Measuring Spousal Violence With the Conflict Tactics Scale: Notes on Reliability and Validity Issues

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METHODOLOGY

The violence scale of the Conflict Tactics Scale (CTS) is a widely used instrument in the field of spousal violence research. However, a number of criticisms have been raised about measuring spousal violence with the CTS, including questioning the item content and the reliability and construct validity of the violence scale. This article discusses certain aspects of these issues and illustrates several points with data analysis.

Measuring Spousal Violence With the Conflict Tactics Scale

Notes on Reliability and Validity Issues

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Measurement is a central issue in psychosocial research. In the field of family and spousal violence research, measurement issues have been both problematic and controversial. This is probably due in part to the underdevelopment this particular area has shown relative to other social research agendas, and also to the diverse theoretical disciplines of researchers in this area. This article will review selected reliability and validity issues that are pertinent to studies using the Conflict Tactics Scale (CTS), from the perspective that well-operationalized, standardized instruments in psychosocial research are both useful and necessary. The advantages of this approach have been enumerated in a sophisticated manner in other work (e.g., Nunnally & Bernstein, 1994), but three of these benefits relevant to this discussion are briefly mentioned here. First, the use of standardized instruments allows direct comparisons to be made across research projects, a seeming necessity if independent research is to accumulate and advance our understanding of

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the dynamics of intimate violence. Second, the use of standardized questionnaires may facilitate the research participant's memory by allowing the use of the less demanding cognitive mechanism of recognition rather than recall. Finally, the use of standardized instruments capitalizes on a vast, evolving research methodology in psychometrics that can be applied over time to update and improve violence assessment instruments.

The instrument most widely used for the estimation of the prevalence and incidence of family violence in the United States is the Conflict Tactics Scale (CTS), developed by Straus (1974, 1979, 1990a) more than 20 years ago. Although typically used in a research setting, especially large-scale survey research, the CTS has also found its way into the armamentarium of clinical assessment devices (e.g., Biddle, 1993). The CTS is composed of three scales designed to assess three facets of conflict: reasoning, verbal aggression, and violence. Several different versions of the CTS have been developed over the years. The violence scale for Form N of the CTS consists of eight items (see Appendix). Originally, Form A of the CTS contained five items measuring violence. For the present version of the CTS, Form R, another item was included (choking) in addition to those items previously found on Form N, for a total of nine items. The CTS violence scale has been modified by various authors, including Miller (1990) and Pan, Neidig, and O'Leary (1994). Multiple studies have demonstrated that spousal consensus on the CTS violence scale is moderate to low (Browning & Dutton, 1986; Edelson & Brygger, 1986; Jouriles & O'Leary, 1985; O'Leary & Arias, 1989; Szinovacz, 1983). It has been shown to have empirical construct validity in several factor analytic studies (Barling, O'Leary, Jouriles, Vivian, & MacEwen, 1987; Hornung, McCullough, & Sugimoto, 1981; Pan et al., 1994; Straus, 1979).

This discussion will focus on issues of reliability and validity, with the understanding that overlap between these areas is inevitable. Neither section is intended to serve as a comprehensive discourse on each topic in relation to the CTS violence scale. Rather, selective points are made in each area, accompanied at times by the results from illustrative data analyses.

RELIABILITY

One way that we assess whether we are measuring a phenomenon reliably, or with precision, is by examining the reports of different raters of that phenomenon to see if they agree. In spousal violence research one indicator of the reliability of a violence measure is the degree to which the spouses' reports are concordant. This is the working definition of reliability used for the following discussion.

