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Factor Structure and Reliability of the Revised Conflict Tactics Scales' (CTS2) 10-Factor Model in a Community-Based Female Sample

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Abstract

The present study investigated the factor structure and reliability of the revised Conflict Tactics Scales' (CTS2) 10-factor model in a community-based female sample (N = 261). The underlying factor structure of the 10-factor model was tested by the confirmatory multiple group factor analysis, which demonstrated complex factor cross-loadings across the subscales for both perpetration and victimization. This confirmatory factor analysis also identified a lack of exclusive factor loadings between minor and severe distinctions of the eight violence measures. Internal consistency of the subscales was generally acceptable (.68-.85 for perpetration and .68-.84 for victimization), except for the Sexual Coercion subscale; the alpha coefficients of the Sexual Coercion Minor subscale were .18 for perpetration and .37 for victimization. Practical implications related to complex factor cross-loadings and internal consistency were discussed.

Keywords

CTS2, psychometric properties, validity, reliability, confirmatory multiple group factor analysis, factor structure, factor loading

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The revised Conflict Tactics Scales (CTS2; Straus, Hamby, Boney-McCoy, & Sugarman, 1996), a modified version of the original Conflict Tactics Scales (CTS; Straus, 1979), is currently one of the most widely used quantitative measurements for intimate partner violence (IPV). Despite a number of criticisms[1] regarding both the original and the modified CTS, these scales have been used in numerous studies involving various ethnic/cultural groups and in multiple languages. Straus et al. (1996) reported that more than 70,000 people from diverse cultural backgrounds had participated in studies using the CTS. According to Dekeseredy and Schwartz (1998), the CTS and CTS2 have been employed in at least 100 scientific journal articles and at least 10 books published within North America. A comprehensive bibliography of the studies using these measurements has been included in the CTS2's handbook (Straus, Hamby, & Warren, 2003) and its bibliography (Straus, 2006).

Because of the prevalent use of the CTS2, several validation studies have been conducted to examine the validity and reliability of the CTS2 since its introduction in 1996. Straus et al. (1996) reported that the CTS2 consists of five constructs (Negotiation, Psychological Aggression, Physical Assault, Injury, and Sexual Coercion) that measure respondents' experience in perpetration (what the respondent has done to his/her partner) and victimization (what the partner has done to him/her). In addition to the 5-factor model, they further hypothesized the 10-factor model; Negotiation consists of "cognitive" and "emotional" subconstructs and each violent scale consists of "minor" and "severe" subconstructs. However, most of the studies have tested the 5-factor model due to its simplicity, and those studies, including the original scale development report by Straus et al. (1996), did not include factor matrices in their report to examine the proposed factor structure. Examining the factor structure of a measurement is important because this procedure confirms the theoretical constructs by demonstrating whether scale items load on the same factor and whether any scale items cross-load on more than one factor. Only a few studies have investigated the factor structure of the CTS2 to test the hypothesized constructs by Straus et al. (1996, 2003).

Previous Studies Investigating Factor Matrices and Structure of the CTS2

One of the first validation studies to examine the factor structure of the CTS2 was conducted by Newton, Connelly, and Landsverk (2001). This study included the 22 items that compose the Negotiation, Psychological Aggression, and Physical Assault subscales for perpetration. Although the study supported evidence for the proposed three constructs (Negotiation, Psychological

Aggression, and Physical Assault), it omitted the Injury and Sexual Coercion constructs from the data analysis.

In a study using a sample of 359 incarcerated female substance abusers enrolled in a voluntary substance abuse treatment program, Lucente, Fals-Stewart, Richards, and Goscha (2001) reported the factor matrices of the five-factor model for both perpetration and victimization. Although the confirmatory multiple group factor analysis generally supported the five-factor model, the study results also revealed a lack of exclusive factor loadings in the Physical Assault, Sexual Coercion, and Injury subscales for both perpetration and victimization (Lucente et al., 2001).

Jones, Ji, Beck, and Beck (2002) also tested the CTS2's five-factor solution by using a sample of 264 incarcerated women in a large maximum security correctional center. The results of the exploratory factor analysis (EFA; principal component analysis) supported the four-factor solution rather than the five-factor solution. They suggested that the Psychological Aggression and Physical Assault subscales be merged together and that the other subscales (Negotiation, Sexual Coercion, and Injury) remain the same. These findings, as with the study of Lucente et al. (2001), showed confusing cross-loadings between the Psychological Aggression and Physical Assault subscales.

Connelly, Newton, and Aarons (2005) examined the minor and severe dimensions of the CTS2 in a confirmatory factor analysis (CFA) study using a sample of 405 English-speaking and Spanish-speaking Latino women. They evaluated the factorial validity of the English and Spanish versions of the CTS2 and tested the relative fit of a single-factor solution against a two-factor model consisting of minor and severe dimensions (Connelly et al., 2005). The results, however, should be interpreted cautiously because the researchers included only 22 items (Negotiation, Psychological Aggression, and Physical Assault subscales) in their data analyses. They excluded other scale items because of "missing data on the sexual coercion scale and low endorsement on the injury scale" (Connelly et al., 2005, p. 1564).

