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A twin study of sex differences in social support

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ABSTRACT

Background. Social support may reduce the risk of psychiatric illness. Though perceived as an environmental measure, genetic factors may influence levels of social support. A relationship between social roles and personality with social support suggests possible sex effects on the sources of individual differences in social support.

Method. We used the responses of MZ and DZ same and opposite sex twins to 16 questions regarding their social life. Six factors – friend support, relative support, friend problem, relative problem, confidants and social integration were used for structural equation modelling. Factor derived scales were analysed for genetic, shared and unique environmental influences. Quantitative and qualitative gender differences were analysed using the software package Mx.

Results. Except for relative support and confidants, no qualitative sex differences were seen. Genetic and individual specific environmental influences accounted for the variance for friend support, friend problems, relative problems and social integration and no quantitative gender differences were seen. For relative support genetic factors were detected in females but not males, while for confidants, the shared environment was important in females but not males.

Conclusions. Except for relative support in males, genetic factors influence variation in all dimensions of social support. Shared environmental factors influence relative support and relative problems in both sexes. Sex differences were detected for confidants and relative support.

INTRODUCTION

Social support encompasses an individual's positive and negative interactions with members of society, especially with friends and relatives. Social support creates an atmosphere where the individual feels cared for and valued. Two essential constructs of social support are perceived and received social support which is weakly inter-related (Sarason *et al.* 1987, 1992).

Many studies have analysed the relationship between social support and psychiatric disorders (Cohen & Wills, 1985; Brown *et al.* 1986; Sarason *et al.* 1986; Alloway & Bebbington, 1987; Andrews & Brown, 1988; Brugha *et al.* 1990; Kessler *et al.* 1992; Grainge *et al.* 2000; Wade & Kendler, 2000*a*, *b*). One hypothesis proposes that, in the presence of adversity, social support acts as a prominent protective factor ('buffer') against mental illness. Another theory proposes that social support may act as a main effect to reduce risk for illness, independent of adversity (Henderson, 1998).

Personality traits may be an important determinant of social support impacting either the perception of social support or the actual creation of the social environment (Brown *et al.* 1986; Alloway & Bebbington, 1987; Andrews & Brown, 1988). Indeed, Sarason *et al.* (1986) claim that 'an individual's level of social support is a personality variable in itself'. Consistent with this claim, social support is positively correlated with extraversion and negatively with neuroticism (Monroe & Steiner, 1986; Sarason *et al.* 1986; Windle, 1992; Henderson *et al.* 1998). Furthermore, social support is more of a

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trait rather than a state variable as it is moderately stable over time (Sarason *et al*. 1986) and over changing environments (Furukawa & Shibayama, 1997). However, Andrews *et al*. suggested that social support and the personality measure of low self-esteem may be interrelated in a complicated way, across time and may in turn influence the risk to subsequent depression (Andrews & Brown, 1988).

It is often assumed that the source of social support is environment-dependent because it is primarily created by the behaviour of others. However, social support may be influenced by temperamental factors that are, in turn, partly genetic. Such perceived 'environmental' measures are often related significantly to genetic influences (Plomin *et al*. 1985; Plomin & Bergeman, 1991; Plomin, 1995). Three previous twin studies suggest moderately heritable influences on the major factors that comprise social support (Bergeman *et al*. 1990; Kessler *et al*. 1992; Kendler, 1997). However, the influence of shared (environment that is common to the twin pair) environmental factors on social support may be significant as well, as twins share many of the same relatives and may have common friends. This shared environment could account for some of the variation in perceived social support especially involving relatives (Kendler, 1997).

