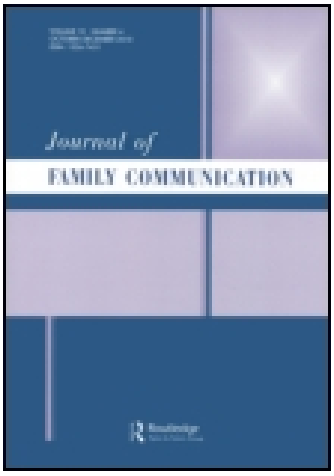

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Differential Solicitude of Social Support in Different Types of Adult Sibling Relationships

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Differential Solicitude of Social Support in Different Types of Adult Sibling Relationships

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The sibling relationship is one of the longest relationships in people's lives, and it is one of the most diverse as it occurs in many different forms. The current investigation seeks to identify differences in the amount of social support received in adult sibling relationships. The sample consisted of 411 participants in 6 different types of sibling relationships: identical twins, fraternal twins, full biological siblings, half-biological siblings, stepsiblings, and adopted siblings. Employing of ideas of discriminative parental solicitude, we developed a hypothesis about which types of siblings receive the most social support from their siblings. The basic prediction was that siblings who are more genetically related to one another receive more social support than siblings who are less genetically related. Results supported these predictions, even when social and relational explanations were controlled.

The sibling relationship is the longest-lasting relationship in most people's lives (Bedford, 1993; Ponzetti & James, 1997), as siblings have continued interaction with each other throughout childhood, adulthood, and old age. Furthermore, few relationships are as widespread as the sibling relationship because most Americans have at least one sibling (National Opinion Research Center, 1998). Although the sibling relationship can be fraught with feelings of rivalry (Ross & Milgram, 1982), it can also be an important source of social support in times of need (Cicirelli, 1995). Consequently, the sibling relationship is worthy of study due to its widespread nature and its relational importance. Although considerable research literature addresses the sibling relationship, much of the past research has focused on issues of birth order, family size, and sex differences on intellectual and personality characteristics (Cicirelli, 1995). Recently, research in the social sciences has focused more on the interpersonal relationships between adult siblings and the factors that influence those relationships (i.e., Myers & Bryant, 2008; Rittenour, Myers, & Brann, 2007).

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Although some researchers have suggested that the lack of research on adult siblings is due to the assumption that siblings have little contact and/or little influence upon each other after childhood (Cicirelli, 1995), researchers have found a strong sense of interdependence between siblings even after childhood and demonstrated the significant influences of adult sibling relationships (for review, see Mikkelson, 2006). For example, Connidis (1989) reported that 77% of adult siblings considered at least one of their siblings to be a close friend.

Strong sibling ties have many important benefits. Previous research, especially research examining elderly siblings, has indicated benefits in physical and mental health for those with strong sibling ties (Cicirelli, 1977, 1989; O'Bryant, 1988). Specifically, Cicirelli (1989) found that having close bonds with a sister was related to fewer symptoms of depression later in life. Furthermore, the level of closeness between siblings has positive mental health effects, such as reducing feelings of loneliness (Ponzetti & James, 1997). Siblings are an important source of support in times of need (Cicirelli & Nussbaum, 1989; Goetting, 1986; Kahn, 1983). Wellman and Wortley (1989) found that siblings were the second-most likely source of support after parents, with 68% of respondents receiving emotional support from siblings.

Given that supportive communication is one of the most important provisions of close relationships (see Gottlieb & Wagner, 1991; Wills, 1991) examining social support in sibling relationships could be an important line of research as receiving support, especially in times of distress, can improve physical and emotional health (Cunningham & Barbee, 2000; Sarason, Sarason, & Gurung, 1997). Aside from studying demographic variables such as sibling sex or age (Mikkelson, 2006), researchers have not examined the extent to which siblings are genetically (or socially) different affects their use of social support behaviors with each other. Although it is known that social support behaviors help build and sustain relational ties, little is known about how different types of siblings utilize these behaviors. It might be especially important to examine some of these sibling relationships in greater detail due to the prevalence of some sibling relationships (e.g., stepsiblings). Thus, understanding genetic relatedness is one key theoretical mechanism necessary for furthering our understanding of how different kinds of siblings communicate with each other.

