce participant burden, thereby increasing the PCS' frequency of use and overall utility in more comprehensive studies or in clinical settings. While early evidence has supported the internal consistency of the PSC 20 and its links to academic achievement (Scott et al., 2014), the factor structure and its invariance are yet to be tested. The structural model of Marsee et al. (2011) differs from the work of Little et al. (2003) in that the four dimensions of aggression are modeled as form and function cross products (e.g., relational overt, etc.). This conceptualization of forms and functions as paired, rather than unique, constructs may provide a new perspective for understanding the link between aggression and psychopathology. Analytical comparison of these models in terms of fit and invariance represents an important next step, and has yet to be conducted.

Following on the original work with the full PCS, the model proposed by Marsee et al. (2011) (referred to here as the *paired factors model*; Figure 3) will be examined first. A second model will draw from Little et al. (2003) and consist of items cross loading onto unique constructs of reactive, proactive, overt, or relational aggression. Each model will be evaluated according to overall fit, parsimony, and (if necessary) requisite modifications necessary to achieve convergence and invariance across grade and gender. PCS 20 subscales will be examined for unique associations with internalizing symptoms (specifically, social anxiety). We

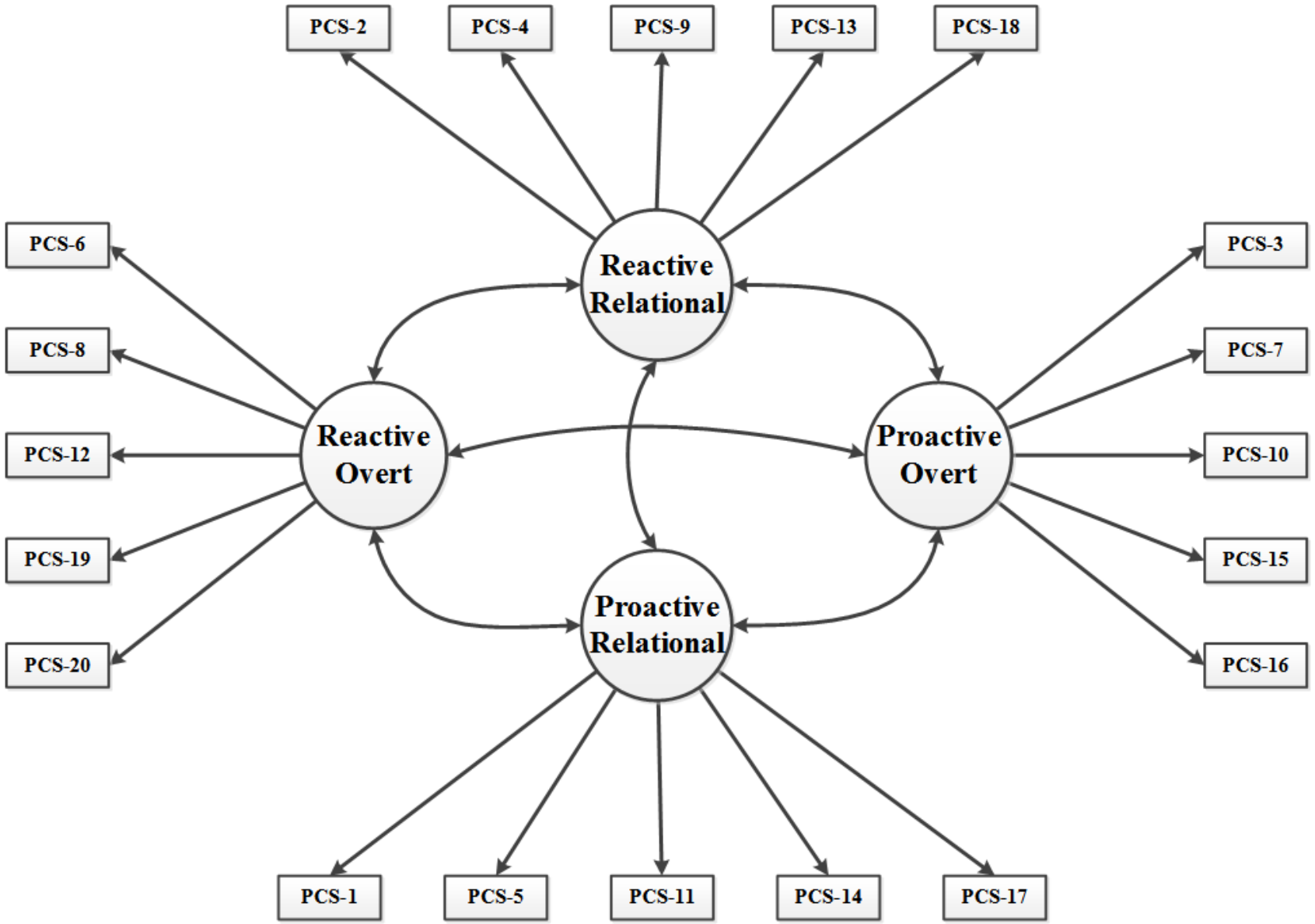
PCS-2
PCS-4
PCS-9
PCS-13
PCS-18
PCS-6
PCS-8
PCS-12
PCS-19
PCS-20
Reactive Relational
Reactive Overt
Proactive Overt
Proactive Relational
PCS-3
PCS-7
PCS-10
PCS-15
PCS-16
PCS-1
PCS-5
PCS-11
PCS-14
PCS-17

Figure 3. Paired factors model of the Peer Conflict Scale – 20 Item Version.

anticipate results consistent with Marsee et al. (2008) who found that reactive relational aggression was uniquely associated with anxiety. Theoretically, relational aggression may be linked to anxiety as a mechanism for transferring negative attention away from oneself and onto others in the peer group (Loudin, Loukas, & Robinson, 2003). This should be particularly true for social anxiety. Moreover, social anxiety may be more strongly linked to the reactive function of aggression due to its association with emotional regulation problems, which in turn may lead to higher levels of internalizing symptoms such as social anxiety.

