

# Factor Structure and Convergent Validity of the Conflict Tactics Scale in High School Students

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This study explored the factor structure of a modified version of the Conflict Tactics Scale (CTS; M. A. Straus, 1979) in a large multiethnic high school sample. Exploratory and confirmatory factor analytic approaches were used. Results generally supported 2-factor models for males and females. A substantial proportion of residual variance remained after the 2 primary factors were extracted, and correlations among this residual variance suggested meaningful differences in the perpetration and experience of dating violence for males and females. Furthermore, the factor structure for males' self-reported victimization suggested that items representing psychological and mild physical aggression, which loaded on 1 factor, may be perceived similarly. Convergent validity analyses that examined the correlation among CTS traditional and factor scores with jealous actions, control tactics, and attitudes justifying males' and females' use of dating aggression provided initial support for the constructs identified. Results are discussed in terms of improving measurement of dating aggression.

Adolescent dating violence has received increased research attention over the past decade. Physical aggression occurs with notable frequency in high school dating relationships. Estimates range from 9% to 41%; rates of self-reported victimization are similar, ranging from 12% to 41% (Avery-Leaf, Cascardi, O'Leary, & Cano, 1997; Bergman, 1992; Henton, Cate, Koval, Lloyd, & Christopher, 1983; O'Keefe, 1997; Roscoe & Callahan, 1983). Unfortunately, psychometric properties of the most frequently used measure of this phenomenon, the Conflict Tactics Scale (CTS; Straus, 1979), have not been investigated in high school samples. The purpose of this study was to conduct a preliminary examination of the factor structure and convergent validity of a modified version of the CTS in a multiethnic high school student sample. The CTS includes measures of both one's own use of physical aggression and one's experience of one's partner's physical aggression (i.e., victimization), so this article is divided into two separate analyses: one reporting on self-reported aggression, the other on self-reported victimization.

The CTS's status as the most commonly used measure of partner aggression supports exploration of its factor structure in an adolescent sample before steps are taken to alter it in ways that might enhance its validity but also render comparisons to the large CTS-based literature impossible. Furthermore, our work and that

of others suggests that the aggression items included on the CTS are relevant to adolescent samples. In our work, the CTS was reviewed by several clinicians and educators, as well as piloted in three separate studies (one conducted in a middle school and two in high schools; Avery-Leaf et al., 1997; Cano, Avery-Leaf, Cascardi, & O'Leary, 1998). Other research teams that have conducted extensive development generally conclude that additional behaviors (e.g., scratching, burning) need to be added to the CTS. Nonetheless, the behaviors included in the CTS are still salient and appropriate to include when administering it to adolescents (see Foshee et al., 1996).

## Factor Analysis Studies of Self-Reported Aggression

The factor structure of the CTS has been demonstrated in adult military, community, clinic, and college student samples (e.g., Barling, O'Leary, Jouriles, Vivian, & MacEwen, 1987; Caulfield & Riggs, 1992; Pan, Neidig, & O'Leary, 1994; Straus, 1990). In general, the CTS has received support as a reliable and valid measure, with few gender differences in the interpretation of factor solutions. A commonly accepted factor solution includes four factors: Reasoning, Verbal/Psychological Aggression, Mild Physical Aggression, and Severe Physical Aggression. However, items that are face valid for physical or psychological aggression do not always load accordingly in factor analysis (e.g., "threatened to throw something at partner," which is face valid for psychological aggression, loads with physical aggression items; Caulfield & Riggs, 1992). Indeed, Caulfield and Riggs (1992) noted that many factor analytic studies of the CTS fail to demonstrate clear distinctions between verbal/psychological and physical aggression items. Furthermore, a severe physical aggression factor has not been consistently identified (Barling et al., 1987; TenVergert, Kingma, & Gillespie, 1990).

One potentially useful way to reconcile these item-factor discrepancies is with confirmatory factor analysis (CFA). With CFA, one can test whether there is a statistically significant difference in goodness of fit between a measurement model that allows contro-

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versal items to cross, or double load, or constrains them to one factor (i.e., forces psychological and physical aggression items to load only on their respective factors). CFA also offers several other advantages over exploratory factor analytic techniques. For example, CFA allows one to examine both the relationships among item variance associated with the constructs under consideration and other systematic variance not explained by proposed latent constructs (e.g., residual variance). For example, when the hypothesized measurement model does not fit the observed data, CFA provides several indices (e.g., size of residuals, LaGrange Multiplier [LM] test) that indicate how model fit can be improved. Oftentimes, these modification indices suggest relationships among item residuals that add meaning to the constructs under investigation.

Although CFA has not been used to address proper loading of problematic psychological and physical items or to explain residual variance, it has been used to evaluate whether separate mild and severe physical aggression factors are warranted. Hornung, McCullough, and Sugimoto (1981); Pan et al. (1994); and Straus (1979) have suggested mild and severe aggression factors. Two published studies have used CFA to determine whether physical aggression is unidimensional in college student (Schafer, 1996) and adult community (TenVergert et al., 1990) samples. Both concluded that physical aggression was best represented as one (with mild and severe aggression combined) rather than two latent constructs.

In sum, exploratory factor analysis (EFA) typically reveals four factors for both males and females: Reasoning, Verbal/Psychological Aggression, Mild Physical Aggression, and Severe Physical Aggression. CFA makes a case for a unidimensional construct of physical aggression in college and community samples. Controversy remains about the proper assignment of items that load on both psychological and mild physical aggression factors.

### Factor Analysis Studies of Self-Reported Victimization

In addition to examining the factor structure of self-reported aggression in a high school sample, we were also interested in exploring the factor structure of self-reported victimization. Unfortunately, there is no substantial empirical base from which to generate hypotheses about the expected factor structure for physical victimization among high school boys and girls. The results of Pan et al.'s (1994) study suggest that gender differences will emerge with respect to the severity of physical victimization, with clear distinctions between mild and severe victimization for males but not for females.