The goal of the present study is to examine communication patterns that could have physical and psychological health benefits by examining siblings' use of socially supportive behaviors across sibling relationship types (full siblings, half-siblings, stepsiblings, etc.). The following section first reviews the different sibling relationship types. Then we will review evolutionary theory as the theoretic lens and specifically the theory of discriminative parental solicitude (Daly & Wilson, 1980). Finally, using discriminative parental solicitude as a guide, we will propose the hypotheses and research questions in the current study.

Different Types of Sibling Relationships

The majority of sibling communication research has examined full biological siblings, even though sibling relationships can takes many different forms, based on common biological origin (genetic relatedness) or legal relationships (remarriage and adoption). Biological sibling relationships are those in which the siblings are genetically related to one another. Sibling relationships that occur due to common biological origin include identical twins, fraternal twins, full biological siblings (those with both biological parents in common), and half-siblings (those with one biological parent in common).

Genetic relatedness refers to the probability that any particular gene found in one person will also be found in another, among the small proportion of genes that varies from person to person. However, the amount of genetic relatedness between siblings varies with the type of sibling relationship, with identical (monozygotic) twins sharing 100% genetic relatedness, full siblings and fraternal (dizygotic) twins sharing approximately 50% genetic relatedness, and half-siblings sharing approximately 25% genetic relatedness.

Sibling relationships that are established by legal means include stepsiblings, who are siblings as the result of the biological parent of one marrying the biological parent of another, and adopted siblings, for whom sibling status is attained when one or both children are legally adopted into the family by the parents. The 2000 U.S. Census reported that 2.5% of children under the age of 18 were adopted (Kreider, 2003). Although there are no current census statistics about the number of stepfamilies in the United States, the Stepfamily Association of America (2006) estimated that, at some point, 30% of children will live in a stepfamily (this estimate included children who live with a cohabitating parent).

Based on differences in genetic relatedness and legally created sibling relationships, it can be said that there are six unique types of sibling relationships: identical twins, fraternal twins, full siblings, half-siblings, stepsiblings, and nongenetic adopted siblings. Unfortunately, research on adult siblings has primarily examined full biological siblings. This is disappointing given the prevalence of stepfamilies (also known as blended families) in the United States and the number of people affected by adoption. Understanding differences between sibling types will be informed by the theory of discriminative parental solicitude.

Discriminative Parental Solicitude

Discriminative parental solicitude (DPS: Daly, Salmon, & Wilson, 1997; Daly & Wilson, 1980, 1987, 1993, 1995) was derived from Hamilton's (1964) idea of inclusive fitness and Darwinian ideas of natural selection. In line with other evolutionary theories, DPS advances the idea that psychological mechanisms evolved because of their contribution to fitness. Fitness is maximized by either having children or by helping relatives produce healthy offspring. DPS builds on both natural selection and inclusive fitness theory but does so with respect to the specific resources that parents allocate to their children that contribute to their viability. Essentially, DPS argues that parents allocate resources to their children discriminately, in order to maximize the parents' reproductive success, even despite conscious efforts not to. Specifically, parental resources are allocated based on three things: genetic relatedness, certainty of parenthood, and the reproductive value of the offspring.

Although genetic relatedness, certainty of parenthood, and the reproductive value of the offspring all influence how resources are given to offspring, we will focus primarily on genetic relatedness because it has the most direct relevance in the current study. As an evolutionary theory, DPS acknowledges that "not all offspring are equally capable of translating parental nurture into increments in the long-term survival of parental genetic materials" (Daly & Wilson, 1995, p. 1273). Based on the evolutionary idea of selection, parents should allocate resources to their children who are most capable of passing on their parents' genes (e.g., biological children as opposed to stepchildren).