Hypotheses of the Proposed Study

1. The *paired factors model* proposed by Marsee et al. (2011) will demonstrate fit superior to unidimensional (one factor) or bi-dimensional (two factor) models.
    a. The *paired factors model* will demonstrate measurement invariance across dichotomized grade groups comprising students in grades 4-8, 9-12. These groups were formed based on an a priori hypothesis that the period surrounding transition to secondary school may be related to a shift in forms and functions of aggressive behaviors.
    b. The *paired factors model* will demonstrate measurement invariance across gender.
2. The *independent factors model* proposed by Little et al. (2003; see Figure 4) will demonstrate fit superior to unidimensional or bi-dimensional models.
    a. The *independent factors model* will demonstrate measurement invariance across dichotomized grade groups comprising students in grades 4-8, 9-12.

b. The *independent factors model* will demonstrate measurement invariance across gender

3. Based on previous research (Marsee et al., 2008) the reactive relational subscales of the PCS 20 will show unique associations with social anxiety.

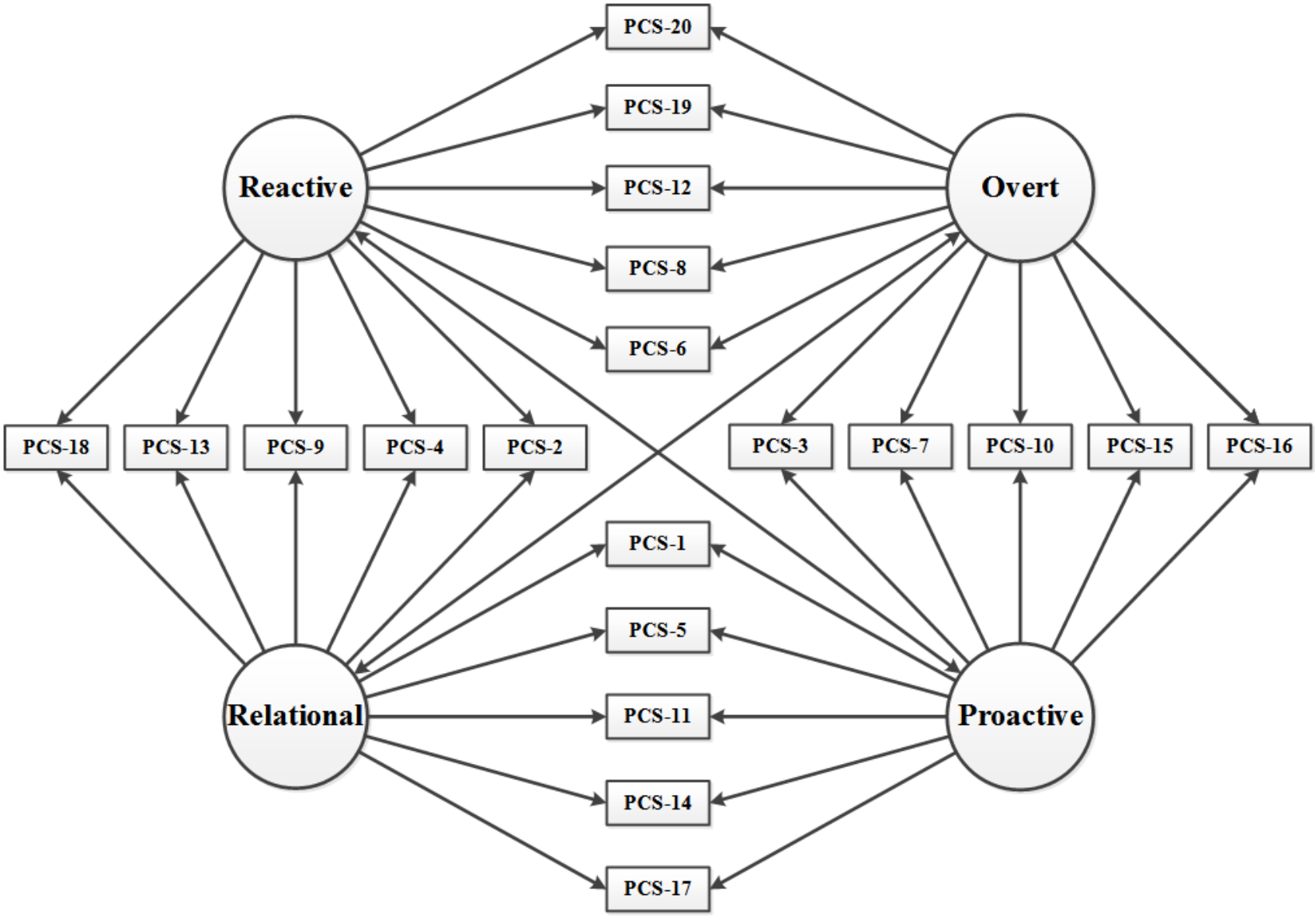

Figure 4. Independent factors model of the Peer Conflict Scale - 20 Item Version

Method

Participants

The sample included 1,048 students in grades 3 – 12 across five schools in the Gulf South region as part of an innovative school counseling curriculum (Weems, Scott, et al., 2010; Weems et al., 2014). Of the original sample, 126 participants were excluded due to missing grade, gender, RCADS anxiety subscale scores, or failing to respond to at least four of five items per PCS subscale, or 18 of 20 items overall. Randomness of missing data was tested by correlating total number of missing responses with gender, grade, aggression, and anxiety. SPSS missing value analysis also looked for within measure response patterns. Results indicated these cases to be MCAR (missing completely at random), and they were omitted from subsequent analyses (n = 922). The remaining sample consisted of 922 participants ranging in age from 7 to 18 years (M = 13.36, SD = 2.39), with 54% reporting as female. A majority identified themselves as African-American (91.0%), though small percentages identified themselves as Hispanic (1%), Caucasian (0.9%), Asian (0.7%), or of mixed race (6.5%). Each school predominantly serves youth from low-income families, as denoted by available school data indicating that 94% of students are eligible to receive free lunch.