Recently, Calvete, Corral, and Estevéz (2007) conducted a study that investigated the CTS2's factor structure and validity of the victimization form by using a convenience sample of 1,266 Spanish women, including a subgroup of battered women. In this study, they tested three models—Model 1: 5 correlated first-order factors (Negotiation, Physical Assault, Psychological Aggression, Injury, and Sexual Coercion); Model 2: 10 correlated first-order factors (Negotiation Emotion [NE], Negotiation Cognition [NC], Psychological Aggression Minor [PM], Psychological Aggression Severe [PS], Physical Assault Minor [PhM], Physical Assault Severe [PhS], Sexual Coercion Minor [SM], Sexual Coercion Severe [SS], Injury Minor [IM], and Injury Severe [IS]); and Model 3: a hierarchical model with 5 broad factors

and with 10 specific subscales (Calvete et al., 2007). They found that Model 3 (the hierarchical model of the CTS2) was preferable and that this hierarchical model confirmed the five main scales with distinctions between minor and severe forms of violence. Calvete et al.'s (2007) study successfully differentiated severe from minor forms of aggression; however, it only used the Spanish CTS2's victimization questions.

Although the studies mentioned above have clarified the CTS2's factor structure, several limitations were identified. All of the available studies have been administered to particular populations, such as those of incarcerated women (Jones et al., 2002; Lucente et al., 2001), high-risk postpartum women (Newton et al., 2001), and Latino/Spanish women (Calvete et al., 2007; Connelly et al., 2005). Most of the above studies were conducted based on the 5-factor model (Jones et al., 2002; Lucente et al., 2001) and only some of the total items in the CTS2 (Connelly et al., 2005; Newton et al., 2001). Although Calvete and associates' (2007) study tested the 10-factor model, the study only included the victimization data by using a specialized population (Spanish women).

The present study aims to test the 10-factor model instead of the 5-factor model because reports increasingly distinguish between the etiology of minor and severe violence (Gelles, 1991; Johnson, 1995; Straus, 1990) as well as noting the theoretical advantages of doing so (Connelly et al., 2005; Hamby & Sugarman, 1999). In particular, *The Conflict Tactics Scales Handbook: Revised Conflict Tactics Scales CTS: Parent–Child Version* (Straus et al., 2003) specified that four violence constructs of the CTS2 (Psychological Aggression, Physical Assault, Injury, and Sexual Coercion) included distinct coverage of both minor and severe violent acts, and the Negotiation construct can be further grouped into the following two subconstructs: emotionally based and cognitively based items (Straus et al., 1996, 2003).

Therefore, this study tests the 10-factor model of the English version of CTS2 for both perpetration and victimization in a community-based female sample. The 10 factors include NE, NC, PM, PS, PhM, PhS, IM, IS, SM, and SS. In addition to examining the factor structure, the present study investigates factor correlations and the CTS2's internal consistency in both perpetration and victimization.

Method

Sample

Participants. Study participants included 297 women who were at least 18 years old and had experienced, or were maintaining, a marital, dating, or cohabiting relationship at the time of the survey. The study sample was recruited

from a large pool of people who were waiting for a court decision on whether they could serve on juries at a local county court in the southeastern United States. The participants were informed that the study was voluntary and that they were free not to join the study and/or not to answer any questions that made them uncomfortable. Two good quality pens were awarded as a token of appreciation for participating. In cases where respondents did not complete the questions (less than 15% of the 37 items), the author replaced the missing values with the mean of the response values for that specific question. Prior to data analysis, 35 returned questionnaires were excluded because the respondents did not answer more than 15% of the CTS2 items, the percentage outlined by Johnson (2003) as the threshold for expulsion. Therefore, the final sample size was 261.

In terms of demographic information, the mean age of the participants was 35.9 (*SD* = 11.2). Approximately, 50% of the participants were White (*n* = 131, 50.2%), followed by Black (*n* = 111, 42.5%) and Asian (*n* = 6, 2.3%). The majority of the participants indicated that their religion was Protestant (*n* = 143, 54.8%), and almost half of the participants were married (*n* = 126, 48.3%). More than 70% of the study participants were educated at the college or graduate level. As for employment, participants described themselves as full-time employed (*n* = 178, 68.2%), part-time employed (*n* = 24, 9.2%), homemakers (*n* = 19; 7.3%), and self-employed (*n* = 18, 6.9%). Refer to Table 1 for a complete demographic profile of the participants. For the frequency of violence incidence, a majority of participants answered 0 (*this has never happened*) to individual items of the CTS2 for both perpetration and victimization except for the PM. In particular, the percentage of participants who answered "no violence" for perpetration and victimization was very similar: PM (perpetration: 28%-66%, victimization: 28%-67%); PS (perpetration: 90%-92%, victimization: 90%-94%); PhM (perpetration: 84%-97%, victimization: 87%-95%); PhS (perpetration: 95%-99%, victimization: 95%-99%); IM (perpetration: 93%-95%, victimization: 94%-97%); IS (perpetration: 98%-99%, victimization: 98%-99%); SM (perpetration: 85%-97%, victimization: 84%-96%); SS (perpetration: 97%-99%, victimization: 97%-98%).

Sample size. Various recommendations on the minimum sample size in factor analysis are available, for example, at least 100 (Gorsuch, 1983; Kline, 1994), 200 (Guilford, 1954), and 250 (Cattell, 1978). Another typical guideline used is the minimum ratio of the sample size (*N*) to the number of variables (*p*) in the analysis: the *N:p* ratio. The literature shows that the ratio should be a range of 3 to 6:1 (Cattell, 1978), at least 5:1 (Gorsuch, 1983), and 10:1 (Everitt, 1975). Recently, these common guidelines have been critically reevaluated and found not valid or not useful because the results can vary across studies (e.g., MacCallum, Widaman, Zhang, & Hong, 1999).