Genetic relatedness in parent-child relationships has been found to be an important predictor of affection (Floyd & Morman, 2001), inheritance (Smith, Kish, & Crawford, 1987), and helping

behavior (Essock-Vitale & McGuire, 1985). Floyd and Morman (2001) examined the use of affectionate communication in father/son relationships and found that fathers gave more affection to biological sons than they did to stepsons. As stated above, close relatives were favored over distant kin as beneficiaries of assets from the deceased (Smith et al., 1987). Further, in adult women's descriptions of giving and receiving helping exchanges with kin were more likely to occur in relationships with greater genetic relatedness (Essock-Vitale & McGuire, 1985).

Daly and Wilson (1995) argued that genetic relatedness is one important predictor of allocation of resources by parents and empirical research has supported the notion that parents invest more resources, both tangible and intangible, in biological children as compared to stepchildren. However, all relatives, including siblings, can contribute to genetic fitness.

Although DPS focuses on parent-child relationships, the factors that influence the allocation of resources in sibling relationships should be similar to those of parental solicitude. Although genetic relatedness, certainty of genetic relatedness, and the reproductive value of the sibling should all influence the allocation of resources, genetic relatedness is the focus of this study as it appears to be the most powerful predictor of supportive behavior in other studies involving kin (Burnstein, Crandall, & Kitayama, 1994; Floyd & Morman, 2001; Segal, 1984; Smith et al., 1987). One primary difference between siblings and parent-child relationships is the variance in genetic relatedness. Whereas parent-child relationships are composed of approximately 50% relatedness for biological children and 0% relatedness for non-biological children, as stated above sibling relationships can involve approximately 100%, 50%, 25%, or 0% genetic relatedness depending on the relationship. The greater variation in genetic relatedness of siblings, as compared with parents and children, allows for a more nuanced test of these evolutionary ideas (Buss, 1999).

The logic of DPS suggests not only that siblings should invest more resources in biological than nonbiological siblings, but also that they should allocate more of their resources to siblings with a higher percentage of genetic relatedness than to those with lower percentage of genetic relatedness. This idea follows logically from DPS and is also supported by research on other family relationships (Burnstein et al., 1994; Floyd & Morman, 2001; Segal, 1984; Smith et al., 1987).

Social Support

Social support is widely recognized as one of the most important features of close personal relationships (see, e.g., Cunningham & Barbee, 2000). Social support itself was defined by Cutrona (1996) as "responsiveness to another's needs and more specifically as acts that communicate caring; that validate the other's worth, feelings, or actions; or that facilitate adaptive coping with problems through the provision of information, assistance or tangible resources" (p. 10). Early researchers, such as Casell (1974), argued that social support could buffer the harmful impact of change, challenge, and loss. Generally, results have demonstrated the health benefits of receiving social support from others (see Cohen & Wills, 1985; Cunningham & Barbee, 2000; Uchino, Cacioppo, & Kiecolt-Glaser, 1996).

Researchers have distinguished between several general types of social support with respect to the type and content of the assistance given. Specifically, both House (1981) and Cutrona and Russell (1990) differentiate five types of social support. *Emotional support* includes the

expression of love, empathy, and concern. *Esteem support* includes the expression of respect, validation, and confidence that helps increase another's self-concept. *Network support* includes behaviors that create a sense of belonging. *Tangible support* includes providing goods and/or services. Finally, *informational support* includes providing facts or advice regarding situations of concern. This five-category scheme has been utilized previously by researchers in attempts to differentiate the different types of support family members can give (Xu & Burleson, 2001, 2004). This conceptual schema will be used in the present study as it differentiates the most common types of social support.

For something to be considered a resource, according to DPS, it must increase the chances of survival and/or procreation for the person receiving it. There is reason to believe that social support constitutes just such an evolutionary resource. A considerable amount of research has examined the health benefits of social support and findings have indicated that receiving social support has both mental and physical health benefits (for extensive reviews, see Cohen, 2004; Cunningham & Barbee, 2000). According to the stress buffering hypothesis, social support protects people against the negative effects of stress (Cohen, 1988, 2004; Cohen & Wills, 1985; Pearlin, 1989; Rook, 1987). Cohen (2004) argued that strong social connections in the form of social support provide both "psychological and material resources needed to cope with stress" (p. 677).