Measures

Peer Conflict Scale – 20 Item Version. The Peer Conflict Scale – 20 Item Version (PCS 20) is an abbreviated version of the Peer Conflict Scale (Marsee et al., 2007), a 40-item measure assessing children's use of aggression subtypes. Like the original, the PCS 20 uses cross-product subscales (e.g., reactive overt) to assess combinatory constructs of form and function. Thus, 10 items assess proactive aggression, with five proactive-overt items (e.g., "I start fights to get what I want") and five proactive-relational items (e.g., "I gossip about others to become popular"),

while the remaining 10 assess reactive aggression, subdivided as reactive overt (e.g., "When someone hurts me, I end up getting into a fight,") and reactive relational (e.g., "If others make me mad, I tell their secrets"). Ratings are made along a four-point Likert-type scale (0 = *not at all true*, 1 = *somewhat true*, 2 = *very true*, 3 = *definitely true*), with scores for each five item group summed to create the four subscales (range = 0 – 15). A description of the creation of the PCS 20 from the original measure is provided in the introduction. Subscales of the PCS 20 have shown excellent internal consistency in previous research (α = .90; Scott et al., 2014).

Revised Child Anxiety and Depression Scales. Anxiety will be assessed using a modified version of the Revised Child Anxiety and Depression Scales (RCADS; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000). Parent study methods necessitated the removal of six items from the original set of 47. The modified RCADS assesses symptom frequency of a broad range symptoms relating to numerous anxiety disorders (e.g., generalized, panic, and separation anxiety disorders). Participants respond along a 4-point Likert-type scale with anchors 1 (*Never*), 2 (*Sometimes*), 3 (*Often*), and 4 (*Always*). Evidence suggests good reliability for the modified RCADS, as well as its individual subscales (Weems, Scott, et al., 2010; Weems, Taylor, et al., 2010).

Procedures

Data collection was part of a larger project investigating the utility of an in-school test-anxiety intervention (Weems, Scott, et al., 2010). Informed consent for data use was obtained from the parent, while oral assent was obtained from the child (children who did not assent were not required to complete questionnaires). Procedures were reviewed by the University of New Orleans IRB and an exempted approval was granted. Measures were completed in a group classroom setting under the supervision of trained research assistants. To ensure participant

comprehension, reading level for individual classrooms was assessed by querying teachers and counselors. When deemed necessary, children were read the measures aloud, or assisted as necessary (as done by La Greca, Silverman, Vernberg, & Prinstein, 1996). In younger classrooms, all children were read the measure without consideration of reading level (see Weems et al., in press).

Data Analysis

Distributions, means, and variance were for all variables using descriptive analysis. Reliability was assessed using coefficient alphas calculated for subscale and overall consistency. Confirmatory factor analysis was performed using Mplus version 6.12 (Muthén & Muthén, 2011). Mplus' robust-weighted least square estimator (WLSMV) was used, and is appropriate for categorical data with severe skew (observed during visual inspection). WLSMV is robust to violations of normality, and establishes estimates using polychoric correlations (T. A. Brown, 2006). Latent variables were identified by fixing the variance of each factor to one. Linear regression was used to identify unique associations between form-function constructs and social anxiety. Missing data was handled using pairwise deletion, as required for use of the WLSMV estimator (Muthén & Muthén, 2011), and suggested for linear regression (Tabachnick & Fidell, 2007).

Model fit was determined using the root-mean-square error of approximation (Browne & Cudeck, 1992) and Bentler's comparative fit index (Bentler, 1990). Traditionally, CFI values greater than .90 suggest good fit, while values greater than .95 constitute acceptable fit (Hu & Bentler, 1999). RMSEA values less than .05 are representative of good fit, values .05 – .08 acceptable fit, values .08 – .10 marginal fit, with values greater than .10 indicating poor model fit. However, Yu (2002) suggests that in analyses with categorical data, these standards may unacceptably elevate the likelihood of Type I error, and suggests a minimum CFI of .96, with RMSEA no greater than .05.

Measurement invariance testing was performed according to the recommendations of Muthén and Muthén (2009), who provide guidelines for analyses with categorical outcomes. In a categorical factor model, discrete values of observed variables are assumed to derive from the

continuous values of their respective factors. Values of the factor at which the observed variable will increase in score (e.g, from 1 to 2) are referred to as "thresholds", and are analogous to intercepts in a continuous factor model. Therefore, for any given categorical indicator, there exist $n - 1$ thresholds, where n is equal to the number of possible values (Millsap & Yun-Tein, 2004). Muthén and Muthén (2009) recommend testing for invariance by comparing the fit of a model with factor loadings and thresholds unconstrained (i.e., free to vary across groups), with a model with these parameters constrained. A specialized chi-square difference testing procedure is used to compare model fit. Difference testing for nested models evaluated with the WLSMV estimator is performed using the DIFFTEST procedure (Asparouhov & Muthén, 2006), therefore results are not equivalent to simple arithmetic subtraction of chi-square values.

Results

Descriptive Statistics

Prior to conducting analyses, all variables were screened for skew and range, as well as the presence of univariate or multivariate outliers. All variables demonstrated substantial positive skew. Therefore, analyses were conducted using both transformed and non-transformed variables where appropriate. Means, standard deviations, and correlations between variables of interest are presented in Table 1. PCS 20 and RCADS subscales presented with distributions and means consistent with extant research (Scott et al., 2014; Weems et al., 2014). Initial analyses compared boys and girls on four PCS aggression subscales using independent samples *t* tests. Equal variances could not be assumed when comparing reactive relational, proactive relational, or proactive overt aggression. Boys reported significantly higher levels of proactive relational, $t(834.88) = 2.93$, $p < .01$, and proactive overt, $t(844.30) = 2.29$, $p < .05$ aggression. Subscale scores were next compared across dichotomized groups of participants in grades 4-8 and grades 9-12. Equal variances could not be assumed when comparing any form-function combinations across grade groups. The 4-8 grade group reported higher reactive relational, $t(712.93) = 8.40$, $p < .001$, proactive relational, $t(771.06) = 4.58$, $p < .001$, and proactive overt aggression, $t(808.41) = 5.47$, $p < .001$. All PCS subscales were significantly inter-correlated ($p < .001$) (see Table 1). RCADS social anxiety subscale scores were also compared between genders and grade groups. Notably, boys reported significantly less social anxiety than girls, $t(918) = -5.48$, $p < .001$. Significant differences in social anxiety were not observed across grade groups.