Validity and reliability are often inextricably bound, as the following discussion will demonstrate. Measuring a behavior with validity is often described as measuring the behavior *accurately*. The problem in assessing spousal violence is that we do not have an external criterion, a "gold standard," against which the reports of the spouses can be compared to assess the validity of their reports. Thus researchers in this area may believe that if the spouses' reports agree (are reliable), then the reports accurately reflect the "true" level of spousal violence (are valid). However, as Kenny (1991) noted, in interpersonal research consensus, or reliability in spousal ratings, is only a proxy for accuracy. Figure 1 illustrates possible matches between spouses' reports on the frequency of a unidirectional violent behavior (e.g., Spouse A aggressing against Spouse B). Assume that a true frequency exists, designated "T" in the figure. Up arrows represent overreporting in relation to this true value, and down arrows depict underreporting. Cell 5 in the figure represents perfect reliability and validity; that is, consensus between the spouses that also corresponds to an accurate value. Cells 1 and 9 represent perfect reliability, but are biased from the true value and are therefore invalid. Making the false assumption that these cells represent valid reports of violence frequency may not be unduly harmful if Cells 1 and 9 are equally likely in the population. In that case, pooling the data and using averages (means) would tend to cancel the reporting biases in these cells toward the true value. However, as discussed below, underreporting is more frequent than overreporting in data on spousal violence, meaning that the average of ratings may not approach the true frequency of violent behavior.

Turning now to cells in the figure that represent discordant spousal reports, averaged values of the spouses in Cells 3 and 7 (Figure 1) may seem to approach the true frequency of violence. Note also that if values are averaged in Cells 2, 4, 6, and 8, then the over- or underreporting bias in each of these cells is reduced by half. Thus averaging would seem to be an attractive approach overall to reducing potential reporting bias. However, this method is based on several assumptions, including the assumption that under- and overreporting are equally likely. There is some literature to suggest that this is not the case, and that underreporting of spousal violence may be more likely than overreporting (O'Leary et al., 1989; Riggs, Murphy, & O'Leary, 1989). Then Cells 1, 2, and 4 would be less likely to occur than Cells 6, 8, and 9. In addition, the mean of the joint distributions in Cells 3 and 7 would be biased toward underreporting. Thus pooled data from a given sample using the averaging method would underestimate the true violence frequency.

Knowing the direction of bias is helpful in determining a method of scoring spousal ratings of violence. The approach described in Miller (1990), where the higher rating by either spouse of a given violent behavior is used

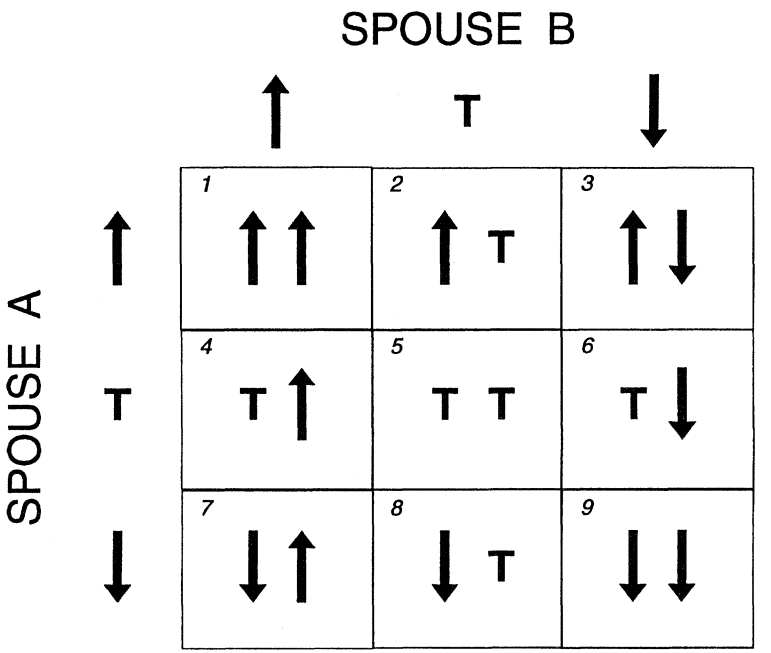

Figure 1: Breakdown of Different Types of Spousal Agreement and Disagreement About the General Frequency of a Hypothetical Violence Behavior

in constructing indexes of spousal violence (e.g., Spouse A aggressing against Spouse B, Spouse B aggressing against Spouse A, total couple violence), appears to be preferable to averaging. However, it is extremely important to note again that, in the absence of an externally verifiable criterion, the validity of this method is unknown.[1] Because other sources of error presumably also affect CTS responses, the use of these summated indexes as observed variables in statistical models seems ill-advised. Instead, methods in which measurement error can be estimated (e.g., structural equation models[2]) are to be recommended, with the caution that systematic bias may still affect the results.