This hypothesis appears to be supported by the literature, as social support is inversely related to anxiety, depression, and psychological distress (Cohen & Wills, 1985). Further, a meta-analysis of laboratory stress and social support confirmed the positive health benefits of social support (Thorsteinsson & James, 1999). Importantly, Uchino et al. (1996) reviewed research examining links between social support and cardiovascular functioning, endocrine functioning, and immune system functioning. In their review they concluded that familial sources of social support may be especially important and that emotional support clearly appears to be linked with health benefits. Consequently, social support can be viewed as an evolutionary resource as it provides important health benefits to those who receive it and family members appear to be an especially important source of that support.

Siblings as a Source of Social Support

Although many individuals receive support from their spouses and/or parents, siblings are also an important source of social support (see Cicirelli, 1995; Mikkelson, 2006). Goetting (1986) argued that the frequency of sibling contact through early and middle adulthood suggests that many siblings continue to be supportive after moving out of their parents' house. According to Goetting (1986), the primary developmental task of siblings during early and middle adulthood is to provide companionship, emotional support, and direct aid to one another. In middle age, siblings are relied on frequently for support, especially in times of crisis (Troll, 1975). Research indicated that sibling support increases in old age, as siblings sometimes provide a great deal of help (Cicirelli, 1995). The most common type of support that siblings offered in old age is that of emotional support (Avioli, 1989; Cicirelli, 1988; Dunn, 1985). In a study of family relationships of the elderly, Cicirelli (1979) found that most siblings were also seen as a source of tangible support to be called on in a time of crisis. In general, siblings who were emotionally closer provided more emotional support for each other in comparison with siblings who are less close

(Cicirelli, 1995). Furthermore, social support was positively associated with sibling commitment (Rittenour, Myers, & Brann, 2007) and a primary way of communicating commitment (Myers & Bryant, 2008).

From the perspective of evolutionary theory in general, and DPS in particular, a fundamental motive of human nature is to maximize fitness either by having children or helping relatives produce healthy and viable offspring. Social support is one resource that can benefit the receiver. One direct implication of the evolutionary principles discussed in this paper is that resources should be allocated in a way that favors those who are the most capable and most likely to pass on some of their genetic material to a new generation. However, only a biological relative has the ability to pass on one's genetic material. Within the current study, only identical twins, fraternal twins, full biological siblings, and half-siblings can pass on each other's genes. Furthermore, these types of siblings vary in their ability to pass on each other's genes.

This is not to imply that siblings only give support to their genetic siblings at the expense of stepsiblings and adopted siblings, but that people are likely to invest more in their biologically related siblings because they increase their own genetic fitness by doing so. The prediction that logically emerges from this discussion is that people allocate greater resources to biological siblings than to stepsiblings and adopted siblings, all other things being equal, because doing so maximizes inclusive fitness.

Further utilizing the evolutionary ideas presented in this study, not only should people invest more resources in biological kin than in nonbiological kin, but the amount of genetic relatedness should also play a role in the differential investment of resources. Specifically, people should invest in siblings who are more genetically related to themselves than kin who are less genetically related, because by doing so they increase their own fitness. Literature supports the notion that people invest more in those who they are more genetically related compared with those they are less genetically related (Burnstein et al., 1994; Floyd & Morman, 2001; Segal, 1984; Smith et al., 1987). Thus, people are likely to invest their resources in those siblings with whom they are more genetically related than those whom they are less genetically related. The following hypothesis is based on the logic of these arguments.

H1: Identical twins receive the most social support (emotional, esteem, network, information, and tangible support), followed by fraternal twins and full siblings, followed by half-siblings, with step and adopted sibling receiving the least social support.

However, it is important to note that the hypothesis could be supported because of relational and social differences between siblings rather than genetic differences. For example, siblings who live together longer tend to share a closer bond and likely share more social support. Further, full siblings generally have lived together longer than stepsiblings. Thus, it would be important to control for how long siblings have lived together as differences in social support could occur due to this factor. Other variables that could also create a confound would be how long the siblings have known each other, their age difference, how far apart they live, and the number of other siblings they have. Each of these represents a possible confounding variable because they could be responsible for variance in social support that would not be due to genetic relatedness of the sibling, but because of other social and/or relational factors. Consequently, each of these variables could represent an alternative explanation for the results and will be controlled for as covariates in the analysis.

