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# Examining the Origins of Gender Differences in Marital Quality: A Behavior Genetic Analysis

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Numerous researchers have examined gender differences in marital quality, with mixed results. In this study, the authors further this investigation by looking for genetic and environmental sources of variation in marital quality. The 1st aim of the study was to replicate previous findings of genetic and nonshared environmental influences on marital quality. The 2nd was to explore the etiology of gender differences in marital quality. The Virginia Adult Twin Study of Psychiatric and Substance Use Disorders sample of twin men and twin women was used. Genetic and nonshared environmental factors were again found to influence marital quality. Findings also suggest small differences between men and women in the levels of genetic and environmental influence on variance in marital quality. The men's reports of marital warmth and conflict were influenced by the same genetic factors, but women's reports of marital warmth and conflict were influenced by different genetic factors. Results are discussed in the context of previous research on social support and implications for future studies of the etiology of marital quality.

*Keywords:* marital quality, gender differences, genetics, nonshared environment

Important questions in family research have been whether men and women experience similar levels of marital quality and whether the same factors contribute to men's and women's marital quality. Thus far, the literature is mixed on both accounts. In this study, we address these issues through a genetically informative design examining the underlying genetic and environmental influences on levels of and factors contributing to marital quality of men and women.

Previous genetically informed research has found that individual differences in various aspects of social support in general, and marriage in particular, are partially due to genetic differences between these individuals. For example, marital status (Johnson, McGue, Krueger, & Bouchard, 2004) and divorce (McGue & Lykken, 1992) are modestly genetically influenced ($h^2$ = .68, .52, respectively). Modest genetic influences were found for women's reports of marital quality ($h^2$ = .22–.34), with nonshared environmental influences accounting for most of the individual differences observed (Spotts, Neiderhiser, Towers, et al., 2004). Because Spotts, Neiderhiser, Towers, et al. (2004) included female twins only, its authors were unable to address any questions regarding gender differences in marital quality, as we are able to do in the current study.

Relevant to this discussion are genetically informed studies of social support, as spouses are a primary source of social support for one another (Beach, Martin, Blum, & Roman, 1993). Perceived adequacy of support, a subjective measure, is strongly influenced by genetic factors, whereas the quantity of supportive relationships, a more objective measure, is influenced entirely by environmental factors (Bergeman, Plomin, Pedersen, McClearn, & Nesselroade, 1990). A previous study that used the same sample used in the current report examined several types of social support: support from relatives and from friends, problems with relatives and with friends, social integration, and confidants (Kendler, 1997). Kendler (1997) found genetic and nonshared environmental influences for all types of support, and in most cases genetic influences accounted for more of the variance than did nonshared environmental influences. Support and problems from relatives were also influenced by shared environmental factors, most likely because the twins have the same relatives (Kendler, 1997). It should be noted that this model corrected for measurement error, so it may not be strictly comparable with other reports using single assessments. In a subsequent report based on an expanded sample from the same twin registry, Agrawal, Jacobson, Prescott, and Kendler (2002) searched for genetic and en-

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vironmental sources of gender differences in social support. They used the same aspects of social support used in the first study, but they found no evidence for qualitative differences in the source of variance by gender for any of the six types of social support. They found some evidence for quantitative differences in the sources of genetic and environmental variance on relative support and confidants, but overall it appears that men's and women's perceptions of social support are similarly influenced by genetic and environmental factors

In this study, we do what other genetically informed studies of marriage have been unable to do, namely examine the possibility of different genetic and environmental influences on marital quality for men and women. The results of phenotypic studies have been unclear as to whether there are meaningful gender differences in levels of marital quality. Several large studies have found at least some differences in marital quality, typically with women having lower levels of self-reported marital quality than did men (Fowers, 1991; Rhyne, 1981; Whisman, Uebelacker, & Weinstock, 2004). Other studies have found an overall absence of gender differences in marital quality (Lauer, Lauer, & Kerr, 1990; Stanley, Markman, & Whitton, 2002). Gender differences that are found may be related differences in how men and women perceive conflicts that begin before marriage (Lloyd, 1987). Men and women may also consider different factors when reporting on their marital quality, although they seem to consider most factors similarly (Rhyne, 1981).

Differences might be attributable to cardiovascular, endocrine, and immune functions (Robles & Kiecolt-Glaser, 2003), among other physiological responses that are linked with marital interaction. Whereas men may show larger physiological responses to acute stress (e.g., Earle, Linden, & Weinberg, 1999), women seem to be more susceptible to the long-term stressors of marital discord and to experience more persistent physiological effects of negative marital interactions than do men (Kiecolt-Glaser & Newton, 2001). This effect is particularly apparent in links between marriage and health, in which marriage typically is more beneficial to men's health than to women's health across many domains, such as arthritis, self-rated health, and depression (see Kiecolt-Glaser & Newton, 2001, for an extensive review). Not all physiological effects are sex-biased, however. For example, endocrine levels of both newlywed spouses predicted marital satisfaction or dissolution 10 years later (Kiecolt-Glaser, Bane, Glaser, & Malarkey, 2003).