Confirmatory Factor Analyses

Single factor, and bi-factor models of the PCS-20 were developed from the original PCS factor structure examined by Marsee et al. (2011). The single-factor model loaded all items onto

Table 1

Means, Standard Deviations, and Correlations among the Variables of Interest

	1	2	3	4	5	6	7
1. PCS - Proactive Overt	-	-	-	-	-	-	-
2. PCS - Reactive Overt	.68**	-	-	-	-	-	-
3. PCS - Proactive Relational	.73**	.55**	-	-	-	-	-
4. PCS - Reactive Relational	.73**	.60**	.73**	-	-	-	-
5. RCADS - Social Phobia	.16**	.18**	.20**	.22**	-	-	-
6. Gender	-.08*	-.04	-.10**	-.03	.18**	-	-
7. Grade Groups	-.18**	-.04	-.15**	-.27**	.02	-.12**	-
Overall							
Mean	1.55	3.40	1.71	1.86	0.83	1.54	0.51
SD	2.68	3.70	2.40	2.71	0.64	0.50	0.50
Males							
Mean	1.78	3.57	1.97	1.93	0.70	n/a	0.45
SD	2.86	3.83	2.57	2.83	0.62	n/a	0.50
Females							
Mean	1.37	3.25	1.50	1.80	0.93	n/a	0.57
SD	2.52	3.58	2.22	2.62	0.65	n/a	0.50
Grades 4-8							
Mean	2.05	3.56	2.08	2.62	0.82	1.48	n/a
SD	3.04	3.89	2.80	3.21	0.66	0.50	n/a
Grades 9-12							
Mean	1.09	3.24	1.36	1.15	0.84	1.60	n/a
SD	2.20	3.52	1.87	1.89	0.62	0.50	n/a

Note. Gender correlation point bi-serial coded 1 (male), 2 (female). Grade Groups correlation point bi-serial coded 1 (Grades 4 – 8), 2 (Grades 9 – 12).
* $p < .05$. ** $p < .01$.

a single construct (i.e., aggression) and was used as a baseline for comparisons. Aggression characteristics (e.g., reactive, relational) are theoretically organized into overarching dimensions of form and function. Drawing from Marsee et al. (2011), a model considering all forms and functions should demonstrate fit superior to two factor models of only form or function. To test this, separate bi-factor models were created that arranged items to load on either form or function factors. Finally, the *paired factors model* was developed by modifying the original structure described by Marsee et al. (2011). Construction of an *independent factors model* drew from the work of Little et al. (2003; see Figure).

According to these criteria, the single factor model demonstrated the poorest fit of the models tested, χ^2 (170) = 841.712, CFI = .954, RMSEA ≈ .066, suggesting the PCS 20 may be multidimensional. A two-factor model, with items arranged to load on factors of aggression form (i.e., overt, relational) was tested next. Though the bi-factor form model yielded slightly better fit (than the single factor alternative), $\Delta\chi^2$ (1, N = 920) = 77.484, $p < .001$, it did not fully meet Yu's acceptability criteria (i.e., RMSEA > .05), χ^2 (169) = 653.242, CFI = .967, RMSEA ≈ .056. A second bi-dimensional model loading items onto aggression functions showed similar improvement according to chi-square difference testing, $\Delta\chi^2$ (1, N = 920) = 37.522, $p < .001$, though also failed to demonstrate appropriate fit, χ^2 (169) = 802.870, CFI = .957, RMSEA ≈ .064. Model testing continued with Marsee's paired factors model (Figure 5). All indices of model fit exceeded necessary thresholds, χ^2 (164) = 458.310, CFI = .980, RMSEA ≈ .044, while chi-square difference testing demonstrated that the hypothesized model improved upon bi-factor models of form, $\Delta\chi^2$ (5, N = 920) = 136.489, $p < .001$, and function, $\Delta\chi^2$ (5, N = 920) = 193.536, $p < .001$. Further, all factor loadings were significant at the $p < .001$ level (Table 2). Thus, Marsee's paired factors model was retained for invariance testing.

Table 2

Factor Loadings for the Paired Factor Model of the Peer Conflict Scale – 20 Item Version

	Overall	Males	Females	Grades 4-8	Grades 9-12
Reactive Relational					
2. Sometimes I gossip about others when I'm angry at them.	.608	.644	.637	.575	.637
4. I spread rumors and lies about others when they do something wrong to me.	.845	.811	.890	.803	.899
9. When others make me mad, I write mean notes about them and pass them around.	.874	.878	.867	.833	.916
13. When I am angry at others I try to make them look bad.	.810	.759	.858	.807	.793
18. When others make me angry, I try to steal their friends from them.	.868	.879	.856	.855	.804
Proactive Relational					
1. I enjoy making fun of others.	.522	.471	.565	.616	.505
5. I try to make others look bad to get what I want.	.838	.839	.841	.818	.854
11. I gossip about others to become popular.	.853	.830	.875	.782	.980
14. When I gossip about others, I feel like it makes me popular.	.842	.837	.846	.784	.926
17. I ignore or stop talking to others in order to get them to do what I want.	.688	.746	.649	.732	.650
Reactive Overt					
6. I threaten others when they do something wrong to me.	.769	.735	.810	.760	.769
8. Sometimes I hurt others when I'm angry at them.	.809	.834	.786	.810	.820
12. If others make me mad, I hurt them.	.886	.866	.902	.870	.894
19. When I get angry, I will hurt someone.	.854	.918	.799	.883	.822
20. I have gotten into fights, even over small insults from others.	.610	.640	.582	.637	.610
Proactive Overt					
3. I start fights to get what I want.	.794	.839	.751	.801	.795
7. When I hurt others, I feel like it makes me powerful and respected.	.806	.812	.804	.799	.799
10. I threaten others to get what I want.	.860	.896	.818	.839	.876
15. I hurt others for things they did to me a while back.	.744	.721	.774	.735	.718
16. I enjoy hurting others.	.840	.819	.871	.832	.828

Note. All loadings significant at the $p < .001$ level.