While the genetic and environmental influences on individual differences in social support have been studied, there has been limited research probing the possibility of gender differences in the aetiology of social support. The 'social role theory' predicts mean differences across genders in social support (Eagly, 1987). According to this theory, gender stereotyping causes gender differences in social behaviour (Williams & Best, 1991; Archer, 1996). Thus, while women tend to be more communal and intimate, males tend to form relationships that were less personal and more based on shared interests (Rubin, 1985). Other research on attachment has shown that while men often possess a dismissing style where they prefer not to depend on others, women prefer intimacy (Bartholomew & Horowitz, 1991; Brennan *et al*. 1991). These obvious gender differences in societal roles may potentially translate into gender differences in the sources of social support.

Relatedly, sexes differ in personality measures (Feingold, 1994). Women are higher than men in neuroticism, while males are found to be more assertive (Fiengold, 1994; Jardine *et al*. 1984). Since personality measures relate to social support, these differences may also be indicative of gender differences in social support as well.

Sex differences in the source of individual differences may be quantitative or qualitative. In this study, we use a combined sample of MZ and DZ male, female and opposite sex twin pairs to determine quantitatively: (1) whether genetic and environmental factors exert a similar magnitude of influence on individual differences in men and women for social support and qualitatively; (2) whether the genetic and environmental factors responsible for individual differences in social support are the same in men as in women.

METHOD

Sample

The twin pairs in this study are drawn from the population-based Virginia Twin Registry, formed from systematic review of all birth certificates in the Commonwealth of Virginia. The Virginia Twin Registry now constitutes part of the Mid-Atlantic Twin Registry (MATR).

For this study, data from interviews, which are part of a longitudinal study was used. The male–male and male–female data draws from a combined male–male/male–female (MM/MF) dataset and the female–female data draws from the female–female (FF) dataset (Kendler *et al*. 1992; Kendler & Prescott, 1999). The MM/MF and FF data were obtained from the second and third of wave interviews respectively. The sample included 3074 complete twin pairs, 14 complete sets of triplets, one complete set of quadruplets and 1316 individual twins with a non-participating co-twin. The precise number of twin pairs in each zygosity group is presented in Table 1.

All twins were sorted by zygosity and sex into monozygotic (MZ) and dizygotic (DZ) males and females. The zygosity of twins was determined by responses to questions relating to their physical similarities and how often people confused the twins when they were children. Questionable cases were resolved using photographs and DNA RFLP testing (Spence *et al*. 1988) and verified, more currently by PCR

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Table 1. *Means, standard deviations and ANOVA* F *values for both sexes for six dimensions of social support*

	Males		Females		
	Mean	(S.D.)	Mean	(S.D.)	*F*
Friend problem	5·17	(1·73)	4·88	(1·60)	67·13
Relative problem	5·55	(1·69)	6·00	(1·78)	73·30
Friend support	16·06	(3·03)	16·46	(2·58)	35·58
Relative support	12·53	(1·63)	11·89	(1·95)	226·3
Confidants	2·06	(1·47)	2·46	(1·29)	154·5
Social integration	2·55	(1·69)	2·79	(1·78)	34·0

$P < 0{\cdot}0001$ for all F values.

analyses (Kendler & Prescott, 1999). The average age for the sample at the time of assessment is 35·6 (S.D. = 8·5) and the average years of education is 13·4 (S.D. = 2·3).

Measure

Social support was measured using a 16-item social interaction scale previously developed and used at the Institute for Social Research (Schuster *et al.* 1990). Two items in full-text are as follows:

1 How often do you have contact with your relatives other than your co-twin and the people you live with-either see them, talk to them on the phone, or write letters? Would you say more than once a week, once a week, a few times a month, once a month, less than once a month, or never?

2 When you are in contact with your relatives, how often do they make you feel they care about you? Would you say often, sometimes, rarely or never?

Items similar to question 2 enquired how often relatives 'make too many demands on you', 'criticize you', 'create tension or arguments while you are around them' and 'express interest in what you are doing'. The same items were administered for 'friend' where the definition of 'friend' was 'someone with whom you have regular contact and some emotional connection – but not counting relatives'. A subset of items regarding 'confidants – someone with whom you have a close relationship and can share your most private feelings' was also administered. Finally, a single item enquired, 'How often do you attend meetings of clubs or other organizations?'