### Dating Status and Factor Structure

Dating status is a concern in unmarried samples that include individuals who may or may not currently be in a relationship. High school students' dating relationships tend to be brief, and fluid; at any given time point, students may be between relationships or temporarily estranged from their partners. Given this, one would eliminate many active daters if the definition of dating were restricted to only current daters. Such elimination would skew estimates of the overall prevalence of dating aggression or the impact of a universal intervention. It is therefore important to consider the responses of current and recent daters. However,

current and recent daters may respond differently to the CTS because (a) their perceptions of episodes of conflict may vary between daters recalling current incidents versus those recalling episodes from a past relationship and (b) the emotional intensity of recent breakups may influence recollections of conflict. The extent to which the CTS is robust to variations in dating status is unexplored in the literature.

### Convergent Validity

Although there is preliminary support for the face validity of CTS items for adolescents, it is not clear whether other forms of validity would be upheld. Ideally, one would compare the CTS factors with other scales measuring the same constructs. Unfortunately, there are no well-validated, published measures of dating aggression other than the CTS. Thus, to address validity, we included measures that are significantly associated with dating violence, namely, acceptance of dating aggression and jealous and controlling actions (e.g., Bookwala, Frieze, Smith, & Ryan, 1992; Cano et al., 1998; Riggs, 1990; Schwartz, O'Leary, & Kendziora, 1996). Using the literature as a guide, we expected the magnitude of association between physical aggression against a partner with the CTS factors to range from .10 to .40. Furthermore, we expected the pattern of association to be such that jealous and controlling actions would correlate more strongly with psychological and physical aggression than would attitudes (e.g., Cano et al., 1998). To determine whether each scoring method reflected the same underlying construct, we also evaluated the relationship of aggression status on the basis of scores derived from factor analysis and those from traditional scoring methods (Straus, 1979) as well as the association of each scoring method with attitudes and jealous and controlling actions. Although these tests of validity are not as strong as desired under optimal test construction conditions, they help to guide future development and validation.

The purpose of this study was to conduct a preliminary evaluation of the factor structure of psychological and physical aggression of a modified version of the CTS in a high school sample. We used EFA to identify a model that we then tested with CFA, using a cross-validation sample. Analyses were conducted separately for students who were currently dating, those not currently dating, and the combined sample of current and recent daters. No specific hypotheses were made in regard to factor variation by dating status. Results are reported separately for aggression and victimization.

### Method

#### *Participants*

Participants were 2,320 high school students (1,180 males and 1,140 females) from seven multiethnic high schools in Suffolk County, Long Island, New York. All students were enrolled in mandatory health education during the spring 1995 or fall 1996 semesters and were participants in a longitudinal study of the efficacy of a dating violence prevention program. Participation in the larger study was voluntary, and passive parental consent was obtained. Data reported here were collected at baseline, before implementation of the prevention program. A randomly selected sample (50% of total sample) was used for EFA; remaining cases were used for CFA. Sample characteristics are presented in Table 1.

The sample was further divided into current and recent daters (i.e., dated in the past but do not currently have a boyfriend or a girlfriend). Analyses were conducted separately for students who were currently dating and those whom we defined as recent daters. For females, the factor structure was the same for current and recent daters. Thus, current and recent daters were combined, and the results of the combined sample are reported herein. The factor structure for current and recent daters was different for males. To simplify presentation of the results, only results for males who were currently dating are presented, even though this leads to a lack of parallelism in the presentation of results. Results for males who were recent daters can be requested directly from Michele Cascardi.

### Measures

**Modified Conflict Tactics Scale.** The M-CTS, developed by Neidig (1986) is a 19-item instrument that measures an individual's means of resolving conflict during the course of a disagreement with his or her partner. The M-CTS is identical to the CTS, but it has 1 additional item: "Have you physically restrained your partner?" and has removed 1 item: "Have you used a knife or a gun?" The item "Have you threatened with a knife or a gun?" was retained. In adult samples, the M-CTS has shown results comparable to CTS results in terms of factor structure and validity (Pan et al., 1994). Caulfield and Riggs (1992) established the validity and reliability of the CTS in a college student sample. The CTS and the M-CTS are reported to have a low refusal and antagonism rate and to have a stable factor structure (Barling et al., 1987).

Given the instability and varying duration of high school dating relationships (e.g., many last less than the 12-month criterion commonly applied to the CTS), we made two modifications to the M-CTS assessment

time frame. First, each behavior was assessed over the entire length of the dating partners' relationship; second, we modified response options from frequency count to a more global 5-point rating scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always). We did this because the specific number of acts across differing periods of time (i.e., students reported on relationships of varying duration) and different frequencies of contact (e.g., daily, weekly) could be difficult to interpret, and the validity of the literal frequency counts of acts has been called into question even in married samples and could be even less accurate with adolescents who move in and out of relationships regularly. Following Barling et al. (1987) and Schafer (1996), we collapsed the item categories such that 0 = never; 1 = rarely; and 2 = sometimes, often, and always.

The measures below were used as convergent validity measures.

**Attitudes Towards Interpersonal Violence Scale.** The Attitudes Towards Interpersonal Violence Scale (AIV; Riggs, 1990) measures the respondent's justification of physical aggression between males and females. Respondents indicate the extent to which they feel that pushing, hitting, and punching a boy- or girlfriend is justified (1 = never, 5 = always). Three items assess justification of male aggression and three items assess justification of female aggression. This scale has been used with samples of college and high school students (e.g., Cano et al., 1998; Riggs & O'Leary, 1996). In the sample used in the present study, the scale has adequate internal consistency and test-retest reliability for both males and females (Slep, Cascardi, Avery-Leaf, & O'Leary, 1999) and has been found to be significantly associated with self-reported dating aggression (e.g., Cano et al., 1998).

