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Factorial Invariance of the Dyadic Adjustment Scale across Gender

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Abstract

The Dyadic Adjustment Scale (Spanier, 1976) is the most widely used inventory of relationship satisfaction in the social sciences, yet the question of whether it is measuring the same concept in men and women has never been addressed. The current study examined the factor structure of the DAS in a sample of 900 currently married couples who participated in the Minnesota Twin Family Study. Confirmatory factor analysis was applied to a second-order factor solution with Spanier's four factors (Consensus, Satisfaction, Cohesion, Affectional Expression) loading on one, higher-order factor (Adjustment) to test for measurement invariance across gender. The second-order solution was relatively invariant across gender, even when taking into account the non-independent nature of the data. This suggests that the best conceptualization of the DAS is one of a gender-invariant measure of marital adjustment with four distinct subfactors, and that differences between men and women on any of these constructs can be interpreted by both clinicians and researchers as true mean differences rather than measurement bias.

Keywords

marriage; adjustment; factor; measurement invariance

The Dyadic Adjustment Scale (DAS; Spanier, 1976) is currently the most widely utilized self-report measure of relationship adjustment¹ in the social and behavioral sciences. A 32-item measure developed for married couples or similar dyads, it can be employed in self-report or interview format. Almost 20 years ago, its author noted that it had been used in more than 1,000 studies by that point (Spanier, 1988), and its use has only continued to grow. For example, the DAS often serves as a dependent measure of marital satisfaction (e.g., in marital therapy outcome studies, Christensen, Atkins, Berns, Wheeler, Baucom, & Simpson, 2004; Whisman & Jacobson, 1992) or to classify “distressed” vs. “nondistressed” couples in marital interaction task research (e.g., Crane, Allgood, Larson, & Griffin, 1990; Eddy, Heyman, & Weiss, 1991).

Spanier's (1976) original factor analysis of the DAS identified four subscales, which he advised could each be used independently: Dyadic Consensus, Dyadic Satisfaction, Dyadic Cohesion, and Affectional Expression. To date, research generally supports the internal consistency of three of these factors, with the exception of Affectional Expression (Graham, Liu, & Jeziorski, 2006). However, as others have noted, the DAS remains an under-researched instrument

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¹The terms relationship satisfaction, quality, adjustment, happiness, consensus, intimacy, etc. are often used interchangeably in the marriage and romantic relationship literature. In this paper, we will use the term adjustment to refer to an overall measure of current relationship functioning and success, including each spouse's satisfaction and dissatisfaction with their partner.

psychometrically (Sabourin, Lussier, Laplante, & Wright, 1990; Sabourin, Valois, & Lussier, 2005). The factor structure of the DAS has been examined in only 12 studies over the past 30 years. Further, in every study that included both men and women, data were analyzed separately by gender; none has specifically examined whether the factor structure of the DAS is invariant across gender. Using an extension of confirmatory factor analysis to test for measurement invariance is an important step to take before concluding that an inventory like the DAS is measuring the same concept in men and women (Floyd & Widaman, 1995). If the DAS is *not* invariant across gender, then dissimilarity between men and women may be due to either true gender differences or bias in the instrument.

Eddy et al. (1991) reviewed the factor analytic studies of the DAS to that point, identifying 10 journal articles that predominantly used exploratory factor modeling. A majority supported Spanier's original solution or a variation thereof. For instance, Spanier and Thompson (1982) confirmed a four-factor solution, but found that the Satisfaction scale lost several of the more "positive" sentiment items and the Affectional Expression scale contained small loadings from several items comprising the other three factors. However, when deviations from Spanier's original solution arise, there is no general consistency across studies. Two studies report a three-factor solution in women, although the factors differ in the mixture of items loading on the factors (Anthill and Cotton, 1982; Sabourin, Bouchard, Wright, Lussier, & Boucher, 1988). Moreover, the authors of one study determined there was poor support for the Consensus scale in a nondistressed sample and the Satisfaction factor in distressed and nondistressed samples (Crane, Busby, & Larson, 1991). Further, studies using both EFA (Kazak, Jarmas, & Snitzer, 1988; Sharpley & Cross, 1982) and CFA (Antill & Cotton, 1982; Spanier & Thompson, 1982) have concluded that the DAS is best interpreted as measuring one general factor of *adjustment*.