Factor analysis

To account for skewness, the variables 'number of friends' and 'number of confidants' were transformed into the natural logarithmic scale using the log of $n+1$ where n was the total number of friends or confidants indicated by the participant. Due to the relative complexity of fitting structural equation models to all 16 items, we used factor analysis as a data reduction tool. Factor analysis using the PROCFACTOR procedure and a VARIMAX rotation were conducted using SAS (SAS Institute, 1990). Males and females were analysed separately at first and then as a combined sample. The maximum variance accounted for by a single factor in both sexes was 18·3%. In males and females, four and five factors were obtained respectively, by eigenvalue criteria (eigenvalue $> 0{\cdot}5$). The four common factors had similar item loadings. Friend problems and relatives problems reflected whether the participant felt that his/her friends and relatives were 'criticizing' 'making too many demands' and 'creating tension or arguments'. The third factor was relative support with highest factor loadings for how often the participant had contact with relatives, how much relatives 'care about you' and 'express interest in what your doing'. The fourth factor, i.e. friend support had three common items for both sexes concerning the same items as those for relative support. The item regarding number of friends that loaded only in the males was also selected because it loaded negatively in males and females when we combined the individual datasets. The fifth factor in females dealt with items about attendance of meetings of clubs (positive), number of confidants (negative) and number of friends (negative). The first two items did not load strongly for any of the factors in the males. Thus, to construct similar factor patterns in males and females, four common factors of friend problems, relative problem, friend support and relative support were selected for both males and females. To compare our results with similar studies conducted previously, and to account for the additional factor in the females, two single item factors were created constituting the total of six factors. The single item factors were social integration dealing with how often the participant attended meetings of social organizations and clubs and confidants, which

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was the number of such confidants the participant had.

Finally, all factor scores were converted to ordinal data for further analyses.

Twin analyses

Data were analysed using the structural equation modelling program Mx (Neale *et al.* 1999). Models were fit to covariance matrices created from the raw data. Estimates of genetic and environmental influence were obtained using maximum likelihood.

In standard twin modelling, the variation in a phenotype is partitioned into additive genetic (A), shared environmental (C) and individual-specific environmental (E) variance (Neale & Cardon, 1992; Neale *et al.* 1994). Models were fit to test both qualitative and quantitative sex differences. The qualitative sex differences were assessed by allowing the genetic or the shared environmental correlation across sexes to vary from 1·0 (i.e. value assumed in same-sex pairs) and examining whether this resulted in a significant improvement in model fit. The quantitative differences were assessed by constraining the magnitude of genetic and environmental parameters to be the same across sexes. This model was compared for fit with the model where the genetic and environmental parameters were allowed to vary. All models were compared to a saturated model for goodness-of-fit (Williams & Holahan, 1994). The best fit model was selected by the Akaike's Information Criterion which is an index of goodness-of-fit and parsimony (Akaike, 1987).

RESULTS

Data analyses

Table 1 gives the means and standard deviations for all six factor-derived scales for both sexes. The ANOVA results suggest that females have significantly higher mean levels than males for all factor-derived scales except friend problems and relative support.

Table 2 gives the size of the zygosity groups along with the polychoric correlations for the six factors derived scale in each of the zygosity groups.

For all the factor derived scales, except for confidants in males and friend problems in females, the MZ correlations are greater than the DZ-same sex correlations, suggesting genetic influence on these measures. Moreover, for friend problems, friend support, confidants and social integration, the DZ-same sex correlations are less than half the MZ-same sex correlations, showing the absence of shared environmental influences. However, for relative support and relative problems the DZ-same sex correlations are substantially greater than half the MZ correlations, suggesting the presence of shared environmental influences. Finally, the DZ-opposite sex tetrachoric correlations suggest qualitative sex differences only for relative support.