**Dominating and Jealous Tactics Scale.** Items were selected from Kasian and Painter's (1992) factor analysis of the Psychological Maltreatment

Table 1  
Sample Characteristics for Exploratory and Confirmatory (Crossvalidation) Samples

Variable	Exploratory sample		Confirmatory sample	
	Male <sup>a</sup>	Female <sup>b</sup>	Male <sup>c</sup>	Female <sup>d</sup>
Age (years)				
14-15	6.8	8.5	6.2	7.7
16	34.8	40.6	35.4	39.7
17	38.9	41.8	40.6	39.5
18	16.4	7.8	14.6	11.2
Over 18	3.1	1.3	3.2	2.0
Grade				
10th	8.7	7.1	6.4	6.3
11th	46.3	53.1	48.5	52.7
12th	44.7	39.9	44.2	40.8
Over 12th	0.3	0.0	0.8	0.2
Ethnic background				
Caucasian	55.7	58.3	57.0	54.2
African American	11.3	14.4	14.2	14.9
Hispanic	18.5	14.3	16.4	20.3
Mixed race	8.0	8.0	7.5	7.5
Asian	3.2	2.7	2.2	1.4
Other	3.2	2.3	2.7	1.7
Currently dating (% yes) <sup>e</sup>	45.5	58.8	46.2	61.5
Relationship type (of those currently dating)				
New	17.8	13.0	19.2	13.5
Casual	11.2	6.8	11.5	10.0
Steady	37.2	44.3	39.2	35.0
Serious	30.2	32.5	25.8	37.1
Engaged	3.5	3.4	4.2	4.4

Note. Table values are percentages.

<sup>a</sup> *n* = 588. <sup>b</sup> *n* = 568. <sup>c</sup> *n* = 592. <sup>d</sup> *n* = 572. <sup>e</sup> Only students who reported ever dating were included in this study; those who never dated were excluded.

of Women scale (Tolman, 1989), a widely used scale that assesses a variety of forms of emotional abuse in intimate relationships. Because of time restrictions for the administration of the assessment, only conceptually distinct items (i.e., factor loadings  $> .40$ ) were retained. This 22-item scale assesses the frequency with which the respondent and his or her dating partner have engaged in seven dominating tactics (e.g., "I tried to keep my boyfriend/girlfriend from seeing or talking to his/her family") and four jealous tactics (e.g., "I was jealous and suspicious of my boyfriend's/girlfriend's friends") in their current or most recent relationship.

### Procedure

Students completed self-report inventories as part of a larger survey associated with a teen dating violence prevention program evaluation. Data used in the present study were collected at preassessment, before the prevention program was introduced to students. Data also collected at preassessment and excluded from the present study included measures of help-seeking intentions and relationship skills. Surveys were completed within a 40-min class period. Two or three advanced graduate students actively monitored survey completion in each classroom. These monitors were available to facilitate distribution and collection of materials as well as to explain survey instructions and answer student questions in a standardized manner.

### Statistical Analyses

**EFA.** We initially inspected all data, to ensure that items were significantly correlated, using Bartlett's test of sphericity, and that they shared sufficient variance, using KMO's test of sampling adequacy, and we used Kaiser's test of sampling adequacy (MSA) to evaluate whether items shared sufficient variance to justify factor extraction. MSA values between .50 and .60 are considered marginally acceptable, with values greater than .80 and .90 considered excellent (Hair, Anderson, Tatham, & Black, 1996; Kim & Mueller, 1978). We selected principal-axis factoring (PAF) as the method of factor extraction because our purpose was to reveal underlying latent factors based only on the shared item variance, excluding unique and error variance (Hair et al., 1996; Kim & Mueller, 1978). We used an oblique method of rotation (oblimin with Kaiser normalization,  $\delta = 0$ ), because we expected verbal and physical aggression factors to be correlated. Items were considered to load on a factor if the factor loading was greater than or equal to .40.

**CFA.** We conducted a CFA to determine the adequacy of fit of the factor models using structural equation modeling with the EQS program for data analysis (Bentler, 1995). This technique solves a series of hypothesized regression equations to generate an estimated covariance matrix. This estimated matrix is then compared with the observed sample covariance matrix to determine whether the model fits the data. A correlated two-factor model consisting of Psychological and Physical Aggression was tested.

Several indices were used to determine goodness of fit: the maximum-likelihood chi-square, and the scaled (Satorra-Bentler; Satorra, 1990) chi-square statistic, because the M-CTS multivariate distribution is non-normal, and the scaled statistic corrects for the tendency of the chi-square statistic to inflate in the presence of non-normal indicators (Curran, West, & Finch, 1996). Other indices were average off-diagonal standardized residuals, the Bentler-Bonett normed and non-normed fit indexes (NFI and NNFI), and the Comparative Fit Index (CFI). For the NFI, NNFI, and CFI, values above .90 indicate an acceptable model fit. In addition to goodness of fit, significance testing of the factor loadings is conducted using  $z$  score robust that adjusts the standard error for non-normality. Standardized coefficients for the latent variable also are reported. When fit was poor, we used the LM test to identify improvements in model fit. This test examines all possible item-factor loadings and correlations among item residuals and provides a rank ordering of which modifications to the measurement model will most improve goodness of fit.

### Results: Self-Reported Aggression

#### *Item Endorsement on the M-CTS: Self-Reported Physical Aggression*

The percentages of students who endorsed each item (i.e., indicated that they had used the specific tactics) on the M-CTS and the overall prevalence of physical aggression are reported in Table 2.