In sum, it is difficult to put forth expectations regarding how genetic and environmental factors might influence men's and women's marital quality. Because of the uncertainty of the literature, it is unclear whether we should expect gender differences in individual variation in genetic influences on marital quality. Differences that have been found between husbands' and wives' marital quality are often attributed to differences in socialization of men and women. When looking at sources of marital quality (e.g., love, help at home, sexual gratification), differences in overall marital quality most often seem to result from differences in levels of satisfaction, rather than from differences in the causes and sources of satisfaction (Rhyne, 1981). However, there do seem to be qualitative differences between men and women on some sources of marital quality, such as friendship, interest, and time spent with children, in that these aspects of relationships are more important for women than for men (Rhyne, 1981). Differences in hormonal and endocrine responses also suggest (but do not necessitate) the possibility of different genetically influenced pathways to marital quality (e.g., Kiecolt-Glaser et al., 2003). In this study, we first test whether genetic and environmental influences contribute differentially to men's and women's marital satisfaction in terms of the magnitude of influence (i.e., quantitative differences). Then we test whether the sources of genetic and environmental variance are the same for men and women (i.e., qualitative differences). Finding qualitative differences, quantitative differences, or both in the sources of environmental variance would be consistent with the socialization hypotheses. In other words, different environmental exposures result in different characterizations of marriage for men and women. Qualitative or quantitative differences in sources of genetic variance would indicate inherent differences between men and women that differentially affect their perceptions of their marriage. To further clarify the role of genetic and environmental influences on marital quality, we also examine the extent to which genetic and environmental influences for warmth overlap with those influencing conflict.

## Method

### *Subjects*

The twin pairs were a part of the Virginia Adult Twin Study of Psychiatric and Substance Use Disorders. The sample was drawn from the population-based Virginia Twin Registry, formed from systematic review of all birth certificates in the Commonwealth of Virginia. More information on the sample can be found elsewhere (e.g., Kendler, Neale, Kessler, Heath, & Eaves, 1992a). The Virginia Twin Registry now constitutes part of the Mid-Atlantic Twin Registry. The Virginia Adult Twin Study of Psychiatric and Substance Use Disorders was approved by the Virginia Commonwealth University Institutional Review Board. Signed informed or verbal consent was obtained, respectively, prior to all face-to-face and telephone interviews.

Data for this report were obtained during interviews conducted as part of two longitudinal twin studies. The male–male (MM) and male–female (MF) pairs were drawn from a sample of male and opposite-sex pairs (Kendler & Prescott, 1999). The female–female (FF) pairs were taken from a female data set (Kendler, Neale, Kessler, Heath, & Eaves, 1992b; Kendler & Prescott, 1999). Analyses were limited to pairs in which both twins were either married or cohabiting with a significant other. Twin pairs concordant for being separated, divorced, widowed, or never married made up 15% of those excluded, and twin pairs discordant for marital status comprised the remaining 85%. No zygosity or gender differences in marital status were found for those excluded. This resulted in 794 female pairs (446 monozygotic [MZ], 348 dizygotic [DZ]), 549 male pairs (328 MZ, 221 DZ), and 445 opposite-sex pairs.

All twins were sorted by zygosity and sex into MZ and DZ male and female groups. The zygosity of the twins was determined by a computer algorithm for responses to questions relating to their physical similarities and how often people confused them when they were children. The zygosity algorithm was verified in a subset of pairs by analysis of DNA markers (Kendler & Prescott, 1999). Questionable cases were resolved by using photographs and, when available, DNA testing. The average age for the sample at the time of assessment was 35.6 years ($SD$ = 8.5), and the average years of education were 13.4 ($SD$ = 2.3).

### *Measures*

The measure of marital quality was an eight-item scale used in the National Comorbidity Study (Zlotnick, Kohn, Keitner, & Della Grotta, 2000). Information on reliability has been reported previously (Zlotnick et al., 2000). The 5-point Likert-type scale ranges from *a great deal* to *not at all*, and possible scores for each scale range from 0 to 20. The items were positively skewed, so the distribution was normalized using a PROC RANK procedure (Eaves et al., 1997). Then, a principal-component factor analysis using a promax rotation was conducted. One item differed between the questionnaires given to the FF and those given to the MM and MF twins, so the factor analysis was conducted separately for the two samples, resulting in two clear factors that did not differ by gender. For each sample the differing item loaded primarily on the Conflict factor. Items on the perceived Warmth factor were "How much does s/he make you feel loved & cared for?" "How much is s/he willing to listen when you need to talk about your worries or problems?" "How much can you depend on him/her to be there when you really need him/her?" and "How much can you open up to him/her about things that are really important to you?" Items on the perceived Conflict factor were "How much do you feel s/he makes too many demands on you?" "How much is s/he critical of you or what you do?" "How much tension is there between you and your husband/wife?" and "How much do you give into his wishes more than he gives into yours" (FF) or "How often did you & your husband/wife have unpleasant disagreements or conflicts?" (MM/MF). For brevity, we refer to the factors as Warmth and Conflict. Warmth and Conflict correlated −.44 for the FF twins and −.45 for the MM and MF twins. Each subject received two factor scores based on these factor loadings.

Estimates of genetic and environmental influences on each measure were obtained via maximum-likelihood model-fitting analysis using the program Mx (Neale, 1997). Model-fitting analysis allows for simultaneous multiple comparisons and expectations, as well as for the testing of alternative models (Eaves, Last, Young, & Martin, 1989; Jinks & Fulker, 1970).