VALIDITY

The existence of "content validity" is disputed by some authors (Pedhazur & Schmelkin, 1991); however, it is an established necessity that test items be

chosen that adequately represent the domain to be measured (Nunnally & Bernstein, 1994). The CTS violence scale has been criticized for its lack of breadth in assessing violent behaviors (reviewed in Straus & Gelles, 1990). Straus (1990a) has defended the CTS by arguing that a limited set of items is necessary for brevity, and that the items are nonspecific because they are intended to generalize across the various types of violence that may occur within the family (e.g., parent-to-child, spouse-to-spouse). Straus (1990a) acknowledged the solution to this problem, namely qualitative research. This preliminary critical step would provide an initial set of items to be used in quantitative scaling procedures, which in turn would suggest an optimal set of items based on empirical criteria.

Empirical construct validity for scale development is often demonstrated with factor analysis (Nunnally & Bernstein, 1994). Several factor-analytic studies for the CTS have been conducted, and in general there has been support for the validity of the violence scale using these methods. In addition, a recent study by Pan et al. (1994) has suggested that the CTS violence scale may be multifactorial. However, studies to date have not employed rigorous empirical tests (e.g., confirmatory factor analysis) to assess the adequacy of the fit of their measurement models to their data. The following examples are illustrated with data collected on 533 college students residing in California, as part of a larger study designed to comprehensively assess, in an experimental fashion, the impact of different modalities of data collection techniques on responses to questions relating to sexual history and violence. Further details on the sample are available in Urquiza, Schafer, Trocki, and Goodlin-Jones (under review).

The confirmatory factor analyses of a unidimensional and bidimensional measurement model for the CTS violence scale were conducted with EQS (Bentler & Wu, 1993). One advantage of the current version of EQS is that it allows for the estimation of a chi-square statistic that is scaled to account for the nonnormality of the indicator variables; this corrects for the tendency of the chi-square statistic to inflate in the presence of nonnormal indicators (Satorra & Bentler, 1988; West, Finch, & Curran, 1995). The (scaled) chi-square should be approximately equal to the degrees of freedom in an adequately fitting model; substantially high values indicate a lack of fit between the model and the data.

A unidimensional (one factor) model and a bidimensional (two factors) model incorporating responses for self-to-spouse violence were tested separately for the 270 women and for the 263 men.[3] CTS Form N violence items (Appendix) were coded as 0, 1, or 2 (two or more), similar to Barling et al. (1987). The two-factor model was based on a model in which items with greater severity are hypothesized to load on a separate factor (Pan et al., 1994;

TABLE 1: Standardized Factor Loadings for the Eight Violence Items

	Model A	*Model B*	
Items	*Factor 1*	*Factor 1*	*Factor 2*
Women			
1	.70	.74	—
2	.59	.62	—
3	.65	.70	—
4	.78	—	.77
5	.72	—	.74
6	.60	—	.65
7	.47	—	.51
8	.20	—	.22
Factor correlation		.86	
Men			
1	.05	.52	—
2	.17	.49	—
3	.39	.92	—
4	.40	—	.39
5	.49	—	.49
6	.75	—	.75
7	.92	—	.92
8	.98	—	.99
Factor correlation		.39	

Straus, 1990b). The one-factor model demonstrated an adequate fit for the women (scaled $\chi^2(20, N = 270) = 30.34, p = .06$), but not for the men (scaled $\chi^2(20, N = 263) = 53.67, p = .00006$). The two-factor model did not fit for either the women or the men: scaled $\chi^2(19, N = 270) = 29.85, p = .05$, and scaled $\chi^2(19, N = 263) = 34.80, p = .01$, respectively. Standardized factor loadings are shown in Table 1. It should be noted that the empirical difference between the unidimensional and bidimensional models for the women is minimal, and that the unidimensional model is retained based both on the principle of parsimony (see Bollen, 1989) and on the fact that the unique information provided by each factor in the two-factor solution is low (i.e., $r = .862$). Therefore, within the limitations of the sample, these results suggest that the CTS violence scale holds as a unidimensional construct for women, but not for men.