Table 1. Demographic Variables

Age	
M	35.91
SD	11.24
Ethnicity	
White	131 (50.2%)
Black	111 (42.5%)
Asian	6 (2.3%)
Mixed	5 (2.0%)
Latino	4 (1.5%)
Other	4 (1.5%)
Religion	
Protestant	143 (54.8%)
None	42 (16.1%)
Catholic	32 (12.3%)
Jewish	9 (3.4%)
Other	28 (10.7%)
Missing	7 (2.7%)
Marital status	
Married	126 (48.3%)
Single (living apart)	73 (28.0%)
Unmarried (living together)	30 (11.5%)
Divorced	18 (6.9%)
Other	7 (2.7%)
Separated	6 (2.3)
Missing	1 (.4%)
Education	
Less than high school	15 (5.8%)
High school graduate	50 (19.2%)
Community college/less than college	53 (20.2%)
College graduate	92 (35.2%)
More than college	51 (19.6%)
Income	
Less than US$9,999	25 (9.6%)
US$10,000-US$24,999	38 (14.6%)
US$25,000-US$39,999	51 (19.5%)
US$40,000-US$54,999	42 (16.1%)
US$55,000-US$69,999	24 (9.2%)
US$70,000 and above	45 (17.2%)
Prefer not to answer	20 (7.7%)
Missing	16 (6.1%)
Employment	
Employed (full-time)	178 (68.2%)
Employed (part-time)	24 (9.2%)
Homemaker	19 (7.3%)
Owner (self-employed)	18 (6.9%)
Unemployed	8 (3.1%)
Other	12 (4.5%)
Missing	2 (.8%)

MacCallum et al. (1999) have suggested that the level of communality of the variables should be considered in determining the minimum sample size, so that the impact of sample size can be reduced when communality is consistently high, such as .6. They specified that a "good recovery of population factors can be achieved with samples that would traditionally be considered too small for factor analytic studies, even when *N* is well below 100" and reported that "it is desirable for the mean level of communality to be at least 7, preferably higher, and for communalities not to vary over a wide range" (MacCallum et al., 1999, p. 96).

In this study, the sample size ($N = 261$) is appropriate because all but one of the communalities of the 39 perpetration items ranged from .60 to .99 ($M = .80$). Similarly, the communalities of the 39 victimization items ranged from .60 to .96 ($M = .78$) except for two (.49 and .56).

Measures

The CTS2 (Straus et al., 1996) is a 78-item self-reporting instrument that measures the extent of prevalence and chronicity in four areas of intimate partner violence (Psychological Aggression, Physical Assault, Sexual Coercion, and Injury) as well as the extent of positive tactics (Negotiation) in dealing with a dating, cohabiting, or marital conflicts. The Negotiation scale consists of two subscales representing cognitively and emotionally based items, and the other four scales measuring violence are further broken down into the minor and severe forms of violence.

All the scale items are formulated in pairs; among the 78 items, half of the items address what the respondent has done to his/her partner (perpetration) and the other half address what the partner has done to the respondent (victimization). The present study used two groups of 39 items to reflect both the perpetration and victimization facets of the CTS2.

Respondents rate an individual item on an 8-point scale: 1 (*1 time in past year*), 2 (*2 times in past year*), 3 (*3-5 times in past year*), 4 (*6-10 times in past year*), 5 (*11-20 times in past year*), 6 (*more than 20 times in past year*), 7 (*not in the past year but it did happen before*), and 0 (*this has never happened*). The author followed the scoring instructions provided by Straus et al. (1996, 2003) by recoding the responses with weighted data.

Results

CFA

CFA is frequently used to assess the proposed measurement model so that the number of factors and the loadings of variables can be tested. In contrast to

EFA, which usually explores the possible underlying factor structure, CFA aims to test the proposed relationship between variables and their underlying latent constructs. The author conducted a confirmatory multiple group factor analysis (Gorsuch, 1983) to investigate the 10-factor model of the CTS2. In recent years, structural equation modeling (SEM) has frequently been employed as a statistical technique for CFA (Crowley & Fan, 1997); the author, though, did not adopt the SEM procedure in the present study but rather conducted a confirmatory multiple group factor analysis because of several advantages over the SEM procedure. Lucente et al. (2001, p. 441, as cited by Gorsuch, 1996) specified several limitations of using SEM in a habitual manner: "these include adjustments that are made to the SEM to 'fix' problems with significant chi-square residuals, improper solutions, and high factor correlations, adjustments that are not typically reported within published research articles." In contrast, a confirmatory multiple group factor analysis is much less affected by the limitations addressed earlier (e.g., Bernstein, Jaremko, & Hinkely, 1994; Bernstein & Keith, 1991; Gorsuch, 1983; Lucente et al., 2001; Nunnally & Bernstein, 1994). In addition, this CFA can clearly provide factor structure and test the hypothesized factor solution, thus demonstrating that certain variables load on a certain factor and others will load on another factor (see Gorsuch, 1983).

Factor loadings measure the degree of generalizability between each factor and each variable (Gorsuch, 1983). Despite no absolute cutoff for a salient factor loading, factor loadings of .30 or .40 and above are usually defined as being *salient* (Brown, 2006; Bryant & Yarnold, 1995; Kline, 1994). The literature on the CTS2 validation studies also shows a cutoff ranging from .30 to .40 as being salient (e.g., Jones et al., 2002; Lucente et al., 2001). The present study used the conservative cutoff of .40 in achieving saliency.

Results from the confirmatory multiple group factor analysis (Table 2 and Table 3) illustrated all the subscale items in both perpetration and victimization loaded above .40 on their respective factors. Despite the salient factor loadings of the items on their own factors, the factor matrices also demonstrated relatively complex cross-loading patterns—many subscale items also load on the other subscales greater than .40.