Three studies have specifically examined the question of whether the DAS is best conceptualized as a unidimensional measure of relationship quality, or a multidimensional measure of several facets of adjustment. Eddy et al. (1991) tested a series of nested models using one of the largest samples to date—over 1300 men and 1500 women. They compared a model in which Spanier's original four factors loaded on one higher-order factor with a series of increasingly restrictive multidimensional models. All multidimensional models fit the data better than the unidimensional model, and supported the conception of the DAS as a measure of "adjustment", one component of which is satisfaction. These results are comparable to Sabourin et al. (1990), who rejected a one-factor unidimensional model in favor of a higher-order model with a 2nd-order factor overlaying four 1st order factors (with loadings corresponding to Spanier's original solution). Kurdek (1992) also found support for a four-factor model (where all factors were allowed to correlate but there was no higher-order factor) in samples of husbands and wives and homosexual partners; this finding was replicated across three additional time points in the married sample.

Notably, none of the previous factor analyses of the DAS have directly compared factor solutions across gender. Whether the DAS measures the same concept in men and women and can therefore be interpreted in the same manner in both groups is therefore unknown. Establishing measurement invariance is an important part of demonstrating the psychometric adequacy of any measure. It determines whether the same construct is being assessed across different groups, and is an essential prerequisite for the comparison of groups with respect to a latent variable (Meredith, 1993; Widaman & Reise, 1997). The method of examining measurement invariance in a CFA framework is well established at this point (see Vandenberg & Lance, 2000 for a review, see also Lubke, Dolan, Kelderman, & Mellenbergh, 2003; Widaman & Reise, 1997). In this type of analysis, a series of increasingly strict constraints are placed on the model parameters to test the equality of the solution across men and women. Given that the multidimensional, second-order factor model of the DAS has received the

greatest support in the literature, we decided to test whether this model demonstrates measurement invariance between men and women. If invariance is found, then group differences on the DAS total scale and subscale scores would reflect actual differences in marital adjustment between men and women rather than an artifact of measurement bias.

Method

Participants

Our sample consisted of husbands and wives drawn from the families who participated in the Minnesota Twin Family Study (MTFS), a longitudinal, epidemiological study investigating the genetic and environmental contributions to substance abuse and related psychopathology. Same-sex twin pairs reared by their biological parents were identified by Minnesota public birth records, located through the use of public databases, and recruited to visit when the twins were either 11 or 17. Male twins and their parents visited the study for intake assessment from 1990–1994 (11 year old cohort) and 1990–1995 (17 year old cohort), while female twins and their parents attended intake in 1993–1996 (both cohorts). Of those families who were eligible for the study, 17.3% declined participation. Families were excluded from participation if the twins had been adopted, if they had a physical or intellectual disability that precluded completing the daylong, in-person assessment, or if they lived more than a day's drive from Minneapolis. All participants were given an explanation and rationale for the study and written informed assent/consent was obtained. Additional information regarding the recruitment and design of the MTFS can be found elsewhere (Iacono, Carlson, Taylor, Elkins, & McGue, 1999).

The sample for the current study consisted of the biological mothers and fathers of twins from both cohorts who were married to each other and completed the DAS at intake. This excluded any stepparents who completed the DAS regarding their current spouse (i.e., a biological parent). These were generally long-term marriages (i.e., couples had to survive intact until their children reached either 11 or 17 years old). There were a total of 900 married couples who completed the DAS at intake. Participants included in the final analyses consisted of 900 women (aged 28 to 59, $M = 42$, $SD = 5.24$) and 900 men (aged 28 to 66, $M = 44$, $SD = 5.84$). Mean years of education were 14 ($SD = 1.92$) for the wives and 14 ($SD = 2.3$) for the husbands. Consistent with Minnesota demographics for the birth years sampled, 99% of the mothers and fathers were Caucasian.

Dyadic Adjustment Scale

Participants completed the Dyadic Adjustment Scale (DAS; Spanier, 1976) appraising their marital satisfaction over the preceding 12 months. As noted above, the original four subscales of the DAS are: Dyadic Consensus (13 items; degree to which they agree or disagree on a number of issues); Dyadic Satisfaction (10 items; aspects related to perceived stability of the marriage and how fights are handled); Affectional Expression (4 items; assessing degree of agreement on how affection is expressed); and Dyadic Cohesion (5 items; frequency of positive interactions between the couple).