Item response theory (IRT) models are another set of methodological tools that have seen increasing use by scale developers in preference to methods based on classic psychometric theory (for an introduction, see Hambleton,

Swaminathan, & Rogers, 1991). Briefly, these methods allow categorical data to be scaled using methods that can be compared to nonlinear factor analysis. Some authors (e.g., McDonald, 1985) have argued that this method is to be preferred to classical methods because the relationship of the latent trait to the items is inherently nonlinear. A similarity can be seen in the preferred use of probit or logistic regression over the use of ordinary least squares (linear probability model) when the dependent variable is categorical. The IRT-based approach is also important for assessing the hierarchical ordering of the CTS violence items suggested by Straus (1990b). An IRT analysis allows a probabilistic rank ordering of the items along the dimension of severity of violence.

IRT models for the eight violence items were estimated separately for the 270 women and 263 men. Two-parameter models were estimated in which the first parameter, *b*, indicates the position of the item in relation to the underlying trait, in this instance, violence. In Figure 2 and Figure 3, the item characteristic curves (ICC) are plotted for each of the violence items. Note that the rank ordering of the items is roughly similar to that proposed by Straus (1990b), except that positive responses to Item 2 are associated with a less severe level of violence than for Item 1 (Appendix). The second parameter, *a*, is a discrimination parameter. Higher values of *a* for a given item translates into a steeper ICC (e.g., Item 7 in Figure 1). Such items are useful for distinguishing between individuals with different levels of the latent trait (i.e., the probability of a "yes" response, the value plotted on the Y axis, changes quickly from a low to a high value within a brief range of the trait).

Goodness-of-fit for IRT models with only a few (e.g., < 10) items may be assessed using G^2, which is expected to be distributed as a chi-square statistic. However, when the response patterns in the data contain a large number of zero cells, G^2 no longer conforms to a chi-square distribution, and there is no convenient alternative available that is analogous to the scaled chi-square statistic in EQS.[4] Instead, the adequacy-of-fit of the model turns to a residuals analysis, in which the standardized root mean square posterior residuals (RMSPR) for each item are examined (Mislevy & Bock, 1990). These values provide overall information on whether the responses predicted by the model at different points along the latent trait differ significantly from the observed values. The RMSPR for each of the items for the women and the men are presented in Table 2. Clearly, the item fit for the women is generally quite good, but the item fit for the men is generally quite poor. This finding is consistent with the results of the factor analysis, and suggests that this version of the CTS violence scale demonstrates an adequate empirical fit for a unidimensional model for the women, but not for the men.