Table 3 gives the goodness-of-fit results for the formal model fitting procedure. Table 4 gives the parameter estimates for the full or heterogeneous ACE model (i.e. Model 1) and the best fitting model for each of the factors. We describe, in detail, the model fitting results for one of the factors, 'friend problem', and briefly comment on the others. For 'friend problems', Model 1 in which additive genetic (A), shared environmental (C) and unique environmental (E) were allowed to vary across sexes was fit first. In Model 1 the genetic correlation (rg) and the correlation for shared environmental influences (rc) was constrained to 1·0 in the opposite-sex pairs (i.e. assuming no qualitative sex differences). In Model 2 and 3, we allowed the correlation of rg and rc to vary from 1·0 respectively. Neither Model 2 nor Model 3 provided a significant improvement in fit over Model 1. Thus, we found no evidence for qualitative gender differences in the genetic factors influencing 'friend problems'.

Quantitative gender differences were analysed next. In Model 4 (ACE equal) we constrained the additive genetic (A), shared environmental (C) and unique environmental (E) influences to be equal across sexes. For friend problems, this model fit as well as Model 1 indicating no significant quantitative sex differences. Working for Model 4 we compared this ACE equal model to the AE, CE and E models. In Model 5 (AE model), we assumed that the variation in each of the social support factors for the twin pairs is entirely due to genetic predisposition and individual specific environmental factors. Model 5 fit the data well and had a significant improvement in fit. Model 6 (CE model) assumed that the resemblance between twin pairs for each

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Table 2. *Group size and polychoric correlations for all six factors in social support in five zygosity groups*

	Male		Female		
	Monozygotic	Dizygotic	Monozygotic	Dizygotic	Dizygotic opposite sex
Pairs, *N*	706	492	504	307	1065
Correlations					
Friend problem					
Correlation	0·19	0·18	0·23	0·10	0·08
S.E.	0·05	0·03	0·05	0·06	0·03
Relative problem					
Correlation	0·38	0·28	0·37	0·22	0·23
S.E.	0·03	0·04	0·04	0·06	0·03
Friend support					
Correlation	0·27	0·14	0·28	0·10	0·15
S.E.	0·04	0·05	0·04	0·06	0·03
Relative support					
Correlation	0·25	0·26	0·33	0·29	0·19
S.E.	0·04	0·05	0·05	0·06	0·03
Confidants					
Correlation	0·29	0·09	0·25	0·23	0·06
S.E.	0·11	0·17	0·12	0·07	0·03
Social integration					
Correlation	0·31	0·08	0·30	0·13	0·13
S.E.	0·03	0·03	0·05	0·06	0·04

Correlations here are polychoric correlations.
S.E. Standard errors; *N* number of individuals.

Table 3. *Results of structural equation modelling using Mx for six dimensions of social support*

Model		Friend problem	Relative problem	Friend support	Relative support	Confidants	Social integration
ACE unequal df (46)	AIC	−1·54	−29·20	−55·86	−43·83	1·18	−26·10
	χ^2	90·47	62·80	68·14 (62)	48·17	93·18	65·90
Fix rc df (47)	AIC	0·518	−27·30	−53·87	−41·83	3·43	−24·40
	χ^2	90·52	62·71	68·13 (63)	48·17	93·43	65·60
Fix rg df (47)	AIC	0·468	−27·23	−53·87	−42·29	3·17	−24·10
	χ^2	90·47	62·80	68·13 (63)	47·72	93·17	65·90
ACE equal df (48)	AIC	−1·94	−32·85*	−59·83	−40·75	1·62	−30·0
	χ^2	94·07	63·15	68·17 (64)	55·25	97·62	66·01
AE df (49)	AIC	−3·94†	−32·90*†	−61·87†	—	—	−32·0†
	χ^2	94·07	65·10	68·13 (65)	—	—	66·01
CE df (49)	AIC	66·36	−16·97	−44·97	—	—	82·09
	χ^2	164·36	81·03	85·04 (65)	—	—	180·09
E df (50)	AIC	64·36	198·22	55·26	—	—	80·10
	χ^2	164·36	298·22	187·26 (66)	—	—	180·10