In this case, we used sex-limitation models to provide information on quantitative differences in the magnitude of genetic and environmental influences on marital quality for men and for women, as well as to inform us about qualitative differences in genetic and environmental influences on men's and women's reports of marital quality. More information on these models can be found elsewhere (Neale & Cardon, 1992). To examine whether the magnitude of the estimates of genetic and environmental influences was the same for men and women, we compared the fit of the model that constrained the estimates to be equal for men and women to the fit of a model in which the estimates were allowed to vary. To examine the extent to which the same genetic factors influence men and women, we compared the fits of two additional models: one in which the correlation between male and female genetic influences was constrained to 1.0 (the value representing no difference) and a second model in which this correlation was allowed to vary. The Akaike information criterion (AIC) was used as a goodness-of-fit index (Tanaka, 1993) to compare the fits of the alternative models (a negative AIC indicates a good fit). The AIC addresses issues related to the use of chi-square tests by penalizing highly parameterized models relative to simpler models and thereby encouraging the researcher to pick the simplest from a range of alternative models (Tanaka, 1993).

## Results

Preliminary descriptive analyses indicate that the range of variability in marital quality did not differ depending on the gender of the reporter, what type of twin they were, or whether they were included in the analyses. We conducted $t$ tests on the Warmth and Conflict scales to see whether there were gender differences. Significant differences were found by gender for the Warmth ($p < .0001$) and Conflict ($p < .001$) scales, indicating that women reported higher Warmth (mean factor score = .18, $SD$ = .98) and Conflict ($M$ = .11, $SD$ = .98) in their marriages than did men ($M$ = −.13, $SD$ = .95, and $M$ = .02, $SD$ = .96, for Warmth and Conflict, respectively). The effect sizes for the differences were small ($r$ = .16 for Warmth, $r$ = .05 for Conflict); however, it should be noted that these small effects have no bearing on further analyses because there could still be gender differences in genetic and environmental influences on marital quality, even if there are few to no gender differences in the mean levels.

Intraclass correlations and cross-sibling correlations are reported in Table 1. The first two columns (Warmth, Conflict) are the correlations of Twin 1 on Measure 1 with Twin 2 on Measure 1. The third column (Warmth–Conflict) is the correlation of Twin 1 on Measure 1 with Twin 2 on Measure 2. These correlations provide a rough idea of the genetic and environmental influences on individual measures and on the covariance between the measures, respectively. In this case, the correlations suggest modest genetic influences, substan-

Table 1
*Intraclass and Cross-Sibling Correlations for Warmth, Conflict, and the Overlap Between the Two*

| | Warmth | | Conflict | | Warmth–Conflict | |
|---|---|---|---|---|---|---|
| Zygosity | *r* | CI | *r* | CI | *r* | CI |
| Female MZ | .20 | .10, .30 | .13 | .01, .22 | .25 | .15, .35 |
| Female DZ | .12 | .00, .24 | −.02 | −.14, .10 | .25 | .13, .36 |
| Male MZ | .15 | .06, .23 | .20 | .12, .28 | .16 | .08, .24 |
| Male DZ | .01 | −.09, .11 | .05 | −.05, .15 | −.04 | −14, .06 |
| Opposite-sex | .12 | .05, .19 | .10 | .03, .17 | .05 | −.02, .12 |

*Note.* CI = 95% confidence interval; MZ = monozygotic; DZ = dizygotic.

tial nonshared environmental influences, and few shared environmental influences.

### *Warmth*

The results of the sex-limitation models for the Warmth factor are reported in Table 2. For this and subsequent tables, the columns labeled A, C, and E contain the estimates for the genetic, shared environmental, and nonshared environmental parameters, respectively. The results from full models, which were used for comparison purposes, are reported in the first row. In the best-fitting model, in the third row, the genetic correlation was fixed at .50, meaning that the same genetic influences operate for men and women, and shared environmental influences were set to zero. This model provided a better fit than did the model equating the magnitude of genetic influences for men and women, $\chi^2(11, N = 2340) = 17.68$, $p = .13$, AIC = −6.32. In the final model, there was slightly more genetic influence on warmth in marriage and a corresponding smaller amount of nonshared environmental influences for women than for men.

The last row of Table 2 shows estimates adjusted for reliability. A small subset (180 female twins) of the sample was assessed for test–retest reliability. The women were chosen at random from the full sample and were reinterviewed, on average, 30.4 days after the initial assessment. The reliability for Warmth was relatively high ($r = .67$ and $r = .73$ for men and women, respectively). Using this information and assuming that genetic variance does not contribute to the unreliable part of the score, we adjusted estimates accordingly. For men's Warmth, 33% (1.00 − .67) of the total variance is assumed unreliable. The remaining variance is thus .15 genetic and .52 reliable nonshared environment. The heritable part of the reliable variance is expressed as .15/(.15 + .52), or .22. The results presented in the Table 2 are standardized so that they sum to unity. The estimates for women's Warmth were calculated in the same way.