In the perpetration subscales, SM, PM, and NC were relatively robust because all items of SM and NC were not cross-loaded, and PM showed clear loading patterns except for two items (see Table 2). Cross-loadings were apparent, however, across 7 of the 10 subscales, including NE, PS, PhM, PhS, IM, IS, and SS; for example, all three NE items cross-loaded on NC (.52-.62), which is much greater than loadings on their own factor (NE; .42-.46). PhS seems to be the least robust among the violence subscales. Among the

Table 2. CTS2 Perpetration 10 Factors

Scale Item	Factor									
	NE	NC	PM	PS	PhM	PhS	IM	IS	SM	SS
NE										
Showed I cared	.46	.58	.28	.09	.14	.02	.00	−.08	.14	.02
Showed respect	.45	.52	.11	−.00	.00	−.03	−.15	−.08	.01	−.01
Said we could work out problem	.42	.62	.26	.08	.12	.03	.02	−.06	.10	.06
NC										
Explained my side	.35	.72	.31	.07	.13	.02	.01	−.05	.10	.01
Suggested a compromise	.30	.85	.33	.09	.05	−.06	−.06	−.04	.04	−.05
Agreed to try partner's solution	.28	.80	.21	.19	.12	.11	−.00	.07	.12	.12
PM										
Insulted or swore	.12	.27	.83	.38	.43	.18	.11	.02	.20	.17
Shouted or yelled	.16	.35	.82	.32	.26	.11	.03	−.05	.13	.04
Stomped out of room, house	.10	.17	.74	.16	.26	.05	.13	.01	.07	.11
Did something to spite partner	.06	.30	.67	.50	.39	.17	.16	.07	.18	.11
PS										
Called partner fat or ugly	.01	.05	.29	.84	.69	.74	.30	.41	.25	.65
Destroyed something	.01	.06	.22	.78	.40	.60	.16	.51	.20	.59
Accused partner of a lousy lover	.05	.16	.31	.55	.08	.11	.20	.12	.12	.10
Threatened to hit/throw something	.04	.15	.47	.75	.70	.44	.28	.09	.27	.54

(continued)

Table 2. (continued)

Scale Item	Factor									
	NE	NC	PM	PS	PhM	PhS	IM	IS	SM	SS
PhM										
Threw something at partner	.05	.11	.44	.42	.80	.55	.42	.32	.41	.41
Twisted arm or hair	.01	.04	.26	.39	.76	.56	.60	.40	.27	.63
Pushed or shoved	.06	.18	.44	.67	.80	.62	.16	.33	.22	.63
Grabbed	.08	.15	.36	.53	.84	.60	.39	.19	.22	.52
Slapped	.04	.02	.25	.55	.76	.51	.29	.09	.20	.58
PhS										
Used a knife or gun	−.02	.00	−.01	.51	.31	.76	.30	.76	.24	.69
Punched/hit partner with something	.03	.05	.13	.56	.52	.71	.29	.44	.23	.76
Choked	−.01	.02	.01	.56	.37	.73	.24	.68	.22	.77
Slammed partner against a wall	.03	.02	.18	.36	.57	.41	.20	.14	.09	.20
Beat up	−.01	−.02	.10	.41	.58	.80	.81	.60	.41	.64
Burned or scalded	−.01	−.04	.05	.20	.38	.67	.72	.63	.48	.34
Kicked	.02	.10	.32	.48	.66	.70	.63	.42	.30	.46
IM										
Had sprain, bruise, or small cut	−.04	−.03	.11	.28	.46	.66	.91	.66	.36	.48
Felt physical pain hurting next day	−.02	−.01	.17	.36	.47	.68	.91	.59	.37	.54

Table 2. (continued)

Scale Item	Factor									
	NE	NC	PM	PS	PhM	PhS	IM	IS	SM	SS
IS										
Passed out from being hit on head	−.02	−.01	−.03	.44	.25	.78	.39	.80	.27	.59
Went to a doctor due to a fight	−.03	.03	−.02	.41	.18	.57	.14	.73	.17	.52
Needed to see a doctor but I did not	−.07	−.02	.06	.16	.24	.45	.68	.71	.22	.27
Had a broken bone from a fight	−.03	−.03	.04	.19	.35	.58	.72	.70	.29	.41
SM										
Made partner have sex without a condom	.03	.07	.03	.17	.06	.13	.04	.14	.64	.12
Insisted sex when partner didn't want	.05	.13	.27	.20	.26	.35	.39	.27	.58	.29
Insisted partner have oral/anal sex	.02	.02	.07	.19	.33	.33	.27	.20	.72	.28
SS										
Used force to have oral/anal sex	.01	.04	.10	.66	.59	.78	.36	.55	.30	.95
Used physical force to have sex	.03	.06	.18	.50	.69	.52	.42	.15	.28	.83
Used threats to have oral/anal sex	.01	.02	.15	.45	.68	.68	.70	.51	.36	.81
Used threats to have sex	−.00	−.01	.04	.48	.29	.66	.19	.67	.21	.67

Note: CTS2 = revised Conflict Tactics Scales; NE = Negotiation Emotion; NC = Negotiation Cognition; PM = Psychological Aggression Minor; PS = Psychological Aggression Severe; PhM = Physical Assault Minor; PhS = Physical Assault Severe; IM = Injury Minor; IS = Injury Severe; SM = Sexual Coercion Minor; SS = Sexual Coercion Severe.