The number in parentheses for each df is the degrees of freedom for that model for all factor-derived scales of social support except friend support for which the df is specified.
* Models within 0·10 AIC units.
† Best model by AIC.

of the social support factors is entirely due to shared environmental and individual specific environmental factors. Model 6 fit the data poorly. In Model 7 (E model) we assumed no resemblance in twins for each of the factors for social support and this model caused a significant worsening of fit. For friend problems, the AE model (Model 5) was selected as the best-fitting model using AIC criteria.

We obtained similar results for three of the other factors. For friend support, social integration and relative problems, the AE model

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Table 4. *Parameter estimates and* (95% *CI*) *for Model* 1 *i.e. ACE unequal model and best fitting model for six dimension of social support*

	Males			Females		
	a^2	c^2	e^2	a^2	c^2	e^2
Friend problem						
1 ACE unequal	0·06 (0·00, 0·25)	0·15 (0·00, 0·26)	0·79 (0·25, 0·93)	0·25 (0·00, 0·34)	0·0 (0·00, 0·24)	0·75 (0·25, 0·93)
5 AE Model	0·23 (0·01, 0·36)	—	0·77 (0·64, 0·99)	0·23 (0·01, 0·36)	—	0·73 (0·64, 0·99)
Relative problem						
1 ACE unequal	0·31 (0·07, 0·46)	0·10 (0·00, 0·29)	0·59 (0·25, 0·93)	0·33 (0·08, 0·46)	0·06 (0·00, 0·29)	0·61 (0·25, 0·93)
5 AE Model	0·41 (0·37, 0·46)	—	0·59 (0·53, 0·63)	0·49 (0·37, 0·54)	—	0·59 (0·46, 0·63)
Friend support						
1 ACE unequal	0·28 (0·10, 0·36)	0·00 (0·00, 0·15)	0·72 (0·49, 0·90)	0·28 (0·10, 0·36)	0·00 (0·00, 0·15)	0·72 (0·49, 0·90)
5 AE Model	0·28 (0·10, 0·36)	—	0·72 (0·49, 0·90)	0·28 (0·10, 0·36)	—	0·72 (0·49, 0·90)
Relative support						
1 ACE unequal	0·00 (0·00, 0·05)	0·26 (0·19, 0·31)	0·74 (0·69, 0·81)	0·20 (0·09, 0·26)	0·15 (0·07, 0·25)	0·65 (0·49, 0·84)
CE/ACE	—	0·26 (0·19, 0·31)	0·74 (0·69, 0·81)	0·20 (0·09, 0·26)	0·15 (0·07, 0·25)	0·65 (0·49, 0·84)
Confidants						
1 ACE unequal	0·27 (0·17, 0·33)	0·00 (0·00, 0·07)	0·73 (0·60, 0·83)	0·02 (0·00, 0·24)	0·21 (0·00, 0·37)	0·77 (0·39, 1·00)
ACE unequal	0·27 (0·17, 0·33)	—	0·73 (0·60, 0·83)	0·02 (0·00, 0·24)	0·21 (0·00, 0·37)	0·77 (0·39, 1·00)
Social integration						
1 ACE unequal	0·29 (0·14, 0·36)	0·00 (0·00, 0·13)	0·71 (0·51, 0·86)	0·31 (0·08, 0·40)	0·00 (0·00, 0·19)	0·69 (0·41, 0·96)
5 AE Model	0·30 (0·14, 0·36)	—	0·70 (0·64, 0·86)	0·30 (0·14, 0·36)	—	0·70 (0·64, 0·86)

with no sex differences was the best-fitting model. However, it should be noted that, for relative problems, the AE model (Model 5) and the ACE equal model (Model 4 – $a^2 = 0{\cdot}30$, $c^2 = 0{\cdot}09$, $e^2 = 0{\cdot}61$) were within 0·10 AIC units suggesting that we cannot reject the hypothesis that shared environmental influences contribute to individual differences for this facet of social support.