#### *EFA of Self-Reported Aggression*

**EFA: Males' conflict tactics (current daters).** The data contained sufficient shared variance for factor analysis ( $KMO = .83$ ), Bartlett's test of sphericity,  $\chi^2(105, N = 267) = 1,145.40, p < .001$ . In addition, MSA values ranged from .70 to .89. Inspection of the scree plot, eigenvalues, factor matrices, and reproduced correlation matrices suggested that a two-factor solution offered the best interpretation of the data. The first factor, labeled Physical Aggression, accounted for 29.8% of total item variance and included items typically conceptualized as physical aggression. The second factor, Psychological Aggression, accounted for 13.8% of total item variance and consisted of verbal aggression, threats of physical aggression, and two physical aggression items. Overall, the two-factor solution explained 43.6% of total item variance. The correlation between the two factors was .25. Factor loadings, extracted communalities, eigenvalues, and percentage variance accounted for are displayed in Table 3.

**EFA: Females' conflict tactics (current and recent daters).** These data also had sufficient shared variance for factor analysis ( $KMO = .90$ ), Bartlett's test of sphericity,  $\chi^2(105, N = 568) = 2,581.4, p < .001$ . Kaiser's MSA values ranged from .86 to .94. Like the male respondents' data, other indices suggested that a two-factor solution offered the best interpretation of the data. The first factor was labeled Physical Aggression, and it accounted for 30.7% of total item variance. For females, a threat of aggression loaded with the items typically classified as physical aggression. The second factor, explaining 7.2% of total item variance, was labeled Psychological Aggression and included verbal insults, threats, and aggression against an object. No items loaded on more than one factor. Overall, the two-factor solution explained 37.9% of total item variance, and the correlation between the two factors was .42. Factor loadings, extracted communalities, eigenvalues, and percentage variance accounted for are displayed in Table 3.

#### *CFA of Self-Reported Aggression*

**CFA: Males' conflict tactics (current daters).** We submitted the model identified in the exploratory analysis to CFA. "Physically restrained partner" and "pushed, grabbed or shoved" were allowed to load freely on both the Psychological and Physical Aggression factors; other items were constrained to one factor. All standard indices suggested a very poor fit of the model: maximum-likelihood  $\chi^2(87, N = 272) = 478.09, p < .001$ ; Satorra-Bentler  $\chi^2(87, N = 272) = 128.28, p = .003$ , NFI = .65, NNFI = .63, and CFI = .69. The LM test suggested that allowing four pairs of error terms to correlate, and permitting "threatened to hit or throw something at partner" to load on both the Psychological Aggression factor and the Physical Aggression factor would substantially improve model fit. All pairs of error terms were related to items on the Physical Aggression

Table 2  
Endorsement of Items on the Conflict Tactics Scale

Item	Aggression (% yes)		Victimization (% yes)	
	Males	Females	Males	Females
1. Discussed things calmly	93.0	97.2	92.9	96.5
2. Got information to back up your side	90.0	92.7	88.3	89.4
3. Got someone to help settle things	47.9	51.9	55.1	48.5
4. Insulted/sworn	52.3	68.0	55.5	59.8
5. Sulked/refused to talk	69.0	75.0	73.9	71.2
6. Stomped out of room	38.7	52.5	43.6	44.7
7. Cried	37.4	78.6	72.6	49.9
8. Did/said something to spite	57.5	65.9	59.5	63.3
9. Threatened to hit/throw at partner	10.4	25.9	21.4	16.6
10. Threw, hit, kicked something	42.2	40.9	33.8	41.7
11. Threw something at partner	6.5	15.0	14.6	10.8
12. Physically restrained	14.2	12.3	11.9	15.2
13. Pushed, grabbed, shoved	13.7	28.0	21.5	20.8
14. Slapped	4.3	18.1	16.8	7.9
15. Kicked, bit, hit	5.5	16.9	14.3	10.2
16. Choked	2.5	2.4	3.4	3.2
17. Beat up	1.6	3.6	2.4	2.7
18. Threatened with knife/gun	1.3	1.8	2.2	1.7
Prevalence (Items 11–18)	22.5	37.8 <sup>a</sup>	30.4	29.3

<sup>a</sup> Gender differences in self-reported rate of physical aggression,  $p < .01$ .

Table 3  
Self-Reported Aggression: Modified Conflict Tactics Scale (M-CTS) Two-Factor Solutions

M-CTS item	Males <sup>a</sup>						Females <sup>b</sup>					
	EFA			CFA			EFA			CFA		
	PhA	MA	$h^2$	PhA	MA	$z$	PhA	PsA	$h^2$	PhA	PsA	$z$
4. Insulted or sworn at partner		.64	.44		.61			.66	.45		.69	
5. Sulked or refused to talk		.43	.18		.48	6.16		.43	.18		.47	10.02
6. Stomped out of room or house		.54	.29		.61	7.21		.60	.39		.62	13.77
7. Cried		.33	.10		.18	2.44		.53	.26		.42	9.12
8. Done/said something in spite		.58	.37		.61	6.39		.55	.33		.60	13.46
9. Threatened to hit or throw something		.46	.36	.57	.29	4.11/3.46	.52		.44	.68		
10. Threw, hit or kicked something		.58	.35		.61	6.09		.40	.33	.46	.20	8.41/3.44
11. Threw something at partner	.47		.36	.71			.60		.50	.66		9.89
12. Physically restrained partner	.34	.38	.32	.37	.35	3.73/2.32	.61		.43	.48		6.36
13. Pushed, grabbed, or shoved	.45	.49	.55	.41	.35	4.23/2.85	.56		.51	.75		14.34
14. Slapped	.56		.35	.81		3.44	.71		.54	.69		10.77
15. Kicked, bit, or hit with fist	.72		.56	.58		4.81	.66		.53	.71		10.82
16. Choked	.69		.45	.65		2.05	.58		.30	.30		2.73
17. Beat up	.59		.35	.60		1.18	.57		.30	.33		3.46
18. Threatened with a knife or gun	.52		.26	.58		1.74	.48		.20	.23		2.61
Correlation between factors		.25			.31	5.43		.42			.61	11.55

Note. Correlated residuals (females): "Slapped" with "Kicked, bit, or hit with a fist." Correlated residuals (males): "Threw something at partner" with "Beat up"; "Kicked, bit, or hit with fist" with "Beat up"; "Physically restrained partner" with "Pushed, grabbed, or shoved"; "Threw something at partner" with "Slapped." When items loaded on two factors,  $z$  scores for each factor loading are reported (Factor 1  $z$  score/Factor 2  $z$  score). EFA = exploratory factor analysis; CFA = confirmatory factor analysis; PhA = Physical Aggression; MA = Psychological and Mild Physical Aggression; PsA = Psychological Aggression.