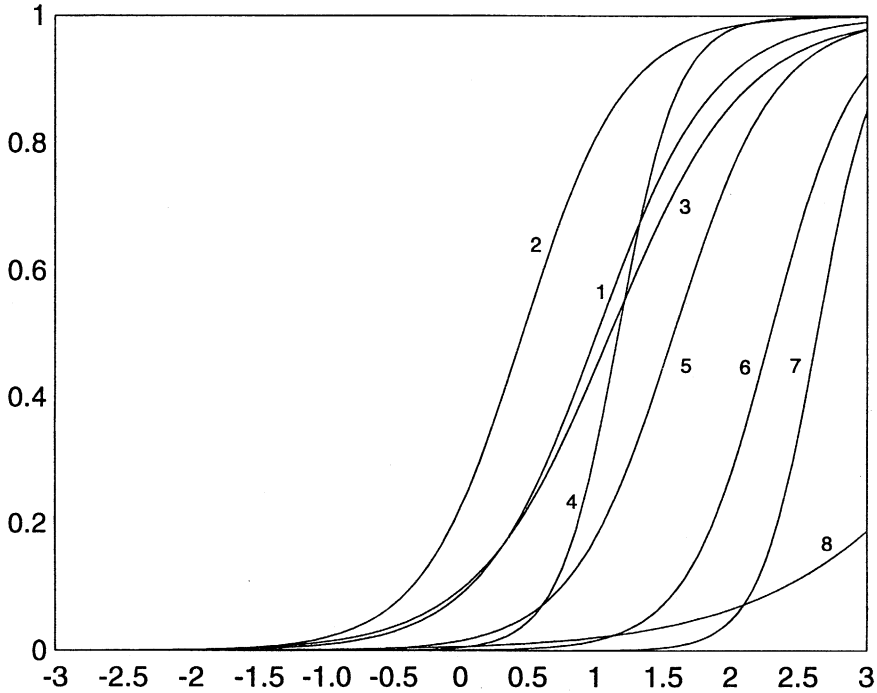

Figure 2: Two-Parameter Item Characteristic Curves for the Eight Violence Items for the Women

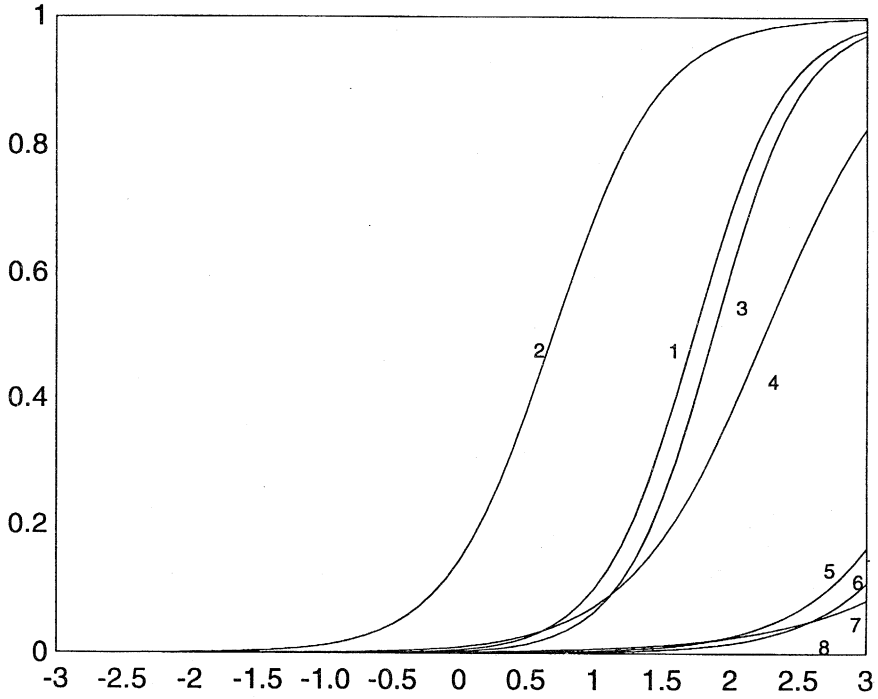

Figure 3: Two-Parameter Item Characteristic Curves for the Eight Violence Items for the Men

TABLE 2: Standardized Root Mean Square Posterior Residuals from the IRT Analyses of the Eight Violence Items for the Women and the Men

Items	*Women*	*Men*
1	1.01	6.67
2	.87	1.09
3	.63	.35
4	.76	.20
5	.99	13.58
6	1.64	12.56
7	1.41	9.69
8	1.57	41.30

Visual inspection of Figure 2 and Figure 3 suggests that the CTS violence items are only related with higher levels of violence. This may indicate that items representing less severe forms of spousal violence are missing from the model. This interpretation is speculative, however, as the relative position of the items to the trait is sample dependent.