Table 3. CTS2 Victimization 10 Factors

	Factor									
Scale Item	NE	NC	PM	PS	PhM	PhS	IM	IS	SM	SS
NE										
Showed I cared	.82	.55	.03	−.09	−.02	−.08	.00	−.10	.02	−.02
Showed respect	.81	.52	−.09	−.13	−.08	−.06	−.06	−.03	.01	−.08
Said we could work out problem	.76	.68	.19	.04	.14	.05	.08	−.01	.11	.05
NC										
Explained my side	.65	.72	.22	−.05	.08	−.04	.03	−.08	.05	.03
Suggested a compromise	.55	.85	.20	.04	−.01	−.05	.03	−.05	.09	−.08
Agreed to try partner's solution	.55	.81	.12	.11	.10	.08	.08	.07	.11	.11
PM										
Insulted or swore	.04	.20	.84	.36	.32	.18	.20	.09	.18	.22
Shouted or yelled	.11	.25	.83	.34	.22	.09	.16	−.03	.27	.09
Stomped out of room, house	.05	.12	.77	.31	.23	.06	.05	−.01	.15	.16
Did something to spite partner	−.02	.15	.73	.44	.39	.23	.16	.01	.31	.29
PS										
Called partner fat or ugly	−.08	−.03	.35	.76	.34	.44	.19	.34	.38	.46
Destroyed something	−.03	.03	.17	.76	.52	.71	.26	.46	.36	.69
Accused partner of a lousy lover	−.09	.03	.44	.72	.13	.12	.07	.05	.33	.22
Threatened to hit/throw something	−.02	.11	.42	.76	.58	.37	.28	.06	.39	.53

(continued)

Table 3. (continued)

Scale Item	Factor									
	NE	NC	PM	PS	PhM	PhS	IM	IS	SM	SS
PhM										
Threw something at partner	−.04	−.05	.28	.37	.75	.71	.56	.40	.49	.49
Twisted arm or hair	−.03	.01	.25	.39	.83	.58	.64	.37	.31	.70
Pushed or shoved	.02	.15	.33	.56	.78	.64	.51	.35	.47	.72
Grabbed	.10	.15	.37	.39	.82	.45	.46	.05	.42	.54
Slapped	.01	.03	.24	.42	.86	.61	.46	.25	.35	.83
PhS										
Used a knife or gun	−.03	.01	.00	.45	.33	.70	.22	.76	.18	.62
Punched/hit partner with something	.00	.04	.11	.51	.60	.72	.31	.36	.38	.70
Choked	−.04	.03	.13	.68	.40	.66	.21	.51	.28	.61
Slammed partner against a wall	−.05	−.04	.21	.31	.58	.66	.49	.31	.51	.28
Beat up	−.03	.00	.25	.44	.86	.75	.56	.40	.38	.77
Burned or scalded	−.04	−.05	.06	.15	.40	.73	.58	.76	.35	.28
Kicked	−.01	.01	.13	.19	.49	.73	.59	.77	.24	.44
IM										
Had sprain, bruise, or small cut	−.02	.02	.13	.21	.55	.53	.91	.52	.26	.48
Felt physical pain hurting next day	.03	.09	.20	.28	.64	.56	.91	.37	.49	.41

(continued)

Table 3. (continued)

Scale Item	Factor									
	NE	NC	PM	PS	PhM	PhS	IM	IS	SM	SS
IS										
Passed out from being hit on head	−.05	−.03	−.01	.41	.22	.63	.20	.83	.14	.47
Went to a doctor due to a fight	−.04	.00	−.03	.39	.22	.64	.19	.77	.14	.51
Needed to see a doctor but I didn't	−.05	−.02	.06	.10	.33	.65	.54	.83	.18	.30
Had a broken bone from a fight	−.05	−.02	.05	.11	.37	.62	.66	.82	.18	.35
SM										
Made partner have sex without a condom	.06	.10	.07	.28	.17	.25	.18	.17	.71	.15
Insisted sex when partner did not want	.02	.12	.46	.57	.52	.31	.39	.02	.68	.42
Insisted partner have oral/anal sex	.04	.01	.07	.19	.38	.43	.30	.22	.71	.26
SS										
Used force to have oral/anal sex	.00	.03	.12	.59	.67	.68	.30	.45	.29	.90
Used physical force to have sex	.01	.04	.26	.41	.82	.47	.35	.07	.32	.79
Used threats to have oral/anal sex	.01	.03	.13	.35	.72	.64	.69	.49	.28	.77
Used threats to have sex	−.08	−.03	.22	.62	.33	.54	.18	.54	.34	.66

Note: CTS2 = revised Conflict Tactics Scales; NE = Negotiation Emotion; NC = Negotiation Cognition; PM = Psychological Aggression Minor; PS = Psychological Aggression Severe; PhM = Physical Assault Minor; PhS = Physical Assault Severe; IM = Injury Minor; SM = Sexual Coercion Minor; SS = Sexual Coercion Severe.

seven items of PhS, two to six items cross-loaded on the other violence subscales: six items on IS (.42-.76), five items on PS (.41-.56) and SS (.46-.77), four items on PhM (.52-.66), three items on IM (.63-.81), and two items on SM (.41-.48). Moreover, five of the seven PhS items loaded higher on the other violence subscales than on their own respective subscale: "punched/hit partner with something" on SS (.76), "choked" on SS (.77), "slammed partner against a wall" on PhM (.67), "beat up" on IM (.81), and "burned or scalded" on IM (.72). SS seems not to be robust because the factor overlap was obvious across PS, PhM, PhS, IM, and IS (ranging from .42-.78).