### *Conflict*

The results for the Conflict factor are reported in Table 3. The full models are shown in the first two lines as points of comparison. The best-fitting model resembles the best-fitting model for Warmth, in which the genetic correlation was fixed at .50 and all shared environmental influences were set to zero. Again, a model that equated the magnitude of genetic and environmental influences for men and women did not provide a better fit, $\chi^2(11, N = 2340) = 12.55$, $p = .40$, AIC = −11.44. Men showed slightly greater amounts of genetic influences on Conflict than did women, the reverse of the results for Warmth.

The last row of Table 3 reflects estimates from the best-fitting model adjusted for reliability and then standardized to sum to unity. The reliability was higher for Conflict than for Warmth ($r = .78$ and $r = .86$ for men and women, respectively).

Table 2
*Genetic and Environmental Influences on Men's and Women's Marital Warmth*

| | | | | | Men | | | Women | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $\chi^2$ (*df*) | AIC | $r_G$ | $r_C$ | A | C | E | A | C | E |
| Full model $r_G$ | 12.06 (8) | −3.94 | .50 (.32, .50) | =1.00 | .16 (.07, .23) | .00 (.00, .06) | .85 (.77, .91) | .23 (.10, .31) | .00 (.00, .11) | .77 (.69, .86) |
| Full model $r_C$ | 13.99 (8) | −2.01 | =.50 | 1.00 (.59, 1.0) | .04 (.00, .15) | .09 (.02, .17) | .88 (.80, .94) | .03 (.00, .20) | .15 (.04, .24) | .82 (.72, .90) |
| Best-fitting model | 12.06 (10) | −7.94 | .50 | −1.00 | .15 (.09, .23) | =.00 | .85 (.77, .91) | .23 (.14, .31) | =.00 | .77 (.69, .86) |
| Adjusted estimates[a] | | | | | .22 | | .78 | .32 | | .68 |

*Note.* 95% confidence intervals for $r_G$, $r_C$, A, C, and E columns are in parentheses. $N = 2{,}340$ for all analyses. In the $r_G$ and $r_C$ columns, an equals sign in front of an entry indicates that the parameters were fixed to that value. AIC = Akaike's information criterion; $r_G$ = genetic correlation; $r_C$ = shared environmental correlation; A = genetic estimate; C = shared environmental estimate; E = nonshared environmental estimate.
[a] Adjusted estimates are the estimates for the best-fitting model adjusted for reliability and then standardized.

Table 3
*Genetic and Environmental Influences on Men's and Women's Marital Conflict*

| | $\chi^2$ (*df*) | AIC | $r_G$ | $r_C$ | Men A | Men C | Men E | Women A | Women C | Women E |
|---|---|---|---|---|---|---|---|---|---|---|
| Full model $r_G$ | 7.18 (8) | −8.82 | .50 (.20, .50) | =1.00 | .20 (.08, .27) | .00 (.00, .09) | .80 (.73, .88) | .12 (.03, .20) | .00 (.00, .07) | .88 (.80, .96) |
| Full model $r_C$ | 10.60 (8) | −5.40 | =.50 | 1.00 (.41, 1.0) | .11 (.00, .23) | .07 (.00, .19) | .82 (.74, .90) | .01 (.00, .15) | .07 (.00, .15) | .92 (.82, .98) |
| Best-fitting model | 7.18 (10) | −12.82 | .50 | =1.00 | .20 (.12, .27) | =.00 | .80 (.73, .88) | .12 (.04, .20) | =.00 | .88 (.80, .96) |
| Adjusted estimates[a] | | | | | .26 | | .74 | .14 | | .86 |

*Note.* 95% confidence intervals for $r_G$, $r_C$, A, C, and E columns are in parentheses. $N = 2{,}340$ for all analyses. In the $r_G$ and $r_C$ columns, an equals sign in front of an entry indicates that the parameters were fixed to that value. AIC = Akaike's information criterion; $r_G$ = genetic correlation; $r_C$ = shared environmental correlation; A = genetic estimate; C = shared environmental estimate; E = nonshared environmental estimate.
[a] Adjusted estimates are the estimates for the best-fitting model adjusted for reliability and then standardized.

### *Overlap*

Marital warmth and conflict are not independent constructs; in this sample they correlated −.43 for men and −.51 for women. To paint a clearer picture of the genetic and environmental influences on marital quality, we examined the extent to which the same genetic and environmental factors influenced marital warmth and low conflict. For these analyses, we examined separately data from men and women.

The best-fitting model (Table 4) indicates that the genetic influences on women's marital conflict were not the same as the genetic influences on warmth, as indicated by the uniqueness of all genetic influences on conflict. The entire covariance between Warmth and Conflict could be explained by common nonshared environmental factors. This finding was strengthened when we found no decrement in fit by dropping the common genetic factor from the model, $\chi^2(13, N = 2340) = 11.64$, $p = .56$. In other words, the nongenetic factors that make twin sisters different in their perceptions of marital warmth are the same factors that make the sisters different in their perceptions of marital conflict.

The picture was slightly different for male twins, as seen in Table 5. The genetic contribution to the overlap between Warmth and Conflict is obtained by multiplying the two paths together ($.32 \times .42 = .13$); the same is true for the nonshared contribution (.29). Dividing these estimates by the phenotypic correlation of .42 yields the proportion of covariance explained by genetic and nonshared environmental influences (.31 and .69, respectively).