The results obtained for the remaining two factors were somewhat different. For relative support although Model 2 and Model 3 did not cause a significant improvement in fit indicating the absence of qualitative gender differences, Model 4 (ACE equal model) did not fit the data as well as Model 1. Because we could not equate A, C and E parameters across sexes, we did not proceed to fit Models 5, 6 and 7. As can be seen in Table 4, based on Model 1, we found differing heritabilities in males and females. In males, genetic influences are negligible; clearly, shared environment (0·26) and unique environment (0·74) accounted for the total variance. In females, however, genetic factors accounted for 20% of the variance while shared environment and unique environment accounted for 15% and 65% of the variance respectively. To test the significance of the individual parameters, we fit four additional models dropping each of the parameters individually for each sex. Working from Model 1, we tested for the significance of genetic factors in females only (CE), with an ACE model in males, in model 8. This model caused deterioration in fit ($\Delta\chi^2 = 6{\cdot}34$, $\Delta df = 1$, $AIC = -39{\cdot}51$). Then, we tested for the relevance of shared environmental factors in females alone with an AE model in females and an ACE model in males, i.e. Model 9. Model 10, in which an ACE and AE model was tested in females and males respectively, to test the significance of shared environmental influences in males, followed this. Both Model 9 ($\Delta\chi^2 = 3{\cdot}87$, $\Delta df = 1$, $AIC = -41{\cdot}97$) and Model 10

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($\Delta\chi^2 = 7{\cdot}25, \Delta df = 1, AIC = -38{\cdot}58$) fit the data significantly more poorly than Model 1. Finally, we fit Model 11, which tested the significance of genetic factors in males by fitting the data to an ACE model in females and a CE model in males. This model provided a significant improvement in fit over Model 1 and was selected as the best-fitting model for AIC criterion ($\Delta\chi^2 = 0$, $\Delta df = 1$, $AIC = -45{\cdot}83$). Thus, for relative support, the role of genetic factors is negligible in males but accounts for 20% of the variance in females. The shared environmental influences account for 26% and 15% variance in males and females respectively and the remaining 74% variance in males and 65% in females is accounted for by individual-specific environmental influences.

Similarly, for confidants, Model 1, i.e. the unequal ACE model fit the data well and neither Model 2 nor Model 3 provided a significant improvement in fit and thus, we found no evidence for qualitative gender differences. Also, Model 4 did not provide a significant improvement in fit and we could not equate A, C and E in males and females. Hence, Models 5, 6 and 7 were not fit. However, to test the significance of individual parameters, we ran the same additional models as for relative support. While Model 11 clearly caused a significant deterioration in fit ($\Delta\chi^2 = 9{\cdot}75$, $\Delta df = 1$, $AIC = 8{\cdot}98$), Model 8 ($\Delta\chi^2 = 0{\cdot}26$, $\Delta df = 1$, $AIC = -0{\cdot}57$), Model 9 ($\Delta\chi^2 = 3{\cdot}51$, $\Delta df = 1$, $AIC = 0{\cdot}69$) and Model 10 ($\Delta\chi^2 = 0$, $\Delta df = 1$, $AIC = -0{\cdot}817$) provided a significant improvement in fit over Model 1. This suggested that while shared environmental factors are not essential in males, either shared environment or genetic factors may be dropped in females. Therefore, to test if we could simultaneously drop both A and C in females we fit an ACE model in males and an E only model in females, i.e. Model 12 ($\Delta\chi^2 = 11{\cdot}33$, $\Delta df = 2$, $AIC = 8{\cdot}506$), which caused a deterioration in fit. This indicated that for confidants, the genetic or shared environmental factors, but not both, could be dropped in females while only shared environmental factors were not important in males. We concluded that by AIC criteria, Model 10, i.e. ACE in females and AE in males was the best-fitting model. Thus, in males, the variance due to genetic influences is 27% and the remaining 73% is accounted for by purely individual-specific environmental influences. In contrast, in the females, genetic factors account for 2% of the variance and shared environmental influences account for 21% of the variance while the remaining 77% is accounted for by individual-specific environmental influences.