The results for victimization were similar to those for perpetration (see Table 3). Except for NE, NC, and PM, most items of the violence subscales displayed cross-loadings. Specifically, among the seven items of PhS, one to six items cross-loaded on the other violence subscales: six items on PhM (.40-.86), five items on IS (.40-.77) and SS (.44-.77), four items on IM (.49-.59) and PS (.44-.68), and one item on SM (.51). Moreover, five of the seven PhS items showed higher factor loadings on the other violence subscales than on their respective factor (PhS): "used a knife or gun" on IS (.76), "choked" on PS (.68), "beat up" on PhM (.86) and SS (.77), "burned or scalded" on IS (.76), and "kicked" on IS (.77). As identified in perpetration, SS seems to be the next least robust because of the complex cross-loadings that range from .41 to .82 across PS, PhM, PhS, IM, and IS. Table 3 demonstrates the cross-loading patterns for the items of each violence subscale on the other violence subscales: PS (.42-.69), PhM (.40-.72), IM (.41-.64), and IS (.41-.66).

Cross-loadings were especially rampant between the minor and severe dichotomies of Physical Assault (PhM and PhS) and Injury (IM and IS). A significant percentage (50%-100%) of the violence subscale items loaded greater than .40 on both the minor and severe constructs of PhM, PhS, IM, and IS, confusing the distinction between the two constructs. For example, all five PhM items cross-loaded on PhS (.55-.60 for perpetration and .45-.71 for victimization). Moreover, a few items on PhS ("I slammed my partner against a wall," "I beat up my partner") and IS ("I had a broken bone from a fight with my partner") had greater factor loadings on PhM and IM, respectively, than on their own factors.

Evidence for the discriminant validity was generally supported by the 10-factor intercorrelations for perpetration and victimization (see Table 4). For perpetration, the correlation coefficients were significant between the two Negotiation subscales (NE and NC; .72) and within the eight violence subscales (PM, PS, PhM, PhS, IM, IS, SM, and SS; .17-.79), whereas the coefficients were not significantly correlated between Negotiation and other violence subscales with three exceptions (PM, PS, and PhM). These correlation patterns

generally support evidence for discriminant validity between the two constructs (so-called "positive" conflict management tactics versus "violent" conflict management tactics).

Much clearer factor correlation patterns were identified for victimization. Negotiation (NE and NC) was not correlated with PhM, as it was in perpetration. PM had significant correlations with all other subscales except for IS, thus showing clearer correlation patterns than those found in perpetration. All other subscales did show significant correlations with one another (ranging from .18-.79).

The alpha coefficients of the 10 subscales across the two forms (perpetration and victimization) are reported in Table 5. The results show that all 10 subscales significantly correlated with each other across the two forms (ranging from .66-.94). To support the discriminant validity among the violence subscales, the author investigated the correlation patterns in the same way that Lucente et al. (2001) had: "The more severely aggressive items from the Pag [Psychological Aggression] subscale correlate highly with the Pas [Physical Assault] subscale, and the more assaultive items from the Pas subscale correlated highly with the I [Injury] subscale item" (p. 446). Table 5 does not clearly identify the correlation patterns reported by Lucente et al. because both PS (the more aggressive items of Psychological Aggression) and PhS (the more assaultive items of Physical Assault) correlated more highly with SS than PhS and IS.

Reliability

The internal consistency reliability of the CTS2 subscales was examined through the alpha coefficients (Cronbach, 1951) for both perpetration and victimization. Table 6 includes the alpha coefficients of the 5 CTS2 subscales (Negotiation, Psychological Aggression, Physical Assault, Injury, and Sexual Coercion) as well as the 10 subscales that were further broken down into emotion and cognition for Negotiation, and minor and severe for the four subscales measuring violent behaviors.

Table 6 shows that the alpha coefficients of the 10-factor model generally support acceptable levels of internal consistency ranging from .68 to .88, except for SM (.18 for perpetration and .37 for victimization). Because of the relatively adequate levels of the alpha coefficients for SS (.77 for perpetration and .71 for victimization), the alpha coefficients for the combined Sexual Coercion scale indicate borderline alpha coefficients (.44 for perpetration and .55 for victimization). The low alpha coefficients for SM are consistent with the results of previous studies: .34 (Lucente et al., 2001) and .17-.42 (O'Leary & Williams, 2006).

Table 4. CTS2 Factor Intercorrelations ($N = 261$)

Factor	NE	NC	PM	PS	PhM	PhS	IM	IS	SM	SS
Perpetration										
NE	1.00									
NC	0.72**	1.00								
PM	0.28**	0.36**	1.00							
PS	0.06	0.13*	0.40**	1.00						
PhM	0.12	0.14*	0.43**	0.68**	1.00					
PhS	0.02	0.03	0.14*	0.70**	0.68**	1.00				
IM	–0.06	–0.02	0.12	0.33**	0.45**	0.52**	1.00			
IS	–0.07	–0.01	–0.02	0.45**	0.28**	0.79**	0.43**	1.00		
SM	0.08	0.08	0.08	0.23**	0.18**	0.23**	0.17**	0.24**	1.00	
SS	0.03	0.03	0.12	0.67**	0.64**	0.87**	0.41**	0.66**	0.22**	1.00
Victimization										
NE	1.00									
NC	0.75**	1.00								
PM	0.07	0.24**	1.00							
PS	–0.08	0.03	0.45**	1.00						
PhM	0.02	0.08	0.36**	0.52**	1.00					
PhS	–0.03	0.01	0.15*	0.60**	0.71**	1.00				
IM	0.00	0.05	0.18**	0.25**	0.63**	0.47**	1.00			
IS	–0.05	–0.03	0.00	0.38**	0.30**	0.73**	0.32**	1.00		
SM	0.06	0.12	0.24**	0.47**	0.43**	0.40**	0.33**	0.18**	1.00	
SS	–0.03	0.01	0.22**	0.66**	0.74**	0.79**	0.37**	0.56**	0.35**	1.00

Note: CTS2 = revised Conflict Tactics Scales; NE = Negotiation Emotion; NC = Negotiation Cognition; PM = Psychological Aggression Minor; PS = Psychological Aggression Severe; PhM = Physical Assault Minor; PhS = Physical Assault Severe; IM = Injury Minor; IS = Injury Severe; SM = Sexual Coercion Minor; SS = Sexual Coercion Severe.