<sup>a</sup> Currently dating only. <sup>b</sup> Currently dating and recent daters.

factor: "threw something at partner" with "beat up"; "beat up" with "kicked, bit or hit with a fist"; "physically restrained partner" with "pushed, grabbed, or shoved"; and "slapped" with "threw something at partner." With these modifications to the model, the fit significantly improved;  $\chi^2(82, N = 272) = 216.56, p = .001$ ; the Satorra-Bentler chi-square value was no longer statistically significant,  $\chi^2(82, N = 272) = 70.43, p = .81$ ; and all other fit indices approached acceptable ranges (NFI = .84, NNFI = .86, CFI = .89). Moreover, all factor coefficients were statistically significant. Standardized factor loadings, *z* scores (robust), and factor intercorrelations are presented in Table 3.

*CFA: Females' conflict tactics (current and recent daters).* All items were constrained to load only on one factor. The fit of this two-factor model was marginally acceptable based on several goodness-of-fit indices: maximum likelihood  $\chi^2(89, N = 572) = 258.59, p < .001$ ; Satorra-Bentler  $\chi^2(89, N = 572) = 156.77, p < .001$ ; NFI = .88; NNFI = .90; CFI = .92. LM test suggested several improvements to model fit, namely, allowing "threw, hit or kicked something" to load on both the Psychological Aggression factor and the Physical Aggression factor and permitting one pair of error terms to correlate ("slapped" with "kicked, bit, or hit with a fist"). When these modifications were made to the model, fit improved significantly. All model fit indices were acceptable and suggested a good model fit: maximum likelihood  $\chi^2(87, N = 572) = 179.04, p < .001$ ; Satorra-Bentler  $\chi^2(89, N = 572) = 108.47, p = .06$ ; NFI = .92; NNFI = .95; CFI = .96. Standardized residuals were uniformly small; review of measurement equations showed standard errors that were small and consistent across parameter estimates, and unstandardized factor loadings were statistically significant for all equations. Standardized factor loadings and *z* scores (robust) are presented in Table 3.

*Convergent validity.* To examine the validity of the factors derived with CFA, we compared the relationship of these new scales for psychological and physical aggression with psychological and physical aggression using traditional CTS scoring criteria, jealous actions, control tactics, and attitudes toward dating aggression for males and females. Separate Psychological Aggression and Physical Aggression factor scales were used for males and females, on the basis of the results of the CFA. Items that loaded on both factors in the CFA were included on both scales. For males, the factor and traditional CTS scores for Physical Aggression correlated at .94 and at .86 for Psychological Aggression. For females, factor and traditional scoring methods for Physical Aggression correlated at .68, and those for Psychological Aggression correlated at .81. Both methods (i.e., factor and traditional) of CTS scale calculation yielded similar patterns of association (i.e., no pair of correlations differed significantly) with jealous actions (.23/.22 and .24/.19, factor/traditional scores for Physical Aggression, .27/.30 and .29/.26, factor/traditional scores for Psychological Aggression, males and females, respectively), control tactics (.34/.32 and .33/.30, factor/traditional scores for Physical Aggression, .27/.31 and .23/.25, factor/traditional scores for Psychological Aggression, males and females, respectively), attitudes toward males' use of dating aggression (.18/.17 and .10/.11, factor/traditional scores for Physical Aggression, males and females, respectively), and attitudes toward females' use of

dating aggression (.22/.23 and .15/.22, factor/traditional scores for Physical Aggression, males and females, respectively).

### Discussion: Self-Reported Aggression

EFA indicated a two-factor solution for males' self-reported conflict tactics in a current relationship: Physical Aggression and Psychological-Mild Physical aggression. The items "pushed, grabbed, or shoved" and "physically restrained partner" loaded on both factors. Several possible explanations include the fact that the two items describe similar tactics; also, these milder forms of aggression may be perceived as both psychological and physical aggression. Alternatively, the double loading may reflect a cause-and-effect relationship between the two items and Psychological Aggression. Cross validation with CFA suggested that the measurement model could be improved by allowing "threatened to hit or throw something" to load on both the Physical Aggression factor and the Psychological-Mild Physical Aggression factor as well and allowing four pair of error terms from the Physical Aggression factor to correlate. Conceptualizing "threatened to hit or throw something" as both physical and psychological aggression is consistent with prior research (Barling et al., 1987; Caulfield & Riggs, 1992). Correlated residuals suggest that the subjective terms *beat up* and *physically restrained* may be defined behaviorally by "threw something at partner"; "kicked, bit, or hit with fist"; and "pushed, grabbed, or shoved."

For females, EFAs yielded a two-factor solution consistent with theory and prior research. The Physical and Psychological Aggression factors consisted of the typical items. One new item, "physically restrained partner," loaded on the Physical Aggression factor. CFA suggested that "threw, hit or kicked something" was a doublet, and the error terms for "slapped" and "kicked, bit, or hit with a fist" were correlated. The best measurement model for females suggests that items connoting threat and attacks against property reflect both psychological and physical aggression, although the association with these items is stronger with physical than psychological aggression. Caulfield and Riggs (1992) also found that these same items bore a stronger association with physical than psychological aggression in female college students and concluded that physical aggression may instead represent a broader construct, such as intimidation.