SUMMARY

Unless an appropriate measurement model is specified for a given construct, the results of analyses that use purported measures of the construct must be approached with a higher degree of uncertainty than usual. These notes have reviewed some of the relevant aspects to be considered when assessing the adequacy of the CTS for measuring spousal violence. A consideration of the issue of spousal consensus on violence has led to a recommendation on scoring the CTS violence scale by using the highest value reported by either spouse for each item. Although this scoring method is intended to offset possible underreporting bias, alternatives are available and all such methods require careful study to establish the optimal technique in terms of bias reduction. Methods for assessing empirical construct validity for the CTS violence scale were demonstrated. Because these types of analyses rest on the assumption of random sampling (Jöreskog, 1993), the results of the illustrative analyses presented here should be regarded as tentative at best. However, within this context, it is interesting to note that the single factor model for the CTS Form N violence scale fit for the women in the sample, but not for the men.[5] This also raises a separate but related issue: the possibility of differential item functioning by gender for the items on the

CTS violence scale. Men and women may not interpret these items to mean the same thing.

Criticism of the CTS is easy (Straus, 1990a); the solution is difficult. One solution is to develop a new instrument. Under ideal circumstances, a multisite study would be conducted including spousal violence researchers from various disciplines. Optimally, these researchers would arrive at a consensus on a precise theoretical definition of spousal violence (see Bollen, 1989). This could be the most difficult step, but potential theoretical differences might be resolved by formulating the definition as a hierarchical, multidimensional construct. An important component of this stage would be to identify the population that the instrument would be designed to assess. Next, qualitative studies would be conducted with representative samples of the target population along a broad continuum of experience as both aggressors and victims. Subsequent steps would include operationalizing the construct and conducting studies to identify the best mode of operationalization. Finally, a measurement model would be specified, a representative sample administered the instrument, empirical identification of the best set of items would be conducted, and the final instrument would be checked in cross-validation samples. Of course, the instrument would need to evolve over time.

The prevalence (O'Leary et al., 1989) and incidence (Straus & Gelles, 1990) of spousal violence in the United States are a serious health concern, especially for women (e.g., Dobash & Dobash, 1978). To address the issue adequately from a research perspective, the measurement of spousal violence requires further development from the current standard.

APPENDIX

Violence Scale Items Adapted from Straus' Conflict Tactics Scale, Form N

1. Threw something at the other one
2. Pushed, grabbed, or shoved the other one
3. Slapped the other one
4. Kicked, bit, or hit with a fist
5. Hit or tried to hit with something
6. Beat up the other one

Choked the other one.*

7. Threatened with a knife or a gun
8. Used a knife or gun

*This item is used on Form R of the CTS (Straus, 1990), but was not included in the studies on which the analyses in this article are based.

NOTES

1. A caveat that can be borrowed from another field and the work of Leigh and Stall (1993) is that this example and a great deal of work in this area consider spousal violence only at a general frequency level. Thus even if both spouses recall seven violent episodes over the previous year, they may not both be referring to the same seven events.

2. Another statistical approach with a great deal of promise is in the area of multilevel models (for a brief introduction, see Hox, 1994). This methodology has already been successfully applied to the analysis of dyadic data (e.g., Raudenbush, Brennan, & Barnett, 1995).

3. The choice of analyzing the self-to-spouse data is arbitrary, as these analyses are conducted principally for the purpose of demonstrating the technique.

4. It might be possible to use the Monte Carlo sampling approach suggested by Collins, Fidler, Wugalter, and Long (1993) for assessing the goodness-of-fit in latent class models to the present problem, but this approach was not attempted here.

5. It is possible for a model to fit one group and not another, and yet have factorial invariance across the two groups (Byrne, 1994). Multiple group analysis in EQS demonstrated that the models were indeed different for the two groups, as suggested by the lack-of-fit of the model in which the model parameters were constrained to be equal across the two groups ($\chi^2(8) = 470.98$, $p < .00001$). However, this type of analysis in EQS does not allow the scaled chi-square statistic to be used, so that this analysis is based on the assumption of normality in the data, which does not hold.

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