DISCUSSION

By studying six factors of social support in MZ same sex and DZ same and opposite sex twins, we sought to examine both qualitative and quantitative gender differences in social support. Although women had higher mean levels for all aspects of social support except for friend problems and relative support, we found no evidence to suggest qualitative gender differences in any of the six factors of social support. This means that genetic factors influencing social support are not different across sexes. However, for relative support, the heritable component is present only in females. The absence of genetic influences in one sex (males) suggests that the genetic correlation across DZ twins in an opposite-sex pair cannot be 0·5 and this may be interpreted as a qualitative sex difference. We did find quantitative gender differences for two of the six factors, those of relative support and confidants suggesting differing heritabilities in males and females.

In our study, genetic factors are detected for all factors of social support, except for relative support in males. This adds to a growing body of research that suggests the influence of genetic factors on measures that are seemingly 'environmental' in nature (Plomin *et al.* 1985; Plomin & Bergeman, 1991; Plomin, 1995). Research regarding measures of the home environment (Coon *et al.* 1990; Braungart *et al.* 1992) and life events (Kendler *et al.* 1993; Foley *et al.* 1996) along with this study affirm that genetic factors influence individual differences in 'environmental' variables.

Consistent with a previous longitudinal study (using some of the same data), we found the influence of shared environmental factors only for relative support (0·26) and relative problems (0·09) and not for friend support or friend problem (Kendler, 1997). The presence of shared environmental influences only in factors relating to relatives is plausible because even in adulthood, most twins still have common relatives.

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We found almost no evidence for qualitative gender differences and allowing genetic correlation to be free did not improve model fit in any of the dimensions of social support. This indicates that the genetic factors responsible for social support overlap completely in both sexes. However, for the factor-derived scale of relative support, there is, technically, no overlap of genes across sexes because genetic factors do not influence relative support in males. This may be considered a qualitative sex differences. Quantitative gender differences were found for relative support and confidants. For relative support, the females showed a moderately heritable component that accounted for 20% of the total variance, and while the females were influenced by genetic and shared environmental components, the males did not show any evidence for the role of genetic factors. Thus, while the ACE model accounted for social support in females, the CE model explained social support in males. There can be two possible explanations for this contrast across the sexes. First, we may assume, that males and females due to gender stereotyping have different perceptions of the dimensions of social support. However, this would mean gender differences should be detected in virtually all the factors of social support (e.g. friend support). We do not see such contrasts in other perceptions of social support and can assume that within the definition of social support provided by the factor, males and females interpret this support similarly. However, a prospective clinical study of depression in males and females suggested that while the variance that explained recovery due to social support was equal across sexes, perceptions of interpersonal relationships and support that predicted support may have been different between males and females (Brugha *et al*. 1990). A second, and more plausible explanation may be that parents are more responsive to genetically influenced traits in their female offspring compared to their male offspring. A study of adolescent depressed mood shows higher estimates of heritability in females than males and shared environmental influences only in males for family connectedness, which is an indication of how well the participants felt their family understood them and cared for them (Jacobson & Rowe, 1999). Relatives, in our definition, do not include the co-twin and thus probably relate to parents. It may be true that parents vary their support depending on whether their female twin pair is identical or fraternal. In contrast for male twin pairs, there is no discrimination for genetic characteristics based on whether the twins are MZ or DZ.