We failed to identify a severe physical aggression factor reported by others (e.g., Pan et al., 1994). However, results are consistent with those who also used CFA methods (i.e., Schafer, 1996, and TenVergert et al., 1990). It is possible that we did not identify a severe aggression factor because two typically included severe aggression items—"forced sex" and "used a knife or a gun"—were not used in this study, leaving us with only three severe physical aggression items: "choked," "beat up," and "threatened with a knife or a gun."

The relationship of the Physical and Psychological Aggression scales with each other based on both factor and traditional CTS scoring was quite strong for males and moderately strong for females, and the pattern of association with other related behaviors (e.g., jealous actions) and attitudes toward dating aggression were very similar, suggesting that both methods of scoring yield similar theoretical constructs.

## Results: Self-Reported Victimization

*Item Endorsement on the CTS: Self-Reported Victimization*

The percentages of students who reported experiencing each CTS tactic and the overall prevalence of victimization are presented in Table 2.

*EFA of Self-Reported Victimization*

*EFA: Males' conflict tactics (current daters).* Examination of sampling adequacy indices indicated that the males' data contained sufficient shared variance for factor analysis ( $KMO = .88$ ), Bartlett's test of sphericity,  $\chi^2(105, N = 267) = 1,702.95, p < .001$ . In addition, MSA values ranged from .76 to .93. A two-factor solution offered the best interpretation of the data. The first factor, labeled Psychological-Mild Physical Aggression, accounted for 34.2% of total item variance and included items reflecting both psychological and mild physical aggression. The second factor, Severe Physical Aggression, accounted for 9.8% of total item variance. Overall, the two-factor solution explained 44% of total item variance; the two factors were modestly correlated ( $r = -.35$ ). Factor loadings, extracted communalities, eigenvalues, and percentage variance accounted for are displayed in Table 4.

*EFA: Females' conflict tactics (current and recent daters).* Females' data also had sufficient shared variance for factor analysis ( $KMO = .91$ ), Bartlett's test of sphericity,  $\chi^2(105, N =$

568) = 11,454.67,  $p < .001$ . MSA values ranged from .87 to .95. Similar to males' data, a two-factor solution offered the best interpretation of the data. The first factor was labeled Physical Aggression and accounted for 33.7% total item variance. This factor included threats of and actual physical aggression. The second factor, which explained 8.2% of total item variance, was labeled Psychological Aggression. Two items loaded on both factors: "threatened to hit or throw something at partner" and "pushed, grabbed, or shoved." Overall, the two-factor solution explained 41.9% of total item variance. Factor loadings, extracted communalities, factor correlation, eigenvalues, and percentage variance accounted for are displayed in Table 4.

*CFA: Males' conflict tactics (current daters).* We submitted the model identified in the exploratory analysis to CFA. All items were constrained to load on one factor. All standard indices suggested a very poor fit of the model: maximum-likelihood  $\chi^2(89, N = 266) = 361.14, p < .001$ ; Satorra-Bentler  $\chi^2(89, N = 266) = 165.25, p < .001$ ; NFI = .77; NNFI = .78; CFI = .81. The LM test suggested that allowing six pairs of error terms to correlate would significantly improve model fit. These error terms associated with the following items were permitted to correlate: "pushed, grabbed or shoved" with "kicked, bit or hit with fist"; "insulted or sworn at" with "said/did something to spite"; "physically restrained" with "slapped"; "stomped out of the room or house" with "threatened to hit or throw something"; "said/did something to spite" with "threatened to hit or throw something" and "sulked or refused to talk" with "cried." With these modifications, model fit signifi-

Table 4  
Self-Reported Victimization: Modified Conflict Tactics Scale's (M-CTS's) Two-Factor Solutions

M-CTS item	Males <sup>a</sup>						Females <sup>b</sup>					
	EFA			CFA			EFA			CFA		
	MA	SvA	$h^2$	MA	SvA	$z$	PhA	PsA	$h^2$	PhA	PsA	$z$
4. Insulted or sworn at partner	.61		.35	.50				.63	.41		.68	
5. Sulked or refused to talk	.39		.13	.30		4.94		.39	.14		.52	10.77
6. Stomped out of room or house	.59		.34	.56		6.03		.63	.35		.63	12.76
7. Cried	.50		.22	.35		5.18		.31	.11		.18	3.91
8. Done/said something in spite	.64		.38	.46		5.97		.57	.34		.64	13.79
9. Threatened to hit or throw something	.62		.51	.70		5.51	.52	.31	.51	.60	.11	7.25/2.33
10. Threw, hit or kicked something	.59		.37	.68		7.68		.53	.36	.25	.40	4.60/6.47
11. Threw something at partner	.71		.61	.73		5.10	.56		.45	.62		
12. Physically restrained partner	.38		.22	.53		3.55	.50		.39	.58		5.28
13. Pushed, grabbed, or shoved	.68		.55	.75		5.64	.52	.38	.58	.71	.09	6.65/1.65
14. Slapped	.63		.54	.62		5.52	.81		.68	.63		4.78
15. Kicked, bit, or hit with fist	.46		.36	.72		5.78	.70		.59	.74		5.76
16. Choked		-.71	.53		.81		.72		.46	.53		3.25
17. Beat up		-.87	.77		.87	6.75	.75		.52	.67		2.42
18. Threatened with a knife or gun		-.84	.70		.23	1.33	.65		.36	.29		1.86
Correlation between factors		-.35			.48	2.28		.43		.54		6.60

*Note.* Correlated residuals (females): "Threw something at me" with "Threatened to hit or throw something," "Threw, hit, or kicked something" with "Choked" and "Beat up" with "Slapped." Correlated residuals (males): "Insulted or sworn at me" with "Done/said something in spite"; "Pushed, grabbed, or shoved" with "Kicked, bit, or hit with fist"; "Physically restrained" with "Slapped"; "Stomped out of room or house" with "Threatened to hit or throw something"; "Done/said something in spite" with "Threatened to hit or throw something"; "Sulked or refused to talk" with "Cried." When items loaded on two factors,  $z$  scores for each factor loading are reported (factor 1  $z$  score/factor 2  $z$  score). EFA = exploratory factor analysis; CFA = confirmatory factor analysis; MA = Psychological and Mild Physical Aggression; SvA = Severe Physical Aggression; PhA = Physical Aggression; PsA = Psychological Aggression.