*Correlation is significant at the .05 level (two-tailed); $df = 261$.

**Correlation is significant at the .01 level (two-tailed); $df = 261$.

Table 5. Factor Correlations Across Different Forms of CTS2

	Perpetration Subscales									
Victimization Subscales	NE	NC	PM	PS	PhM	PhS	IM	IS	SM	SS
NE	.92**	.65**	.19**	.03	.09	.01	−.08	−.07	.05	.02
NC	.74**	.89**	.32**	.10	.13*	.04	−.03	−.04	.04	.03
PM	.19**	.33**	.85**	.37**	.35**	.12	.19**	.04	.03	.11
PS	.02	.13*	.33**	.67**	.44**	.50**	.26**	.47**	.21**	.54**
PhM	.05	.09	.35**	.60**	.87**	.64**	.60**	.32**	.23**	.71**
PhS	.00	.01	.14*	.67**	.61**	.90**	.52**	.77**	.35**	.83**
IM	−.01	.06	.23**	.45**	.66**	.50**	.66**	.30**	.18**	.41**
IS	−.04	−.02	−.02	.44**	.29**	.80**	.49**	.94**	.23**	.64**
SM	.09	.16**	.22**	.31**	.37**	.28**	.22**	.26**	.78**	.27**
SS	−.02	.05	.12	.61**	.58**	.78**	.43**	.65**	.19**	.92**

Note: CTS2 = revised Conflict Tactics Scales; NE = Negotiation Emotion; NC = Negotiation Cognition; PM = Psychological Aggression Minor; PS = Psychological Aggression Severe; PhM = Physical Assault Minor; PhS = Physical Assault Severe; IM = Injury Minor; IS = Injury Severe; SM = Sexual Coercion Minor; SS = Sexual Coercion Severe.

*Correlation is significant at the .05 level (two-tailed).

**Correlation is significant at the .01 level (two-tailed).

Table 6. Coefficient of Reliability (Cronbach's Alpha) of the CTS2

Scale	Alpha Coefficient	
	Perpetration	Victimization
Negotiation	.83	.83
NE	.74	.71
NC	.69	.68
Psychological Aggression	.75	.78
PM	.75	.79
PS	.70	.73
Physical Assault	.87	.88
PhM	.85	.84
PhS	.74	.76
Injury	.75	.73
IM	.79	.75
IS	.68	.73
Sexual Coercion	.44	.55
SM	.18	.37
SS	.77	.71

Note: CTS2 = revised Conflict Tactics Scales; NE = Negotiation Emotion; NC = Negotiation Cognition; PM = Psychological Aggression Minor; PS = Psychological Aggression Severe; PhM = Physical Assault Minor; PhS = Physical Assault Severe; IM = Injury Minor; IS = Injury Severe; SM = Sexual Coercion Minor; SS = Sexual Coercion Severe.

Discussion

This study has several important implications for the factor structure and practical utility of the CTS2's 10-factor model. The two Negotiation subscales (NE and NC) were independent from those that measure violent behaviors. Factor intercorrelations between the 10 subscales also support this finding in that all violence subscales were significantly (.01 or .05 significance level) correlated with each other, while both NE and NC were independent from the violence subscales (see Table 4). Within Negotiation, however, the author found the distinction between NE and NC unclear. The factor matrices showed cross-loadings between NE and NC greater than .40. In particular, all three NE items had greater salient factor loadings on NC than on their own factor (NE) in perpetration, which suggests that rather than being independent from each other, NE and NC's items should be considered as a single factor. Along the same lines, the high factor intercorrelations (.7 for perpetration and .8 for victimization) between NE and NC support one factor rather than two separate factors. According to Gorsuch (1983), factors would

not be considered sufficiently independent if the correlations between the two were significantly larger than what theory states. Nunnally and Bernstein (1994) also specified that if two factors correlated at .8, they could be replaced by a single factor.

The study finds cross-loadings across all the violence subscales except PM for both perpetration and victimization and SM for perpetration. A varied percentage (20%-100%) of the items of a subscale measuring violent behavior loaded on the other violence subscales greater than .40 (see Table 2 and Table 3), suggesting that the proposed eight subconstructs (PM, PS, PhM, PhS, IM, IS, SM, and SS) are closely related. In particular, PhS seems to be the least robust among the violence subscales for both perpetration and victimization because it cross-loaded across the other violence subscales (PS, PhM, IM, IS, SM, and SS) above .40. For example, one of the Physical Assault items ("choked") loaded not only its own factor (PhS: .73), but also cross-loaded on Psychological Aggression (PS: .56), Injury (IS: .68), and Sexual Coercion (SS: .77). In a practical sense, the results raise the question of whether it would be meaningful or even correct to categorize the "choked" item under PhS. The literature articulates that various forms of violence, such as physical, psychological, and sexual violence, tend to occur together in intimate partner relationships (Hyden, 1995; Ryan, 1995, Stets & Henderson, 1991); nonphysical incidents can be extended to physical attack (Dobash & Dobash, 1984); and diverse forms of violence, such as physical, verbal, and economic abuse, may occur simultaneously (Rutherford, Zwi, Grove, & Butchart, 2007). In particular, Cascardi, Langhinrichsen, and Vivian (1992) reported that one episode of marital violence often affects the intimate partners physically and psychologically.