## Discussion

In this study, we examined genetic and environmental influences on marital quality in a sample of male, female, and opposite-sex American twin pairs. Phenotypic sex differences in perceived warmth and conflict were found. Modest genetic and substantial nonshared environmental influences were also found on warmth and conflict, replicating previous findings from a Swedish sample (Spotts, Neiderhiser, Towers, et al., 2004). We extended these findings by exploring by gender the possibility of different sources of genetic and environmental variance for perceptions of marital quality.

We replicated in this American sample previous findings from the Swedish Twin Moms sample that indicated some genetic influences and substantial nonshared environmental influences on marital quality (Spotts, Lichtenstein, et al., 2005; Spotts, Neiderhiser, Towers, et al., 2004). We found modest amounts of genetic influence for both men's and women's reports of warmth and conflict. Nonshared environmental factors explained most of the variance in marital quality for men and for women. These findings suggest that heritable characteristics, possibly personality characteristics (Spotts, Lichtenstein, et al., 2005) or psychopathology (Spotts, Neiderhiser, Ganiban, et al., 2004), contribute either directly to the quality of marriage or to how the marriage is perceived. In addition to including measurement

Table 4
*Genetic and Environmental Influences on Association Between Women's Marital Warmth and Conflict*

| | Common to Warmth and Conflict | | | Specific to Conflict | | |
|---|---|---|---|---|---|---|
| Factor | A | C | E | A | C | E |
| | | | Full model[a] | | | |
| Warmth | .00 (.00, .58) | .40 (.00, .49) | .91 (.81, .96) | | | |
| Conflict | .32 (.00, .44) | .07 (.00, .21) | .45 (.35, .51) | .00 (.00, .46) | .00 (.00, .36) | .83 (.78, .90) |
| | | | Best-fitting model[b] | | | |
| Warmth | .44 (.33, .53) | — | .90 (.85, .94) | | | |
| Conflict | — | — | .48 (.43, .54) | .28 (.00, .40) | — | .83 (.78, .88) |

*Note.* 95% confidence intervals for A, C, and E columns are in parentheses. Dashes indicate parameters that were dropped from the model. A = genetic estimate; C = shared environmental estimate; E = nonshared environmental estimate.
[a] $\chi^2(11, N = 2{,}340) = 11.64$; Akaike information criterion = −10.36. [b] $\chi^2(15, N = 2{,}340) = 9.83$; Akaike information criterion = −20.17.

error and short-term effects, the nonshared environmental influences consist of enduring factors that make each twin different. Other researchers from the Twin Moms project have made a strong case for the influence of spouses explaining a majority of the nonshared environmental variance in marital quality (Spotts, Neiderhiser, Ganiban, et al., 2004; Spotts, Pedersen, et al., 2005; Towers, 2003). Considering that the spouses of MZ twins are not very similar to each other (Lykken & Tellegen, 1993), spouses are likely to be a large source of differential experience for the twins.

Because we were able to evaluate the reliability of the marital composites, we can be fairly certain that a substantial portion of the nonshared environmental factors influencing marital quality results from factors other than measurement error and short-term fluctuations. Adjusting for reliability also shows that genetic factors may be more important for marital quality than initially thought and emphasizes the importance of accounting for error variance in future investigations of interpersonal relationships.

Phenotypic research has been mixed as to gender differences in marital quality. Evidence for differences ranges from marital satisfaction in general (Kiecolt-Glaser & Newton, 2001; Rhyne, 1981; Schumm, Resnick, Bollman, & Jurich, 1998) to specific aspects of the marital relations, such as interaction patterns (Carrere & Gottman, 1999; Gottman, Coan, Carrere, & Swanson, 1998) and the importance of relationships (Kiecolt-Glaser & Newton, 2001). Many theories address these differences, but to date, no one has examined the possibility of underlying differences in the sources of genetic and environmental variance as an explanation for phenotypic sex differences. The best-fitting model for both marital warmth and conflict shows that the same genetic influences operate for men and women and allows for quantitative differences in genetic and environmental influences between the genders, lending support to previous research suggesting that any differences that exist between men and women are of degree (quantitative) rather than of kind (qualitative; Rhyne, 1981).

It is intriguing that, to the extent that there were differences, these differences fell along gender-congruent lines; women showed higher heritabilities for warmth, whereas men showed higher heritabilities for conflict. Too much should not be made of this until the findings are replicated. However, one possible explanation is that women, for example, are socialized to be warm and relationship-oriented, which reduces environmental variation in their perceived

Table 5
*Genetic and Environmental Influences on Association Between Men's Marital Warmth and Conflict*

| | Common to Warmth and Conflict | | | Specific to Conflict | | |
|---|---|---|---|---|---|---|
| Factor | A | C | E | A | C | E |
| | | | Full model[a] | | | |
| Warmth | .37 (.06, .47) | .00 (.00, .36) | .93 (.88, .98) | | | |
| Conflict | .33 (.07, .48) | .26 (.00, .41) | .34 (.26, .41) | .00 (.00, .41) | .00 (.00, .38) | .84 (.79, .89) |
| | | | Best-fitting model[b] | | | |
| Warmth | .32 (.16, .45) | — | .95 (.90, .99) | | | |
| Conflict | .42 (.28, .52) | — | .31 (.24, .38) | — | — | .85 (.80, .90) |