<sup>a</sup> Currently dating only. <sup>b</sup> Currently dating and recent daters.

cantly improved; however, the Satorra–Bentler chi-square was still statistically significant,  $\chi^2(83, N = 266) = 110.20, p = .02$ . Nonetheless, all other fit indices approached acceptable ranges (NFI = .84, NNFI = .86, CFI = .89). Moreover, all factor coefficients were statistically significant. Standardized factor loadings and *z* scores (scaled) are displayed in Table 4.

*CFA: Females' conflict tactics (current and recent daters).* All items were constrained to load on one of the two factors, with two exceptions: "threatened to hit or throw something at partner" and "pushed, grabbed, or shoved"; these were permitted to load on both factors, as indicated by EFA. The fit of this two-factor model approached acceptability on the basis of several goodness-of-fit indices: Satorra–Bentler  $\chi^2(87, N = 566) = 148.71, p < .001$ ; NFI = .86; NNFI = .87; and CFI = .89. "Partner pushed, grabbed, or shoved" did not have a statistically significant factor loading on the Psychological Aggression factor, suggesting that model fit may be improved if this item were constrained to only the Physical Aggression factor. However, such constraint did not improve model fit, and it was permitted to remain a doublet, loading on both the Psychological Aggression factor and the Physical Aggression factor. The LM test indicated that model fit would be improved if the item "threw, hit or kicked something" was also permitted to load on both the Psychological Aggression and the Physical Aggression factors. In addition, the LM test suggested that three pairs of error terms were correlated: "partner threw something at me" with "partner threatened to hit or throw something"; "partner threw, hit, or kicked something" with "partner choked"; and "partner slapped" with "partner beat up." When these modifications were made to the model, fit improved significantly. All model fit indices were acceptable and suggested a good model fit, maximum-likelihood  $\chi^2(83, N = 566) = 206.59, p < .001$ ; Satorra–Bentler  $\chi^2(83, N = 566) = 104.12, p = .06$ ; NFI = .91; NNFI = .93, and CFI = .94. Review of the measurement equations showed standard errors that were small and consistent across parameter estimates and unstandardized factor loadings that were statistically significant for all equations. Standardized factor loadings and *z* scores (scaled) are presented in Table 4.

*Convergent validity.* We examined the validity of the factors derived with CFA using the same strategy as for self-reported aggression. For males, the first CFA factor consisted of psychological and mild physical aggression items and correlated .22 with physical aggression (CTS score) and .76 with psychological aggression (CTS score). Severe Physical Aggression (CFA factor) correlated .36 with physical aggression (CTS score). For females, factor and traditional scoring methods for physical aggression correlated .63, whereas those for psychological aggression correlated .86. The patterns of association with jealous actions, control tactics, attitude toward males' use of dating aggression, and attitude toward females' use of dating aggression were similar for the factor with Psychological and Mild Physical Aggression items (CFA factor) and the Psychological Aggression factor (CTS score), but only for males (factor/traditional scores: .38/.41, .27/.30, .02/.06, .10/.11, respectively). Only attitudes were similarly correlated with each scoring method for males' aggression factors (factor/traditional score: .18/.17 for males' use of dating aggression and .25/.21 for females' use of dating aggression). The Psychological–Mild Physical Aggression factor behaved more like the traditionally scored Physical Aggression factor in its association with jealous actions and control tactics. Both methods of CTS

scale calculation yielded similar patterns with jealous actions (factor/traditional score: .26/.18 and .31/.31) control tactics (.33/.32 and .25/.27), attitude toward males' use of dating aggression (.10/.10 and .00/.01), and attitude toward females' use of dating aggression (.12/.16 and .03/.04), physical and psychological aggression, respectively, for females.

### Discussion: Self-Reported Victimization

The exploratory analyses yielded two factors for males: Psychological–Mild Physical Aggression and Severe Physical Aggression. This grouping may suggest that for males, females' use of mild physical aggression tactics is perceived no differently than insults, name calling, sulking, and threatening. This would be consistent with findings showing that female aggression is less injurious and less fear producing than male aggression (Cantos, Neidig, & O'Leary, 1992). This measurement model was moderately supported by the CFA. The LM test indicated that six pairs of error terms should correlate. This suggested three types of tactics: (a) physical (as depicted by push, grab, shove/kicked, bit, hit with fist and physically restrain/slap), (b) verbal (insult or swear/spite), and (c) noninteractive (stomp out of room/threaten to hit or throw something and sulk or refuse to talk/cry).

EFA using the females' victimization supported the two-factor model (Psychological Aggression and Physical Aggression; e.g., Pan et al., 1994). However, CFA results suggested improvements to the measurement model. These improvements included allowing the item "threw, hit or kicked something" to load on both the Physical Aggression factor and the Psychological Aggression factor and allowing three pairs of error terms to correlate. These adjustments significantly improved model fit. The correlated residuals suggest an escalation process from the threat of aggression to subsequent mild to moderate physical aggression. The items "partner threatened to hit or throw something" was significantly associated with "partner threw something," "partner threw something" was significantly associated with "partner choked," and "partner slapped" was significantly associated with "partner beat up." Knowledge of the context of the aggressive interaction (described below) might shed light on the meaning of these associations.