METHOD

Participants

Participants ($N = 411$) were 174 (42.3%) male and 236 (57.4%) female undergraduate communication students (1 participant did not report his/her sex). Participants ranged in age from 18 to 29 years ($M = 21.53$ years, $SD = 2.75$). A majority (80.5%) were Caucasian, whereas 8.0% were Hispanic, 5.1% were Asian/Pacific Islander, 4.9% were Black/African-American, 2.7% were Native American, and 5.6% were of other ethnic origins. (The percentages sum to >100 because participants were allowed to check all that applied.)

Each participant also reported demographic information on their sibling. Of the 411 participants, 94 (22.9%) reported on a full sibling, 80 (19.5%) on a half-sibling, 66 (16.1%) on a fraternal twin, 64 (15.6%) on a stepsibling, 61 (14.8%) on an identical twin, and 46 (11.2%) on an adopted sibling. Of the siblings reported on, 183 (44.5%) were male siblings and 226 (55.0%) were female (2 participants did not report their siblings' sex). Participants' siblings ranged in age from 16 to 39 years ($M = 23.50$ years, $SD = 5.11$).

Procedure

Participants were recruited from undergraduate communication classes at a large southwestern university in the United States in compliance with the institution's human subjects Institutional Review Board (IRB). Specifically, students who had an identical twin, fraternal twin, full biological sibling, half-sibling, stepsibling, or adopted sibling were recruited to participate in this study. Undergraduate students received extra credit for soliciting people with siblings to participate in the study.

Students who had at least one sibling had the option of participating themselves or finding a person with a sibling to participate. Participants reported on one of their sibling relationships: an identical twin, fraternal twin, full biological sibling, half-sibling, stepsibling, or adopted sibling. It was specified in the questionnaire that adopted siblings must not be biologically related to the participant. Participants had to be at least 18 years of age to abide by IRB policies. Participants with more than one sibling were asked to move down a checklist of sibling relationships, starting with twins, adopted siblings, half-siblings, stepsiblings, and full biological sibling. Participants were asked to fill out the questionnaire with respect to the first relationship on the checklist that they were a part of. Thus, if a person had an adopted sibling, half-sibling, and full biological sibling, they filled out the questionnaire for the adopted sibling.

In addition, if participants had more than one sibling of that type they were told to pick the sibling of that type whose birthday was closest in the calendar year to their own. This was done so participants would not automatically pick their closest sibling to report on, which could create a confounding variable in the study. Participants were also asked to report the sex of the sibling they were reporting on and other important demographic information, such as the amount of time the siblings had lived together, how often they communicated with one another, and if they were stepsiblings or adopted siblings, how many other siblings they had, how close they lived to one another, and how long they had been siblings.

Measures

Social support was measured using Xu and Burleson's (2001) 35-item Desired and Experienced Social Support (DESS) scale. Specifically, the scale contains seven items for each of the five types of social support: emotional, esteem, network, tangible, and informational support. The participants were asked to indicate on a seven-point Likert-type scale how much support their sibling displayed to them when they needed it, with the options of "don't receive at all" and "receive a great deal" as the anchors. Due to the fact that the scale was designed for social support in marriage, the instructions were altered to indicate the sibling relationship. Example items include, "Expressing sorrow or regret for your situation or distress," and "Assuring you that you are a worthwhile person." Furthermore, participants filled out these questions with respect to how much support they received from their sibling.

Because high correlations were observed between the five subscales, a confirmatory factor analysis (CFA) was conducted on the data using AMOS 18.0 for Windows (Arbuckle, 2009). We evaluated model fit using the comparative fit index (CFI) and the root-mean square error of approximation (RMSEA) with its 90% confidence interval (CI). Published standards suggest that a CFI of greater than .90 and an RMSEA of .06 to .08 is indicative of good fit whereas a CFI greater than .95 and an RMSEA of less than .05 represents excellent fit (Browne & Cudeck, 1993; Hu & Bentler, 1999).