In addition, several empirical studies have noted the CTS2's complex factor loading issue. Lucente et al. (2001) reported a lack of exclusive factor loadings in the Physical Assault, Sexual Coercion, and Injury subscales. In a study using an EFA, Jones et al. (2002) have suggested that the Psychological Aggression and Physical Assault subscales should be merged to establish a better factor solution. Furthermore, several factor validation studies have removed the Injury and Sexual Coercion subscales of the CTS2 from factor analyses to avoid any potential confusion by respondents regarding answering the scale items (e.g., Connelly et al., 2005; Newton et al., 2001; O'Leary & Williams, 2006). Connelly et al. (2005), for example, use only 22 items (Negotiation, Psychological Aggression, and Physical Assault) for analyses but have not included Sexual Coercion and Physical Injury scales because of "missing data on the sexual coercion scale and low endorsement on the injury scale" (p. 1564).

This study also observed a lack of exclusive factor loadings in the secondary subconstructs, which were further categorized as minor and severe. Despite the conceptual advantages of separating violent behaviors into minor and severe, significant cross-loadings between the two constructs failed to fully support the dichotomies hypothesized by Straus et al. (1996). Researchers and practitioners have argued about whether people can successfully differentiate the severity of various violent acts by simply counting the number of incidents (blows) because in conflicts violent acts can take place within a variety of contexts, meanings, and motives.[2] Dekeseredy and Schwartz (1998) claimed that ranking certain violent acts as severe or minor could be meaningless (e.g., kicking is automatically defined as more severe than slapping) because emotional and psychological aggression could be more damaging than many aspects of physical violence. Because the minor and severe dichotomies are the major distinct characteristic of the 10-factor model, further confirmatory studies should be conducted to confirm the proposed dichotomies by Straus et al. (1996, 2003).

From a conventional standard, the CTS2 subscales displayed adequate levels of internal consistency (.68 - .85 for perpetration and .68-.84 for victimization), except for SM (.18 for perpetration and .37 for victimization). However, the author recommends a reevaluation of this general guideline. According to Nunnally (1978), the acceptance of any measurement error is alarming in situations in which measures are clinically applied. Nunnally and Bernstein (1994) specified that "if important decisions are made with respect to specific test scores, a reliability of .90 is the bare minimum, and a reliability of .95 should be considered the desirable standard" (p. 265). Because the CTS2 is frequently used in clinical prevention and intervention settings to evaluate the severity of violent behavior that seriously affects individuals and society, the alpha coefficients observed in the present study should be accepted with caution.

Several methodological issues, including sampling, the manner of self-reporting, and social desirability, limit the study. The recruited sample may not fully be representative and could be biased. Although the participants were randomly selected by a court and therefore should represent the general characteristics of the community (diverse socioeconomic and ethnic background), self-selection bias could affect sampling. In addition, the participant pool only included the citizens from a county located in one of the southeastern states in the United States, so the pool could not fully represent the characteristics of the community.

The results could be also biased because the CTS2's self-reporting measure draws data from only one member of the couple in an intimate relationship.

Respondents had the potential to underreport the level of their own violence, while overreporting the level of their partner's violence. A factor validation study designed to include both partners within an intimate relationship would help complete the understanding of the structure of perpetration and victimization and would also circumvent problems such as social desirability, underreporting, and/or overreporting.

From a purely statistical view, the violation of the data's normal distribution should be mentioned. The frequency of violence incidents for the eight subscales reveals that the majority of the participants (84%-99%), except for psychological aggression minor, responded that the violent incidents did not happen to them; thus, the data are not normally distributed. Departures from normality may distort the results of the analyses; however, nonnormal data, missing data, and outliers are almost inevitable in social and behavioral sciences where questionnaires are used (Yuan, Marshall, & Bentler, 2002). In particular, nonnormal distribution of the scale items measuring violent behaviors is not an atypical phenomenon, and violation of normal distribution assumptions is hardly avoidable in such a study that investigates violence and aggression (Vega & O'Leary, 2007). Many items of the violence subscales, however, were not normally distributed in the present study. In particular, the majority of Physical Assault, Sexual Coercion, and Injury items were highly skewed and kurtotic, so that the results should be interpreted cautiously.

It should be noted that the review of the factor loading patterns is only part of the psychometric information needed to evaluate a measurement, and cross-loading patterns may not be the final indicator of poor factorial validity. Despite the limitations mentioned above, this study is the first trial to test the 10-factor model of the CTS2 by using the confirmatory multiple group factor analysis in a community-based female sample and unique in terms of providing a comprehensive evaluation of the psychometric factor structure in both perpetration and victimization.

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Notes

1. Criticisms of the CTS and CTS2 have been well documented in several studies (see Archer, 2000; Chang, 1996; DeKeseredy, Saunders, Schwartz, & Alvi, 1997; DeKeseredy & Schwartz, 1998; Desai & Saltzman, 2001; Dobash, Dobash, Wilson, & Daly, 1992; Ellis & Stuckless, 1996; Kelly, 1987; Kirkwood, 1993; Kimmel, 2002). Particularly, issues of gender symmetry (asymmetry) have highlighted the habitual use of these scales in IPV research.
2. The feminist perspective successfully places these situational aspects explaining violence within the context of self-defense, fighting back, gender inequality, and male dominance. Discussions regarding the contexts, meanings, and motives of violent acts are well documented in the literature (e.g., Berk, Berk, Loseke, & Rauma, 1983; Bogard, 1984; Dobash et al., 1992, Johnson, 1995; Wardell, Gillespie, & Leffler, 1983).

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Bio

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