*Note.* 95% confidence intervals for A, C, and E columns are in parentheses. Dashes indicate parameters that were dropped from the model. A = genetic estimate; C = shared environmental estimate; E = nonshared environmental estimate.
[a] $\chi^2(11, N = 2{,}340) = 21.40$; Akaike information criterion = −0.60. [b] $\chi^2(15, N = 2{,}340) = 23.89$; Akaike information criterion = −6.11.

warmth, which in turn increases genetic variation and heritabilities. A more detailed explanation of these differences may have to wait for future research that focuses on more specific aspects of marriage. The current study did not use measures as detailed and subtle as those used in other studies that have found evidence for gender differences. For example, social interactions between husband and wife are an important component of marital satisfaction (Carrere & Gottman, 1999; Notarius & Pellegrini, 1987). The measure used in our study does not provide a detailed picture of spousal interactions and was not administered to both spouses. The Swedish study assessed the marital quality of both husband and wife and then, as a crude proxy of marital interaction, examined the overlap of the spouses' perceptions of their marriage (Spotts, Neiderhiser, Towers, et al., 2004). In so doing, Spotts, Neiderhiser, Towers, et al. (2004) discovered the importance of gene–environment correlations. In other words, the results suggest that genetically influenced characteristics of the wife influence her husband's perceptions of their marriage. This could be the result of the husband responding to genetically influenced characteristics of his wife, such as personality characteristics, psychopathology, or relationship behaviors. Studying more nuanced aspects of marriage will better define the role that differences in genetic and environmental variance play in the observed differences between men and women in marriages.

In an additional set of analyses, we examined the extent to which the genetic and environmental sources of variance for marital warmth were the same as those for conflict. For both men and women, nonshared environmental influences could explain most or all of the covariance between the two marital constructs. This indicates that the same nonshared environmental influences that served to make the twins different in their perceptions of marital warmth also made the twins different in their perceptions of marital conflict. An obvious and plausible source of this nonshared environmental influence is the spouses of the twins. Previous research has identified husbands as an important source of nonshared environmental influences for wives (Spotts, Neiderhiser, Ganiban, et al., 2004; Spotts, Neiderhiser, Towers, et al., 2004).

The role that genetic factors played in influencing both warmth and conflict differed for men and women. Genetic factors did not covary for women's perceptions of warmth and conflict. In other words, the genetic influences that affected their perceptions of marital warmth were different from the genetic factors influencing their perceptions of marital conflict. For men, however, all genetic influences on warmth and conflict were shared, with no unique genetic influences. These genetic factors are likely to operate via personality characteristics, as previous research has reported that personality characteristics account for all of the genetic variance in perceived marital quality (Spotts, Lichtenstein, et al., 2005).

Our findings differ somewhat from those from examinations of social support. Social support tends to have higher heritabilities than does marital quality (Bergeman et al., 1990; Kendler, 1997) and virtually no differences in levels of genetic and environmental influences for men and women (Agrawal et al., 2002). The differences could be the result of both the nature of these two types of relationships and how they were assessed. Social support is, to some extent, dependent on the subject eliciting support from others, an action that might be genetically based. Additionally, the assessment of social support is concerned with the broad support network and whether one perceives that it is supportive. On the other hand, questions about marital quality are directed toward a relationship with one specific person, and the subject is asked about how that one specific person interacts with the subject. The nature of these questions seems likely to result in higher amounts of nonshared environmental variance because the twins are reporting on different spouses who are unlikely to be very similar (Lykken & Tellegen, 1993). Genetic factors influence the choice of a mate, but in the long term, nonshared environmental factors (e.g., day-to-day interactions with one's spouse) may play a larger role in overall marital quality.

## Limitations

Several limitations to this study should be acknowledged. The sample is Caucasian, thus limiting the generalizability of these results to other ethnic groups. Additionally, only twins for whom both members of a pair were married or cohabiting with a significant other were used for these analyses. Basing our analyses on only pairs in which both twins were part of stable relationships may have reduced some of the genetic or environmental variation of the sample and affected estimates.

As we discussed above, the measure of marital quality used in this study was very general and did not tap into specific behavioral and emotional details. Future studies using more nuanced measures are necessary to further define these results. Another limitation to these measures is that they are self-reported and thus reflect the individual's perceptions as opposed to an objective assessment of marital quality and interaction. Future studies should consider observational assessments of marriage. Finally, the questionnaires differ by one item between the FF and the MM and MF samples. However, an examination of the means of the items (not reported here) reveals nearly identical results for men and women, and the items loaded very similarly on the Warmth and Conflict factors. These results reassure us that the difference of one item does not have a large impact on our findings.

As with any form of statistical analysis, certain assumptions accompany the use of quantitative genetic models. One such assumption is that environmental effects relevant to marital quality are shared to the same extent by twins from MZ and DZ pairs (i.e., equal environments assumption). This assumption has been tested extensively in at least five different ways, including other studies that have used subjects from the current sample (Hettema, Neale, & Kendler, 1995; Kendler, Neale, Kessler, Heath, & Eaves, 1993, 1994), all of which have supported its tenability (Hettema et al., 1995). Although the effects on marital quality have not been specifically tested, there is no reason to assume that marital quality would be affected differently than are psychiatric, personality, or other constructs.