Statistical Analyses

Based on findings from previous studies, we tested the measurement invariance of a multidimensional, second-order model in which Spanier's original four factors (Consensus, Satisfaction, Cohesion, and Affectional Expression) all loaded on one, higher-order factor. Second-order models are applicable in situations, as has been proposed for the DAS, when a higher-order factor is hypothesized to explain the relations among lower-order factors (Chen, Sousa, & West, 2005). The items of the DAS are either Likert-type (e.g., 0–5; 30 items) or Dichotomous (e.g., Yes/No; 2 items), so to handle the non-normal distribution of the DAS

items, Mplus's (Version 5.0, Muthen & Muthen, 2007) weighted least square mean variance estimation method (weighted least square parameter estimates using a diagonal weight matrix and robust standard errors and a mean- and variance-adjusted chi-square test statistic; WLSMV) was used to evaluate the invariance models. Because a small percentage of participants was missing DAS data for individual items (mean per item = .61%, range 0–2.7% for wives; mean per item = .86%, range .1–4.0% for husbands) we used full-information modeling of missing data, a procedure that produces more reliable inferences when compared to other options (e.g. listwise deletion) for missing data (Enders, 2001).

Different authors have articulated their own procedures for conducting tests of measurement invariance in a CFA framework (Vandenberg & Lance, 2000), although the series of steps is similar across studies and there is consistency in how the steps are carried out. We generally followed the outline of Muthen and Muthen (2007) in testing our series of increasingly restrictive models, with some variations to account for special circumstances of measurement invariance of a second-order structure (Byrne & Stewart, 2006; Chen et al., 2005). To account for possible non-independence of the data (i.e., both spouses are reporting on the same marriage), we modeled the data at the couple level (i.e., both husbands and wives were on the same line of data). The factor model for husbands and wives was connected through a correlation between the higher-order latent factors. Specifically, we used the structural equations between the higher-order latent factors to connect the higher-order dimensional CFA model (four lower-order factors, one higher-order factor) obtained for men and women. We then imposed our invariance constraints on top of this baseline model. We began by testing invariance of form, or whether the same items are indicators for the same factor (or factors) across gender (Horn & McArdle, 1992). An equivalent pattern of fixed and free loadings was specified for the items across groups, and the thresholds and factor loadings were left free to vary. In the second step, we tested for invariance of the first-order factor loadings. Third, we added the constraint of invariant factor loadings of the four lower-order factors on the second-order factor. Fourth, the thresholds (owing to the categorical nature of the observed variables) were constrained across husbands and wives. Finally, we tested the mean differences between the latent factors across gender.

To investigate the goodness of fit of the CFA models, we evaluated the chi-square statistic, the comparative fit index (CFI), the Tucker-Lewis Index (TLI), and the root mean square error of approximation (RMSEA). When WLSMV is used, the difference in chi-square values for nested models is not distributed as chi-square, and it is necessary to use the DIFFTEST option of the SAVEDATA command in Mplus to calculate difference in chi-square. If the chi-square difference value ($\Delta\chi^2$) is significant when comparing two nested models, it suggests that the constraints do not hold (i.e., the two models are not equivalent across groups). Because the chi-square difference value can be very sensitive to sample size and non-normality, such that large samples often return statistically significant chi-square values (Cheung & Rensvold, 2002; Hu & Bentler, 1993), other criteria for fit were used. The CFI and TLI compare the hypothesized model with a more restricted, baseline model. In general, CFI and TLI values above .95 are desirable (Hu & Bentler, 1998), although values from .90 to .95 may indicate acceptable model fit (Bentler, 1990). Cheung and Rensvold (2002) also suggested that the change in CFI values between nested models should not exceed .01. The RMSEA is a measure of the error of approximation of the specified model covariance and mean structures to the covariance and mean structures in the population. We adopted the criteria of RMSEA of .08 or below as demonstrating an adequate fit (Browne & Cudeck, 1993).

Results

Means, standard deviations, and reliability estimates of each subscale and total DAS score are presented in Table 1 for both husbands and wives. As shown in this table, on average the

husbands and wives in this study are reporting that they are relatively free of major relationship concerns. This was a largely nondistressed sample, as shown by the fact that 21% of women and 22% of men scored below 100, the cut-off identified by Spanier (1976) to distinguish distressed from nondistressed couples, and 17% of both women and men fell below the cut-off of 97 used by Jacobson et al. (1984). Internal consistency was acceptable, ranging from .72 for the Affectional Expression scale for husbands to .93 for the DAS total score for both husbands and wives.