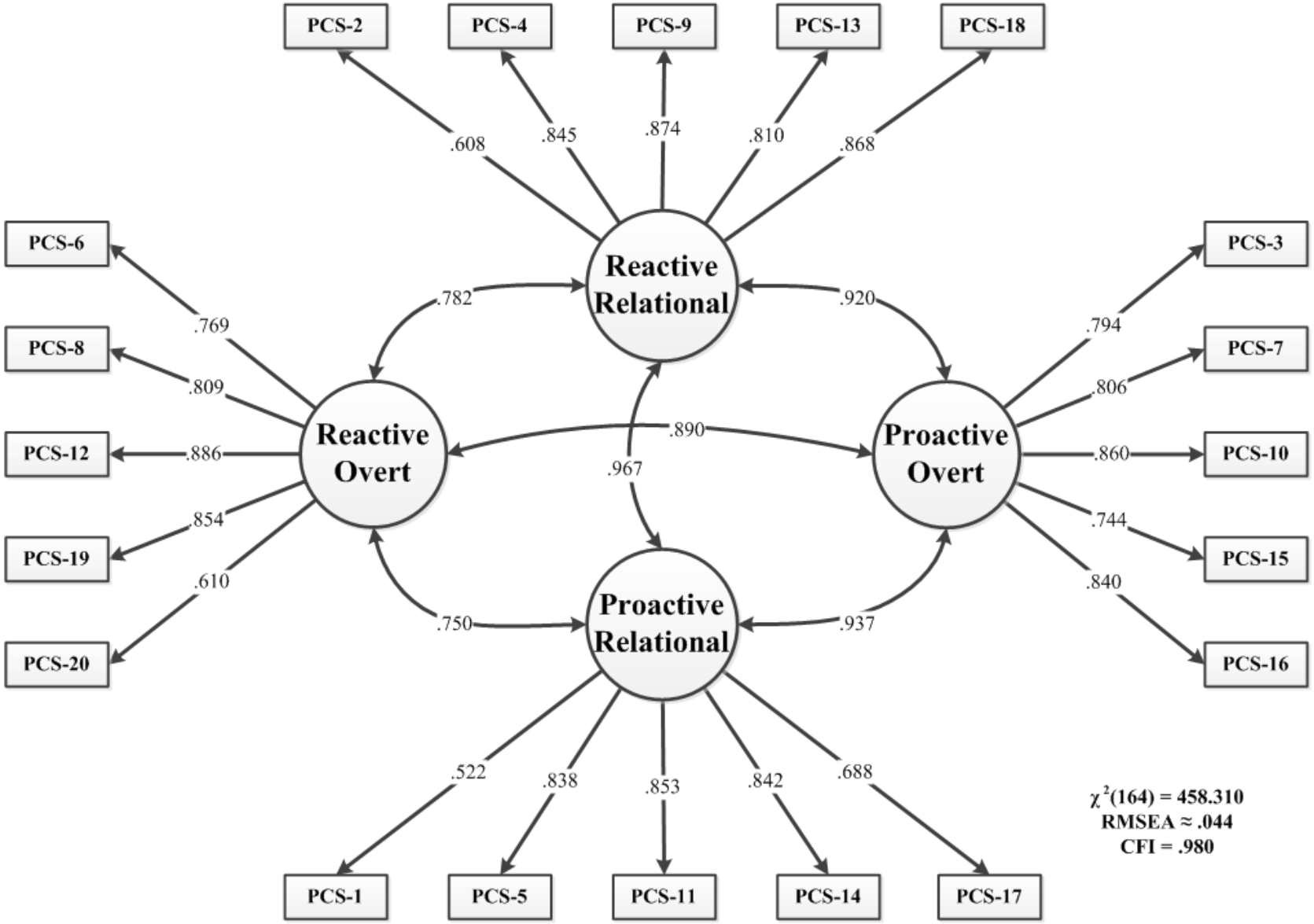

Figure 5. Paired factors model of the Peer Conflict Scale - 20 Item Version with loadings.

Table 3

Factor Loadings for Functions of the Independent Factors Model of the Peer Conflict Scale – 20 Item Version

	Overall	Males	Females	Grades 4-8	Grades 9-12
Reactive					
2. Sometimes I gossip about others when I'm angry at them.	.603	.638	.632	.577	.599
4. I spread rumors and lies about others when they do something wrong to me.	.825	.775	.861	.781	.841
6. I threaten others when they do something wrong to me.	.666	.657	.690	.702	.707
8. Sometimes I hurt others when I'm angry at them.	.660	.722	.629	.712	.731
9. When others make me mad, I write mean notes about them and pass them around.	.846	.833	.827	.803	.860
12. If others make me mad, I hurt them.	.705	.744	.674	.734	.772
13. When I am angry at others, I try to make them look bad.	.807	.758	.850	.811	.737
18. When others make me angry, I try to steal their friends from them.	.844	.858	.788	.833	.738
19. When I get angry, I will hurt someone.	.703	.831	.570	.801	.678
20. I have gotten into fights, even over small insults from others.	.487	.536	.464	.574	.505
Proactive					
1. I enjoy making fun of others.	.520	.471	.580	.632	.467
3. I start fights to get what I want.	.779	.827	.755	.814	.802
5. I try to make others look bad to get what I want.	.829	.815	.836	.818	.763
7. When I hurt others, I feel like it makes me powerful and respected.	.792	.810	.787	.809	.796
10. I threaten others to get what I want.	.845	.898	.783	.830	.889
11. I gossip about others to become popular.	.804	.767	.793	.736	.820
14. When I gossip about others, I feel like it makes me popular.	.784	.770	.737	.723	.745
15. I hurt others for things they did to me a while back.	.722	.713	.745	.716	.710
16. I enjoy hurting others.	.830	.819	.854	.824	.843
17. I ignore or stop talking to others in order to get them to do what I want.	.679	.717	.649	.722	.596

Note. All loadings significant at the $p < .001$ level.