We assessed the fit of the DESS using a series of nested models starting with a one-factor model containing all 35 items from the complete scale. For the second nested model, we created a two-factor solution. The first factor consisted of the emotional and esteem support items and the second factor consisted of the network, informational, and tangible support items. For the model containing the three-factor solution, we separated the network support items into a discrete latent factor and left emotional/esteem and informational/tangible support items as the two additional factors.

For the model analyzing the four-factor solution, we allowed the emotional/esteem items to load onto a common factor and analyzed network, esteem, and support items as discrete factors. Finally, we analyzed a model in which all five factors were analyzed as proposed by Xu and Burleson (2001). Full results from the nested model comparison appear in Table 1. Overall, the five-factor model as proposed by Xu and Burelson demonstrated the highest degree of fit to the data, χ^2 (550, $N = 411$) = 2560.217, $p < .001$, CFI = .861, RMSEA = .094 (90% CI = .091 − .098), however, the five-factor solution failed to meet the criteria for acceptable fit. Thus, a specification search was utilized to identify parameters that needed to be changed in the model. Byrne (2001) argued that as long as the respecification of the model is theoretically tenable, then this approach is acceptable.

The specification search revealed three items needing reevaluation. First, the item "Offering to spend time with you to get your mind off something (chatting, having dinner together, going to a concert, etc.)," which is a network support item, actually loaded onto tangible support. Given the similarity to the question, "Joining you in some activity in order to alleviate stress (tangible support)," it makes sense that this item might load on tangible support. Second, the item "Telling you whom to talk to for help," which is an informational support item, actually loaded onto network support. Given the similarity to the question, "Connecting you with people whom you can confide in" (network support), it makes sense that this item would load onto network support. Finally, one item ("Offering to do things with you and have a good time together") loaded

TABLE 1
Confirmatory Factor Analysis for Desired and Experienced Social Support ($N = 411$)

Model Iteration	χ^2 *(df)*	*CFI*	*RMSEA (CI)*	$\Delta\chi^2$ *(df)*
Single factor	3177.30 (560)	.82	.107 (.103 − .110)	
Two-factor solution	2716.74 (559)	.85	.097 (.093 − .101)	460.57* (1)
Three-factor solution	2649.25 (557)	.86	.096 (.092 − .099)	67.49* (2)
Four-factor solution	2589.65 (554)	.86	.095 (.091 − .098)	59.60* (3)
Five-factor solution	2560.22 (550)	.86	.094 (.091 − .098)	29.43* (4)

*Significant at $p < .01$.

onto all five types of support; given that it was not useful in distinguishing specific types of support, it was removed from additional analyses. Further, two tangible support items demonstrated poor factor loadings and were also removed. The final model with these changes still demonstrated marginal fit to the data, χ^2 (454, $N = 411$) = 1738.22, $p < .001$, CFI = .903, RMSEA = .083 (90% CI: .079 − .087), despite a significant improvement in fit, $\Delta\chi^2$ (96) = 821.993, $p < .01$.

To assess model fit further, we conducted an additional specification search to determine if additional factor loadings or covariances could be added to the model. Kline (2005) cautioned against the addition of unnecessary factor loadings and covariances (particularly those involving error terms) except when the addition of these paths is theoretically and/or methodologically defensible. We identified two such pairs of error covariances that, although affiliated with items loading on separate social support factors, assessed similar concepts and appeared in succession on the questionnaire[1]. The addition of these covariances led to a significant improvement in model fit, $\Delta\chi^2$ (2) = 121.07, $p < .01$, and the final model containing these covariances demonstrated an acceptable degree of fit to the data, χ^2 (452, N = 411) = 1617.16, $p < .001$, CFI = .912, RMSEA = .079 (90% CI: .075 − .083).