Another key assumption is assortative, or random, mating. Nonrandom mating results in spouses who are more genetically similar to each other than they would be by chance. This can inflate shared environmental estimates of their offspring, a problem not relevant here. In a cross-sectional study such as the current one, it is not possible to separate the genetic factors that influence the twin's choice of a spouse and the genetic factors that influence the quality of that twin's marriage. In fact, one of the paths from genes to marital quality could be through the choice of a spouse. Longitudinal data will be needed to begin to untangle these entwined genetic and environmental effects.

Finally, quantitative genetic research also assumes that the effects of Genotype × Environment (GE) interactions are negligible. The most common type of GE interaction occurs when the environment is individual-specific; this type of GE interaction is reflected in the nonshared environmental estimate. The less common type, in which the environment is shared, seems irrelevant in a sample of grown twins but would be expressed in the genetic estimate. To support this assumption, previous researchers have shown that there is not likely much of a shared environment for adult twins, at least in the form of contact (Pedersen et al., 1999). If GE interactions were present in this study, they would likely serve to underestimate the genetic effect on marital quality rather than to overestimate it.

Having a better understanding of the etiology of gender differences in marital relationships can only improve treatments of distressed marriages. For example, had different sources of genetic and environmental variation in warmth and conflict for men and women been found, it might have been prudent to think about substantially different courses of treatment for men and women. Additionally, studies of this sort are stepping stones for future studies that will search for more specific gene and environment processes. For example, future researchers might attempt to identify specific sources of nonshared environment that influence marital quality. Future work will also begin to identify specific genes involved in marital quality and how these genes interact with specific environmental factors, allowing researchers to further refine their interventions and treatments.

## References

Agrawal, A., Jacobson, K. C., Prescott, C. A., & Kendler, K. S. (2002). A twin study of sex differences in social support. *Psychological Medicine, 32,* 1155–1164.

Beach, S. R., Martin, J. K., Blum, T. C., & Roman, P. M. (1993). Effects of marital and co-worker relationships on negative affect: Testing the central role of marriage. *The American Journal of Family Therapy, 21,* 313–323.

Bergeman, C. S., Plomin, R., Pedersen, N. L., McClearn, G. E., & Nesselroade, J. R. (1990). Genetic and environmental influences on social support: The Swedish adoption/twin study of aging: SATSA. *Journal of Gerontology: Psychological Science, 45,* 101–106.

Carrere, S., & Gottman, J. M. (1999). Predicting the future of marriages. In E. M. Hetherington (Ed.), *Coping with divorce, single parenting and remarriage: A risk and resiliency perspective* (pp. 3–22). Mahwah, NJ: Erlbaum.

Earle, T. L., Linden, W., & Weinberg, J. (1999). Differential effects of harassment on cardiovascular and salivary cortisol stress reactivity and recovery in women and men. *Journal of Psychosomatic Research, 46,* 125–141.

Eaves, L. J., Last, K. A., Young, P. A., & Martin, N. G. (1989). Model fitting approaches to the analysis of human behavior. *Heredity, 41,* 249–320.

Eaves, L. J., Silberg, J. L., Meyer, J. M., Maes, H. H., Simonoff, E., Pickles, A., et al. (1997). Genetics and developmental psychopathology: 2. The main effects of genes and environment on behavioral problems in the Virginia Twin Study of Adolescent Behavioral Development. *Journal of Child Psychiatry and Psychology and Allied Disciplines, 38,* 965–980.

Fowers, B. J. (1991). His and her marriage: A multivariate study of gender and marital satisfaction. *Sex Roles, 24,* 209–221.

Gottman, J. M., Coan, J., Carrere, S., & Swanson, C. (1998). Predicting marital happiness and stability from newlywed interactions. *Journal of Marriage and the Family, 60,* 5–22.

Hettema, J. M., Neale, M. C., & Kendler, K. S. (1995). Physical similarity and the equal-environment assumption in twin studies of psychiatric disorders. *Behavior Genetics, 25,* 327–335.

Jinks, J. L., & Fulker, D. W. (1970). Comparison of the biometrical, genetical, MAVA, and classical approaches to the analysis of human behavior. *Psychological Bulletin, 73,* 311–349.

Johnson, W., McGue, M., Krueger, R. F., & Bouchard, T. J. (2004). Marriage and personality: A genetic analysis. *Journal of Personality and Social Psychology, 86,* 285–294.

Kendler, K. S. (1997). Social support: A genetic-epidemiologic analysis. *American Journal of Psychiatry, 154,* 1398–1404.

Kendler, K. S., Neale, M. C., Kessler, R. C., Heath, A. C., & Eaves, L. J. (1992a). Major depression and generalized anxiety disorder: Same genes, (partly) different environments? *Archives of General Psychiatry, 49,* 716–722.

Kendler, K. S., Neale, M. C., Kessler, R. C., Heath, A. C., & Eaves, L. J. (1992b). A population-based twin study of major depression in women: The impact of varying definitions of illness. *Archives of General Psychiatry, 49,* 257–266.

Kendler, K. S., Neale, M. C., Kessler, R. C., Heath, A. C., & Eaves, L. J. (1993). A test of the equal environments assumption in twin studies of psychiatric illness. *Behavior Genetics, 23,* 21–27.