Table 4

Factor Loadings for Forms of the Independent Factors Model of the Peer Conflict Scale – 20 Item Version

	Overall	Males	Females	Grades 4-8	Grades 9-12
Overt					
3. I start fights to get what I want.	.145	.138†	.065†	-.021†	.034†
6. I threaten others when they do something wrong to me.	.315	.288	.333	.202	.195†
7. When I hurt others, I feel like it makes me powerful and respected.	.141	.060†	.162	.010†	.097†
8. Sometimes I hurt others when I'm angry at them.	.468	.445	.446	.372	.323
10. I threaten others to get what I want.	.158	.022†	.243	.132	-.026†
12. If others make me mad, I hurt them.	.593	.522	.647	.661	.450
15. I hurt others for things they did to me a while back.	.174	.090†	.213	.177	.139†
16. I enjoy hurting others.	.129	.038†	.180	.127†	-.067†
19. When I get angry, I will hurt someone.	.469	.290	.629	.290	.574
20. I have gotten into fights, even over small insults from others.	.398	.431	.342	.249	.415
Relational					
1. I enjoy making fun of others.	-.259	.238	-.246	.196†	.086†
2. Sometimes I gossip about others when I'm angry at them.	-.057†	-.017†	-.056†	.027†	.149†
4. I spread rumors and lies about others when they do something wrong to me.	.234	-.337	.227	-.224	.274
5. I try to make others look bad to get what I want.	.002†	-.095†	.010†	-.023	.336
9. When others make me mad, I write mean notes about them and pass them around.	.278	-.366	.295	-.283	.271
11. I gossip about others to become popular.	.394	-.405	.454	-.387	.527
13. When I am angry at others, I try to make them look bad.	-.047†	.041†	.046†	.015†	.284
14. When I gossip about others, I feel like it makes me popular.	.466	-.430	.585	-.527	.625
17. I ignore or stop talking to others in order to get them to do what I want.	.001†	-.193	-.111†	-.094†	.130†
18. When others make me angry, I try to steal their friends from them.	.248	-.190	.417	-.228	.336

† $p > .05$.

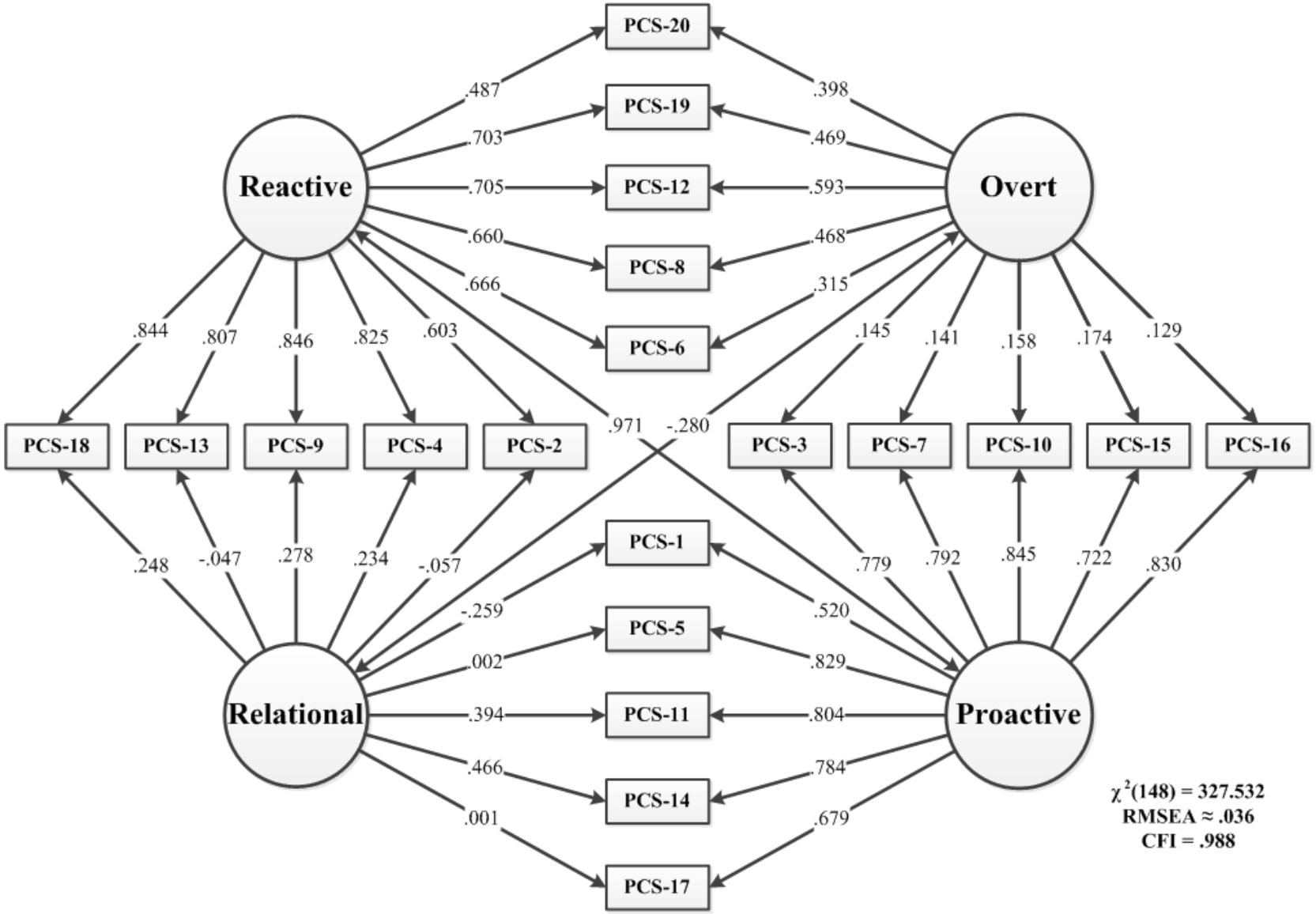

Figure 6. Independent factors model of the Peer Conflict Scale - 20 Item Version with loadings.

Little's independent factors model was tested next (Figure 6). Overall, the model well exceeded Yu's fit criteria, χ^2 (148) = 327.532, CFI = .988, RMSEA ≈ .036, and chi-square difference testing showed that the model demonstrated improved fit over bi-factor form, $\Delta\chi^2$ (21, N = 920) = 228.419, $p < .001$, or function alternatives, $\Delta\chi^2$ (21, N = 920) = 306.435, $p < .001$. However, four of ten items in the relational group did not show significant loadings, while a fifth was significantly negative (all others were significant at $p < .001$) (Table 3, 4). Despite these item problems, this model was also retained for the purposes of testing gender and grade invariance given its strong fit.