Relational closeness was measured using Aron, Aron, and Smollan's (1992) Inclusion of Other in the Self (IOS) scale. This single-item, graphic-based scale consists of pairs of circles labeled "self" and "other." In each successive pair, the circles overlap one another to increasing degrees, similar to a Venn diagram. Specifically, the circles in the first pair do not overlap at all and the circles in the last pair overlap almost entirely. Respondents were asked to choose the pair of circles that best depict the nature of their relationship with their sibling. This scale

[1]Kline (2005) suggested that the addition of error covariances to a structural equation model is permissible when items represent similar underlying constructs or share some distinguishing feature related to their measurement. In model specification searches, we identified two pairs of items that met these criteria. First, item 11 asked participants to rate their sibling's level of "Comforting you when you are upset by showing some physical affection" and item 12 asked whether or not siblings "Tried to reduce feelings of guilt about a problem situation." Although these items were associated with different dimensions of support (emotional and esteem, respectively), both items assessed some form of soothing behavior and appeared in succession on the questionnaire. In addition, item 33, "Helping you find the people who can assist you with things," was closely related to item 34, "Providing detailed information about the situation or about skills needed to deal with the situation." As with the previous pair of items, these items addressed a similar concept (managing a threatening situation) despite primary associations with different dimensions of support (network and informational, respectively). Although the specification search identified additional covariances that could have improved model fit, none of the identified covariances were theoretically or methodologically related.

TABLE 2
Reliabilities, Means, Standard Deviations, and Intercorrelations for Study Variables ($N = 411$)

Variable	α[1]	*M/SD*	*1*	*2*	*3*	*4*	*5*
1. Emotional Support	.92	4.51/1.65	—				
2. Esteem Support	.94	4.47/1.67	.92*	—			
3. Network Support	.93	3.84/1.64	.83*	.83*	—		
4. Informational Support	.93	4.19/1.66	.85*	.83*	.89*	—	
5. Tangible Support	.91	3.95/1.67	.83*	.80*	.88*	.86*	—
6. Closeness[2]		4.04/1.85	.72*	.68*	.65*	.65*	.66*

Notes. [1]Internal reliability estimates are based on Cronbach's alpha. [2]Closeness does not have an alpha reliability because it is a single-item scale. *$p < .001$ (two-tailed).

has demonstrated excellent psychometric properties, has even been found to match or exceed other multi-item measures of closeness that require much more time to complete (Aron & Aron, 1997), and has been used in the study of various relationship topics (see Agnew, Loving, Le, & Goodfriend, 2004).

Scores on all scales represent the mean of the items in that scale and have a theoretic range of 1 to 7, wherein higher scores indicate a greater level of the variable. Some items were worded positively and others will be worded negatively to mitigate response sets. Internal reliabilities, means, and standard deviations for all multiple-item measures appear in Table 2.

RESULTS

Preliminary Results

To determine which variables should be included as covariates in the analysis, bivariate correlations were computed between closeness, how long the siblings had known each other, how long they had lived together, the age of the participant, the age of the sibling, the siblings' age difference, how far apart they lived, and the number of other siblings they had with the five social support outcomes. If any correlation between the covariates and one of the social support outcomes was significant, the covariate was included in the analysis below. Significant correlations existed between the social support outcomes and closeness, how long the siblings had known each other, how long they had lived together, the siblings' age difference, how far apart they lived, and the number of other siblings they had. However, most significant correlations were relatively small ($r < .20$).

Hypothesis Tests

The hypothesis was tested with a $2 \times 2 \times 6$ MANCOVA, with sibling type (identical twin, fraternal twin, full biological sibling, half-sibling, stepsibling, or adopted sibling), sex of participant, and sex of participant's sibling as the independent variables. Due to their conceptual similarity,

the dependent variables of emotional, esteem, network, information, and tangible support were analyzed together (average $r = .78$; Bartlett's test of sphericity $\chi^2\ (14) = 1501.42$, $p < .001$). To account for alternative explanations to the hypotheses, closeness, the amount of time the siblings have known each other, the amount of time the siblings lived together, how many other siblings they have, how far apart the siblings' live, and their age difference were entered as covariates. None of these covariates produced a significant effect, except for closeness ($\eta^2 = .45$), so to simplify the model all other covariates were removed from the final reported analysis. The MANCOVA produced significant multivariate main effects for sibling type, $\Lambda = .85$, $F\ (5, 357) = 2.33$, $p < .001$, $\eta^2 = .15$. Neither the main effect for participant sex, sex of the sibling, nor any of the interaction effects, was significant at the multivariate level.