Kendler, K. S., Neale, M. C., Kessler, R. C., Heath, A. C., & Eaves, L. J. (1994). Parental treatment and the equal environments assumption in twin studies of psychiatric illness. *Psychological Medicine, 24,* 579–590.

Kendler, K. S., & Prescott, C. A. (1999). A population-based twin study of lifetime major depression in men and women. *Archives of General Psychiatry, 56,* 39–44.

Kiecolt-Glaser, J., Bane, C., Glaser, R., & Malarkey, W. B. (2003). Love, marriage, and divorce: Newlywed's stress hormones foreshadow relationship changes. *Journal of Consulting and Clinical Psychology, 71,* 176–188.

Kiecolt-Glaser, J., & Newton, T. L. (2001). Marriage and health: His and hers. *Psychological Bulletin, 127,* 472–503.

Lauer, R. H., Lauer, J. C., & Kerr, S. T. (1990). The long-term marriage: Perceptions of stability and satisfaction. *International Journal of Aging and Human Development, 31,* 189–195.

Lloyd, S. A. (1987). Conflict in premarital relationships: Differential perceptions of males and females. *Family Process, 36,* 290–294.

Lykken, D. T., & Tellegen, A. (1993). Is human mating adventitious or the result of lawful choice? A twin study of mate selection. *Journal of Personality and Social Psychology, 65,* 56–68.

McGue, M., & Lykken, D. T. (1992). Genetic influence on the risk of divorce. *Psychological Science, 3,* 368–373.

Neale, M. C. (1997). Mx: Statistical modeling (4th ed.) [Computer software]. (Available from the Department of Psychiatry, Medical College of Virginia, Box 126, Richmond, VA 23298)

Neale, M. C., & Cardon, L. R. (1992). *Methodology for genetic studies of twins and families.* Boston: Kluwer Academic.

Notarius, C. I., & Pellegrini, D. S. (1987). Differences between husbands and wives: Implications for understanding marital discord. In K. Hahlweg & M. J. Goldstein (Eds.), *Understanding major mental disorder: The contribution of family interaction research* (pp. 231–249). New York: Family Process Press.

Pedersen, N. L., Spotts, E. L., Cederblad, M., Lichtenstein, P., Hansson, K., Neiderhiser, J. M., et al. (1999, June). *Lack of effect of intrapair contact and aspirations to be similar on twin similarity for personality, marital adjustment, and parenting.* Paper presented at the Behavioral Genetics Association conference, Vancouver, British Columbia, Canada.

Rhyne, D. (1981). Bases of marital satisfaction among men and women. *Journal of Marriage and the Family, 43,* 941–955.

Robles, T. F., & Kiecolt-Glaser, J. K. (2003). The physiology of marriage: Pathways to health. *Physiology and Behavior, 79,* 409–416.

Schumm, W. R., Resnick, G., Bollman, S. R., & Jurich, A. P. (1998). Gender effects and marital satisfaction: A brief report from a sample of dual military couples from the 1992 Department of Defense Worldwide Survey of Members and Spouses. *Psychological Reports, 82,* 161–162.

Spotts, E. L., Lichtenstein, P., Pedersen, N. L., Neiderhiser, J. M., Hansson, K., Cederblad, M., et al. (2005). Personality and marital satisfaction: A behavioral genetic analysis. *European Journal of Personality, 19,* 205–227.

Spotts, E. L., Neiderhiser, J. M., Ganiban, J., Reiss, D., Lichtenstein, P., Hansson, K., et al. (2004). Accounting for depressive symptoms in women: A twin study of associations with interpersonal relationships. *Journal of Affective Disorders, 82,* 101–111.

Spotts, E. L., Neiderhiser, J. M., Towers, H., Hansson, K., Lichtenstein, P., Pedersen, N. L., et al. (2004). Genetic and environmental influences on marital relationships. *Journal of Family Psychology, 18,* 107–119.

Spotts, E. L., Pedersen, N. L., Neiderhiser, J. M., Reiss, D., Lichtenstein, P., Hansson, K., et al. (2005). Genetic effects on women's positive mental health: Do marital relationships and social support matter? *Journal of Family Psychology, 19,* 339–349.

Stanley, S. M., Markman, H. J., & Whitton, S. W. (2002). Communication, conflict, and commitment: Insights on the foundations of relationship success from a national survey. *Family Process, 41,* 659–675.

Tanaka, J. S. (1993). Multifaceted conceptions of fit in structural equation modelling. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 10–39). Thousand Oaks, CA: Sage.

Towers, H. (2003). *Contributions of current family factors and life events to women's adjustment: Nonshared environmental pathways*. Dissertation, Department of Psychology, The George Washington University.

Whisman, M. A., Uebelacker, L. A., & Weinstock, L. M. (2004). Psychopathology and marital satisfaction: The importance of evaluating both partners. *Journal of Consulting and Clinical Psychology, 72,* 830–838.

Zlotnick, C., Kohn, R., Keitner, G., & Della Grotta, S. A. (2000). The relationship between quality of interpersonal relationships and major depressive disorder: Findings from the National Comorbidity Survey. *Journal of Affective Disorders, 59,* 205–215.

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