Multi-group Invariance Testing

Marsee's Paired Factors Model: Invariance testing began with Marsee's paired factors model. Prior to invariance testing, models were fit separately for individual groups (male, female, grades 4-8, 9-12). Invariance across gender was evaluated using a sequence of analytical steps specific for multi-group invariance testing with categorical indicators (Marsee et al., 2011; Muthén & Muthén, 2011, 2009). Table 5 provides fit indices for all models tested. An unconstrained multi-group model was tested first, with item thresholds and factor loadings free to vary across gender. This initial model showed good fit to the data according to Yu's criteria. A constrained model was tested next, with all factor loadings and thresholds constrained to be equal across groups. A chi-square difference test showed this model fit slightly (though significantly) worse than the unconstrained model, $\Delta\chi^2$ (56, N = 920) = 95.842, $p < .001$, suggesting some factor loadings or thresholds may vary across genders. Model modification indices provided by Mplus suggested that the first and second thresholds of Item 2 may not be invariant across gender. These thresholds were subsequently freed in a partially constrained model.

Table 5

Fit Indices Comparing Confirmatory Factor Models for the Peer Conflict Scale 20 Item Version

Model	χ^2	*df*	*N*	*CFI*	RMSEA
Single Factor	841.712	170	920	.954	.066
Bi-factor Form	653.242	169	920	.967	.056
Bi-factor Function	802.870	169	920	.957	.064
Paired Factor Model	458.310	164	920	.980	.044
Gender – Unconstrained	661.611	328	920	.978	.047
Gender – Constrained	710.634	384	920	.978	.043
Gender – Partially Constrained	677.395	382	920	.980	.041
Grade – Unconstrained	561.591	328	920	.983	.039
Grade – Constrained	645.565	384	920	.981	.038
Grade – Partially Constrained	-	-	-	-	-
Independent Factor Model	327.532	148	920	.988	.036
Gender – Unconstrained	497.005	296	920	.986	.038
Gender – Constrained	591.018	372	920	.985	.036
Gender – Partially Constrained	535.002	368	920	.989	.031
Grade – Unconstrained	472.176	296	920	.987	.036
Grade – Constrained	586.960	372	920	.984	.035
Grade – Partially Constrained	-	-	-	-	-

Note. CFI = comparative fit index; RMSEA = root-mean-square error of approximation.

This model was not significantly different from the unconstrained baseline, as shown by chi-square difference testing, $\Delta\chi^2$ (54, N = 920) = 68.807, p = .085, confirming the paired factors model's partial invariance across gender.

Subsequent invariance testing examined Marsee's paired factor models across grade, dichotomized into groups of participants in grades 4-8, and grades 9-12. Invariance was examined using a series of steps identical to that above. An unconstrained model showed good fit, meeting Yu's criteria. Mplus reported that the latent covariance matrix was non-positive definite (*NPD*) in the 4-8 grade group. Inspection of the matrix for this group revealed that NPD

may be a result of high correlations (> .90) between proactive overt aggression and other form-function factors. Chi-square difference testing found that the constrained model showed significant degradation of fit, $\Delta\chi^2$ (56, N = 920) = 111.248, p < .001. Though numerous modifications were tested, partial invariance could not be achieved.

Little's Independent Factors Model: Analyses continued with invariance testing of Little et al.'s (2003) independent factors model. As above, the model was individually fit for each group (males, females, grades 4-8, grades 9-12) prior to testing. Invariance across gender was tested first. An unconstrained model showed good fit to the data. A constrained model was tested next and was showed significantly poorer fit according to chi-square difference testing, $\Delta\chi^2$ (76, N = 920) = 132.934, p < .001. Modification indices revealed that Item 19's loadings on overt and reactive aggression varied across gender, as did the first thresholds of items 1 and 2. These loadings and thresholds were freed in a partially-invariant model. Chi-square difference testing found that the model showed no significant difference from the unconstrained baseline, $\Delta\chi^2$ (72, N = 920) = 90.425, p = .07, thus supporting the independent model's partial invariance across gender.

Invariance across grade groups was evaluated next. An unconstrained model showed good fit. Chi-square different testing found that a constrained model showed significantly poorer fit, $\Delta\chi^2$ (76, N = 920) = 142.320, p < .001. Notably, a partially invariant model could not be identified.

Paired Factor Model Associations with Social Anxiety

Analyses continued by regressing social anxiety onto PCS. Results of regression models are reported in Table 6. Zero-order correlations showed that each construct was associated with a significant increase in social anxiety. However, as predicted, only the association between

reactive relational aggression and social anxiety remained significant when considered in the context of other form-function constructs (i.e., partial and semi-partial correlations; see Table 6). Gender effects were examined by running the model separately for male and female cases. Of note, inspection of semi-partial correlations for males revealed the presence of a suppressor effect in the proactive overt subtype. More specifically, after controlling for shared variance with other form-function subtypes, the association between proactive overt aggression and social anxiety became significantly negative. Developmental differences were examined next by running the model separately across grade groups. As in the overall model, after controlling for shared variance with other subtypes, only reactive-relational aggression significantly predicted social anxiety. Analyses with transformed variables did not change the substantive findings described above, and therefore are not reported here.

Table 6

Regression Analyses Examining Unique Associations of PCS Form-Function Constructs with Social Anxiety

	Zero-order	Partial	Semi-partial
Overall			
Proactive Overt	.17**	-.05	-.04
Reactive Overt	.19**	.06	.06
Proactive Relational	.20**	.05	.05
Reactive Relational	.24**	.13**	.12**
Male			
Proactive Overt	.31**	.04	.04
Reactive Overt	.28**	.05	.05
Proactive Relational	.30**	.03	.03
Reactive Relational	.34**	.14**	.13**
Female			
Proactive Overt	.08*	-.10*	-.10*
Reactive Overt	.13**	.07	.06
Proactive Relational	.16**	.10*	.10*
Reactive Relational	.16**	.09*	.09*
Grades 4 - 8			
Proactive Overt	.21**	-.05	-.05
Reactive Overt	.23**	.03	.03
Proactive Relational	.27**	.09	.09
Reactive Relational	.29**	.13**	.12**
Grades 9 - 12			
Proactive Overt	.12**	-.03	-.03
Reactive Overt	.15**	.06	.06
Proactive Relational	.12**	.00	.00
Reactive Relational	.21**	.15**	.14**

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

Discussion

This study examined the structure of aggressive behavior by evaluating the fit and invariance of competing structural models as applied to the Peer Conflict Scale – 20 Item Version. Generally, findings expand on existing aggression research by evaluating and contrasting commonly cited models, and presenting the viability of a new, abbreviated measure. Results demonstrate that Marsee et al.'s (2011) paired factors model of aggression is comparable in fit to the independent factors model of Little et al. (2003).