In contrast, for confidants, an almost reverse pattern was seen: shared environmental influences were detected only in the females and although genetic influences were seen in both sexes, the variance they accounted for in males was greater than that for females. A possible explanation for this is that females score higher than men for personality traits of extraversion (Jardine *et al*. 1984; Eaves *et al*. 1989). From the means presented in Table 1, we see that females tend to form more intimate relationships than males (higher means for confidants in females). We are also aware that female twins are more frequently in contact as adults than male twins and share more common friends than males. This may be a source of shared environmental influences (Jacobson, 2001). Since we did not have a question in our interview to verify whether the twin pair were speaking of the same confidants or not, it may be that female twin pairs, due to closeness in their childhood have the same set of confidants. Males, have fewer confidants overall and it is less likely that male twins share the same confidants. Thus, in males, confidants may vary with individual hobbies and interests that are not shared by the twins in adulthood (Alloway & Bebbington, 1987).

We may conclude that males and females perceive care and support provided by friends and family in the same manner. While genetic factors are important for most aspects of social support, the shared environment plays an important part for certain factors that deal with relationships between family members. Thus, while there are basic gender stereotypes that influence social responses to an individual, and there are sex differences in mean levels of social support, these translate into actual gender differences in sources of variation for social support for select factors of relative support and confidants only.

Limitations

The results of this study should be interpreted considering six potential limitations in methodology.

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First, the data used for analysis is only from one wave of interviews. We cannot be sure of how much of the individual specific environmental influence is due to measurement errors. This measurement error may have decreased the estimates of heritability by increasing estimates of unique environmental influences (since $A+C+E=1$). We were also unable to conduct any prospective analyses. However, short-term reliability measures were available for these measures in the males alone. Intraclass correlations (95% CI) for the six measures of social support are presented: friend support, 0·56 (0·48–0·64); relative support, 0·56 (0·45–0·67); friend problem, 0·38 (0·29–0·46); relative problems, 0·55 (0·46–0·63); confidants, 0·57 (0·48–0·66); and social integration, 0·68 (0·61–0·75). This suggests that the relatively high estimates of E are due to measurement error that is also responsible for decreased estimates of A.

Secondly, due to limitations in the twin design, we were unable to measure sex differences in the individual-specific environmental influences. Our models did not include measured environment variables and this may have decreased our power to detect sex differences in environmental influences.

Thirdly, we may have lacked the power to detect any actual shared environmental effects. These effects may have been confounded with the genetic factors and we would need a much larger sample size to distinguish A from C (Neale *et al*. 1994). To address the question of whether the lack of C was a true effect or a power limitation, we created a global social support variable as the average of the sum of the scores on the 16 items. The items were first orientated towards increasing social support, i.e. a low score on problems and a high score on support meant greater social support. All scores were standardized. The results obtained for the global social support variable were similar to the results for confidants. Equating the additive genetic, shared environmental and specific environmental influences did not improve the fit of the model ($\Delta\chi^2 = 7{\cdot}4$, $\Delta df = 3$, $AIC = 1{\cdot}4$). There was evidence for quantitative genetic differences across sexes and the shared environmental influences in females could not be dropped without a significant deterioration in fit ($\Delta\chi^2 = 51{\cdot}6$, $\Delta df = 1$, $AIC = 49{\cdot}6$). Model 10, i.e. ACE in females ($a^2 = 0{\cdot}29$, $c^2 = 0{\cdot}05$, $e^2 = 0{\cdot}66$) and AE in males ($a^2 = 0{\cdot}27$, $e^2 = 0{\cdot}73$) was the best-fitting model by AIC criterion. This power to detect C with low magnitude may be due to the continuous nature of the variable. We would require a relatively large sample size to parse out C when treating the data ordinally.

Fourthly, certain facets of social support, like instrumental social support, were not examined (Cohen & Wills, 1985).

Fifthly, our measures of social support are self-reported. Several studies have used interview-ratings to assess levels of social support (Brown *et al*. 1986; Andrews & Brown, 1988; Grainge *et al*. 2000).

Finally, our sample consisted of Caucasians only and we cannot be certain of similar results for other ethnic groups.

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