Factorial Invariance Models

A hierarchical series of nested models was applied to the second-order, four-factor model, with each step building on and keeping the constraints from the previous model². The results of the tests of invariance across gender are shown in Table 2. The first type of invariance tested, form (also known as configural, see Meredith, 1993), holds the fewest number of parameters equal across gender. For invariance of form, the factor structure (i.e., the pattern of fixed and free loadings) was constrained across gender, while the factor loadings were allowed to differ. As shown, the invariance of form model produced adequate fit statistics for the second-order factor model, although CFI values were somewhat lower than accepted guidelines.

The next step tested for factor loading invariance of the first-order factors. This test of invariance provided a good fit, with a non-significant change in chi-square and improvement in RMSEA, CFI, and TLI. In the third step, equality constraints were placed on the higher-order factor loading, while maintaining constraints on the lower-order factor loadings. This model also fit the data well. The fourth step tested invariance of the thresholds linking the observed items to the latent factors. This test of invariance resulted in a significant chi-square test as compared to the previous model. Following modification indices in Mplus, we allowed the thresholds of Item 5, Item 11, and Item 32 to vary across gender. This resulted in improved, but still significant, chi-square difference from Model 3. However, this model still fit well according to RMSEA and TLI; as with Models 2 and 3, CFI was somewhat low but still within the acceptable range, thus we continued to the next stage of invariance testing.

The next step in invariance testing is to test for mean differences in the lower order factors of Consensus, Satisfaction, Cohesion, and Affectional Expression. The means of the four lower-order latent factors for the reference group (here, wives) were set to 0 and freely estimated for husbands. Husbands were significantly lower on the Consensus factor (.10 standard deviations below women; $Z = -2.14$, $p \leq .05$) and the Affectional Expression factor (.13 standard deviations; $Z = -2.66$, $p \leq .01$). Values on the Cohesion and Satisfaction factor were not significantly different for husbands and wives. In the final step, we tested group differences on the higher-order factor of Adjustment. It was necessary to constrain the lower-order factor intercepts to zero for both groups (Byrne & Stewart, 2006). Again, the latent factor mean was set to zero for wives, and the latent mean for husbands was estimated. There was no significant difference between husbands and wives. The higher-order Relationship Adjustment factor was correlated .61 between husbands and wives.

Discussion

This study adds to the literature on the structure of relationship satisfaction as it is measured by the Dyadic Adjustment Scale. Findings from tests of measurement invariance in the context of CFA demonstrated support for factorial invariance across gender. Factor invariance establishes that the latent variables operate in the same manner to produce the same kind of

²For space constraints, the full variance-covariance matrices used for the measurement invariance models are not reported here; however, they are available upon request from the first author.

measurement under different conditions (i.e., gender). This form of measurement invariance is an important test of construct validation. Having established invariance of the DAS across gender, we can conclude that any differences between men and women can be interpreted as arising from actual differences in relationship adjustment, *not* that the instrument is measuring different concepts in the two groups. It appears that Spanier's (1976) original conception of relationship adjustment applies equally well to men and women. Differences found between men and women on this scale most likely represent true gender differences—whether in the effectiveness of marital therapy, or in the relationship to lab-based interaction studies—rather than different constructs being measured by the same instrument.

Results of this study also provide clinicians with greater information about an assessment instrument that can and should be put to greater use in applied settings. In general, a majority of marital and family therapists tend *not* to utilize standardized assessment measures in their practices (Boughner, Hayes, Bubenzer, & West, 1994; Chun, Cobb, & French, 1975). The reasons for this underutilization of measures is unclear; the sheer number of available instruments may be overwhelming (Touliatos, Perlmutter, Straus, & Holden, 2001). Other possible reasons include time constraints, unfamiliarity with scoring, or uncertainty about applicability to their patient population. The DAS is a relatively brief measure that can be found in major sourcebooks of family assessment instruments (e.g., Touliatos et al., 2001). And as shown in the current study, practitioners can have greater confidence that the DAS will provide clinical utility equally well for men and women. The level of invariance found for the DAS increases the confidence that when mean differences are found between men and women, they represent true gender differences. Certainly, we realize that this sample was relatively high in relationship satisfaction, and these findings should be replicated in clinical samples of distressed couples. In choosing a self-report inventory for couple assessment, therapists need to be able to rely on the fact that the measure they choose can be interpreted across both members of the couple. The findings of the current study offer preliminary support for the DAS as such a measure.