The independent factors model presented by Little et al. (2003) markedly advanced the research by demonstrating a method of simultaneous examination of forms and functions. However, its complexity may be contributing to difficulties with convergence (Fite, Stauffacher, et al., 2008; Fite, Stoppelbein, Greening, & Gaertner, 2009), which often necessitates deviation from the original model. The model conceptualized by Little et al. (2003) incorporates six factors. Four form-function pairings and two "pure" forms of aggression are depicted as directly observed factors (i.e., drawing from observed indicators). Two additional second-order (indirectly observed) constructs of "pure" function draw from the paired factor constructs (see Figure 1). Notably, the overt and relational items in the Little et al. model showed were generally poor (i.e., weak\non-significant). Further, the model required greater modification to achieve partial invariance across gender. Therefore, the paired factors model of Marsee et al. (2011) might be advantageous due to its single order construction. However, the paired factors model showed slightly poorer fit in comparison, and presented with extreme intercorrelation between factors.

Results supported the partial invariance of the PCS 20 across gender but not grade level (in either model). By demonstrating the partial invariance of the PCS 20 across gender, we

confirm that the four subtypes of aggression are appropriately measured in males and females in similar developmental contexts. Importantly, results may not be comparable across development. Many researchers have suggested that manifestations of aggression may change as children age (Côté, Vaillancourt, Barker, Nagin, & Tremblay, 2007; Fite, Colder, et al., 2008; Kawabata, Tseng, Murray-Close, & Crick, 2012; Murray-Close & Ostrov, 2009; Vaillancourt, Miller, Fagbemi, Côté, & Tremblay, 2007; Vitaro, Brendgen, & Barker, 2006), thus perplexing its assessment in youth. However, few studies have examined changes in form-function combinations of aggression across development. Future study in this area is crucial to enhancing measurement of childhood aggression, and improving their predictive validity.

The PCS and the paired factors model may be preferable in research examining anxiety and\or social problems. Fite et al. (2009) found that the function subscales of the original Little et al. (2003) measure failed to differentially predict either social problems or anxiety problems. Our finding that the subscales of the PCS 20 uniquely relate to social anxiety could speak to the broader importance of considering form and function as paired constructs. This association was tested by regressing PCS 20 subscales (i.e., paired constructs) onto social anxiety. When considered independently (i.e., zero-order correlations) each subscale was significantly correlated with social anxiety. However, when examined in the context of other form-function pairings (semi-partial correlations), only reactive relational aggression predicted social anxiety. This finding is analogous to that of Marsee et al. (2008) who demonstrated an identical association with generalized anxiety using the original PCS, though specific to males. In the current study, the relationship was observed across genders, though was stronger for males. In females, both forms of proactive aggression showed significant semi-partial correlations with social anxiety. Extant research does not support an association between social anxiety and use of

proactive aggression, but does identify such a relationship between social anxiety and use of relational aggression (Loudin et al., 2003). Therefore, we suspect that the proactive relational subscale is in effect pulled toward significance by its relational component.

Conversely, and again specific to females, proactive overt aggression predicted reduced social anxiety after controlling for other form-function pairs, despite a positive zero-order correlation. A suppression effect is said to occur when the simultaneous entry of two or more predictors into a regression model improves the validity of prediction by one or both variables. Specifically, the removal of error variance shared with other predictors functioned to reverse the proactive overt aggression's association with social anxiety. This finding adds to research suggesting that despite their high degree of intercorrelation, individual form-function constructs may be differentiated according to their associations with internalizing symptoms.

The findings in this thesis should be considered in the context of several limitations. First, exclusive use of self-report assessment may have inflated correlations between variables due to shared method variance. This was unavoidable given that our primary goal was to examine the psychometric properties of a self-report measure. If results were solely driven by method variance, we would expect a consistent pattern of association between PCS subscales and RCADS social anxiety symptoms. That these relationships ranged from non-significant to significant suggests that the PCS 20 may be predicting beyond shared method variance. Moreover, extant research using the PCS has found it reliably predicts aggression subtypes as assessed by other methods (e.g., simulated conflicts; see Muñoz, Frick, Kimonis, & Aucoin, 2008). Second, the study sample was comprised primarily of African American youth limiting generalizability to other ethnicities and racial groups. Future research might examine invariance of the PCS 20 (or PCS) across ethnicities in youth. Finally, invariance of the PCS 20 across

grade groups and genders required freeing factor loadings and thresholds, as well as modifying the hypothesized factor structure (i.e., addition of a covariance path). These modifications were performed post-hoc, and would be required in future research. Subsequent research could re-examine the factor structure of the PCS 20 with these items reworded or removed.

Our findings contribute to the literature in several ways. We provide additional empirical support for the theory that aggression is comprised of form and function components. Given that this conceptualization serves as a foundation for contemporary aggression research (Bailey & Ostrov, 2008; Murray-Close & Ostrov, 2009; Ostrov & Crick, 2007; Prinstein & Cillessen, 2003; Sijtsema et al., 2010), confirmation of its validity is critical. We show the viability of a more parsimonious model of these constructs, the paired factors model. Given that items on aggression measures typically include both form and function constructs (e.g., "I threaten others when they do something wrong to me,"; Little et al., 2003; Marsee et al., 2007), a model combining these factors (i.e., reactive-overt) is logical. Finally, in presenting the PCS 20, we contribute a flexible (though psychometrically sound) measure for future researchers.

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