Validity analyses yielded different results for males and females. For females, results paralleled those of self-reported aggression: Each method of CTS scoring yielded similar patterns of association, suggesting little difference in the underlying theoretical constructs. For males, results suggested that the theoretical constructs of psychological–mild physical victimization and psychological victimization were similar. The Severe Physical Aggression factor was weakly related to jealous and control tactics, explaining only 1%–3% of variation. This could be explained, in part, by the low rate of occurrence of severe physical aggression tactics.

### General Discussion

In this multiethnic high school sample, students reported substantial rates of psychological and physical aggression. Note that these data were collected from dating individuals who reported on their own and their partner's behavior, not dating couples. Females were more likely to report all forms of aggression and reported



significantly more physical aggression than males; however, a similar proportion of males and females reported having sustained physical aggression by their dating partner.

This study represents important, albeit limited, advances in defining self-reported aggression measured on the CTS in a high school sample for males and females. For females, threat, attacks against property, and physical restraint all co-occurred with typical physical aggression items (e.g., pushing, shoving, grabbing). For males, these three items had a stronger association with psychological aggression than with physical aggression. Overall, two-factor structures were identified for both victimization and aggression, although some interesting gender differences emerged. Specifically, data for males revealed a severe aggression factor for self-reported victimization but not perpetration of aggression. For females, no severe aggression factor was identified, but some of the items denoted as psychologically aggressive tactics loaded on the Physical Aggression factor. These findings may be suggestive of profound differences in the way aggressive acts are perceived or experienced. Males may view the experience of mild physical aggression by a dating partner as equivalent to acts of a psychologically aggressive nature. This perspective may also contribute to denial and minimization of males' own aggressive behaviors and their underreporting on the CTS. For females, however, the opposite may hold true. Specifically, girls may perceive their boyfriends' threatening behaviors (defined as psychological aggression on the CTS) as similar to physically aggressive acts. They may be more fearful and sensitive to conflict and hence may have greater recall of aggressive episodes.

A large portion of variance in the exploratory analysis remained unexplained by the two factors. This was confirmed by CFA, where model fit most improved when the residual (error terms) of several items were allowed to correlate. These relationships among unexplained item variability suggest that the CTS can provide some information that bears on how males and females perceive or experience aggressive acts (i.e., which actions tend to co-occur). Moreover, those tactics most vaguely defined (e.g., "beat up") frequently emerged in the pairs of correlated error terms. This may suggest the need for a more specific and expanded measure of dating aggression behaviors, as in the CTS-2 (Straus, Hamby, Boney-McCoy, & Sugarman, 1996). Finally, the results also suggest that more attention should be directed to motivations and functions of aggressive behavior, such as a reaction to perceived threat, preventing a partner's unwanted actions, or coercion. The relationships among error terms identified in this study and their corresponding interpretations await validation in future work.

Of note is that factor analysis results for males varied depending on dating status. Although only results for current daters were reported here for purposes of simplification, the overall conclusion is that different scoring methods should be used depending on the dating status of adolescent males under study. For females, factor results were the same irrespective of dating status. If one assumes that reports about one's current relationship are more accurate or reflective of events as they occur (i.e., less likely to have been forgotten or a fragmented recollection), and if one adopts the theory that females are more likely than males to define themselves in relationship to others (e.g., Chodorow, 1978), then one might infer that females maintain memories about relationship events for longer periods than do males. It is also possible that use and experience of aggressive behaviors in a dating relationship

may make a more specific and lasting impression on females than on males, causing females', but not males', accounts of recent and current relationships to be consistent.

Although the items constituting the factors derived from this study are different from those recommended by conventional scoring approaches (Straus, 1979), the relationship of psychological and physical aggression scales calculated with results of factor analysis and conventional scoring were strongly related, with one exception: severe physical victimization for males. Furthermore, the patterns of association of these aggression scales with jealous actions, control tactics, and attitudes toward aggression in a dating relationship were very similar. Taken together, these results provide initial support for the use of these factor-derived scales, particularly in theoretically driven analyses where indices of instrument reliability have significant import. Support for the males' Severe Physical Victimization factor awaits additional validation.

This study advances measurement and definition of the constructs on the CTS in a high school sample. However, there are several limitations that preclude firm conclusions at this time. First, a new version of the CTS, the CTS-2 (Straus et al., 1996), is now available. This measure consists of a larger number of items, retaining the expanded versions of original CTS scales and adding measures of injury and sexual aggression. Analyses conducted with this new measure may reduce the number of correlated residuals of subjective items (e.g., "beat up") with more objective ones (e.g., "kicked"). Second, changes to the assessment frame and response options (frequency to subjective estimates) were made. These changes were designed to ease respondent burden while enhancing the validity of information obtained but may explain discrepancies with past factor analyses. Third, one new item was added to the CTS. This item was expected to load with physical aggression items for males and females but did not for males. Finally, model fit adjustments in CFA were conducted post hoc and were based on model improvements suggested by residual analysis and the LM test, thereby using CFA in an exploratory manner and possibly capitalizing on sample-specific variance. Perhaps the most crucial limitation is the lack of additional data with well-validated measures of psychological and physical aggression to provide strong support for validity of the M-CTS with an adolescent sample. Measurement limitations of the field in general prevent such analysis.

The present results provide preliminary support of the CTS as a measure of dating aggression and victimization among high school students. The traditional factor model delineating psychological and physical aggression was upheld. Correlated error terms suggested that contextual information regarding aggressive interactions could clarify and strengthen the theoretical underpinnings of this measure. The next step in determining the usefulness of the CTS with high school students would include exploring additional psychometric properties (e.g., test-retest reliability, predictive validity).

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