This study has certain limitations that should be addressed. First, the CFI values of the best fitting measurement invariance models were lower than what some (Hu & Bentler, 1998) have recommended as a cutoff (i.e., .95), although CFI did improve with increasing restrictions, reaching .93 for the best fitting models in Table 2. Research suggests that the CFI generally tends to worsen as the number of variables in the model increases (Kenny & McCoach, 2003), and there were 64 observed variables in these measurement invariance models. Further, other fit indices (RMSEA, TLI) showed good fit and invariance across men and women with increasingly strict parameter constraints. Clearly, additional work needs to be done to investigate how various fit indexes perform in different situations; in particular, which fit indexes are most appropriate for measurement invariance of second-order models (Chen et al., 2005). Second, the sample was primarily Caucasian and fairly homogenous in terms of education level. Both culture and education may affect an individual's interpretation of the DAS items, and thus our results should be replicated in more ethnically and socio-economically diverse samples. Moreover, while a majority of our sample was between the ages of 30–45 (65%), the range of the total sample was quite large. While previous work has found that age did not affect the stability of the DAS (Carey, Spector, Lantinga, & Krauss, 1993), to our knowledge there has been no work investigating the measurement invariance of the DAS across age. This is a good area for potential future research.

Our study provides valuable information regarding the concept of satisfaction across gender as measured by the DAS. To our knowledge, this is the first study to examine factorial invariance between men and women on the DAS, one of the few studies to examine gender differences, and one of only a handful of confirmatory factor analytic studies of this measure. Other areas of inquiry for research include applying the measurement invariance procedures

utilized here in the comparison between married and dating samples, across different age ranges, or between romantic partners from different races, ethnic groups, or countries. In confirming that the instrument is measuring the same concept (relationship adjustment) in men and women, we provide continued support for the use of this measure in research and clinical settings.

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Figure 1. Path diagram of the gender invariance model with correlated higher-order factors between husbands and wives.

Table 1**DAS Descriptive Statistics and Internal Consistency by Gender**

	M	SD	Range	α
DAS Total				
Women	109.75	16.23	12–146	.93
Men	108.72	14.81	32–144	.93
Total	109.24	15.54	12–146	.93
Cohesion				
Women	14.72	3.75	2–24	.81
Men	14.53	3.52	3–24	.79
Total	14.62	3.64	2–24	.80
Consensus				
Women	48.49	6.79	2–65	.87
Men	47.75	6.38	13–64	.87
Total	48.12	6.60	2–65	.87
Satisfaction				
Women	38.13	6.18	4–50	.88
Men	38.21	5.84	7–50	.86
Total	38.17	6.01	4–50	.87
Affectional Expression				
Women	8.51	2.27	0–12	.75
Men	8.31	2.14	0–12	.72
Total	8.41	2.21	0–12	.74

Note. N=900 couples. α = Cronbach's α .

Table 2

Results of Measurement Invariance Tests for the Second-order Model of the Dyadic Adjustment Scale across Gender

Tests of Measurement Invariance Across Gender	Overall Fit Indices					Comparative Fit Indices				
	χ^2	df	RMSEA	CFI	TLI	Model Comparison	$\Delta\chi^2$	Δdf	p	ΔCFI
1 Baseline model	1377.10	347	0.06	0.89	0.97					
2 Invariance of first-order factor loadings	1142.03	313	0.05	0.91	0.98	2 vs 1	24.68	24	0.42	-0.02
3 Invariance of first- and second-order factor loadings	1079.56	298	0.05	0.91	0.98	3 vs 2	7.53	3	0.06	0.00
4a Invariance of thresholds	1107.55	308	0.05	0.91	0.98	4a vs 3	201.04	62	0.00	0.00
4b Invariance of thresholds ^a	1095.00	307	0.05	0.91	0.98	4b vs 3	161.89	59	0.00	0.00
5 Lower order factors mean difference	918.66	256	0.05	0.93	0.98	5 vs 4b	7.26	1	0.01	-0.02
6 Higher order factor mean difference	920.87	256	0.05	0.93	0.98	6 vs 5	18.45	3	0.00	0.00

Note. N=900 couples. At each step in the sequence of invariance tests, all earlier constraints remain in place. Chi-square difference testing for nested models was done via the difference test implemented in Mplus. χ^2 = chi-square fit statistic with robust standard errors; df = degrees of freedom; RMSEA = root mean square error of approximation; CFI=comparative fit index; TLI=Tucker-Lewis index.

^aThe thresholds of Items 5, 11, and 32 were estimated to be unequal across gender.