Univariate analyses for sibling type produced significant main effects for emotional support, $F\ (5, 407) = 2.49$, $p = .031$, $\eta^2 = .03$; network support, $F\ (5, 407) = 3.42$, $p = .005$, $\eta^2 = .05$; informational support, $F\ (5, 407) = 2.81$, $p = .017$, $\eta^2 = .04$; and tangible support, $F\ (5, 407) = 3.00$, $p = .011$, $\eta^2 = .04$. There were no other significant main or interaction effects at the univariate level.

The hypothesis predicted that identical twins would receive the most social support, followed by fraternal twins and full siblings, followed by half-siblings, with adopted siblings and stepsiblings receiving the least social support. Due to the directional nature of the hypothesis, planned contrasts were conducted. Because five planned contrasts were conducted, a Bonferroni correction was used to protect against family-wise error of conducting multiple statistical tests ($p < .01$). Contrast coefficients were 3 for identical twins, 1 for fraternal twins and full biological siblings, -1 for half-siblings, and -2 for adoptive siblings and stepsiblings. The planned contrasts were significant for emotional support, $t\ (184.22) = 7.36$, $p < .001$; network support, $t\ (197.96) = 7.76$, $p < .001$; informational support, $t\ (203.43) = 7.44$, $p < .001$, and tangible support, $t\ (405) = 7.58$, $p < .001$. In these contrasts, corrected degrees of freedom are reported when the homogeneity assumption was violated. These results indicate that more genetically related siblings received more social support in the form of emotional, esteem, network, informational, and tangible support than did nongenetically related siblings. All means and standard deviations appear in Table 3. Hypothesis one was supported for emotional, network, informational, and tangible support.

TABLE 3
Means and Standard Deviations for Social Support by Sibling Type ($N = 411$)

Group	*Emotional*	*Esteem*	*Network*	*Informational*	*Tangible*
Identical Twins	$5.51/1.21_a$	$5.27/1.34$	$4.52/1.68_a$	$5.32/1.20_a$	$5.41/1.37_a$
Fraternal Twins	$4.91/1.34_b$	$4.68/1.49$	$4.04/1.41_b$	$4.68/1.33_b$	$4.67/1.52_b$
Full Siblings	$4.68/1.48_b$	$4.70/1.49$	$3.53/1.54_b$	$4.52/1.52_b$	$4.44/1.50_b$
Half-Siblings	$4.19/1.76_c$	$4.27/1.81$	$3.04/1.78_c$	$3.94/1.85_c$	$3.77/1.78_c$
Adopted Siblings	$4.13/1.84_d$	$3.89/1.82$	$2.92/1.58_d$	$3.70/1.68_d$	$3.74/1.66_d$
Stepsiblings	$3.59/1.63_d$	$3.83/1.71$	$2.87/1.67_d$	$3.58/1.78_d$	$3.54/1.74_d$

Note. Scores are on a scale of 1 to 7, wherein higher scores indicate a greater frequency of the type of social support received. Scores with different subscripts are significantly different from one another.

DISCUSSION

The present study investigated whether the genetic relatedness of siblings was related to amount of social support they received from their siblings. The predictions in this study were derived from the evolutionary ideas of discriminative parental solicitude (DPS). Evolutionary theories in general posit that psychological mechanisms are subject to evolutionary adaptations in the same way as physical characteristics. Thus, such physiological adaptations should include behaviors that promote genetic material being transferred to future generations.

In particular, DPS claims that parents discriminate in their resource allocation to their children, in order to serve their genetic fitness goals. In the current investigation, the rationale of these ideas was applied to sibling relationships. Consequently, the predictions derived from the logic of DPS accounts for why people provide more support to some sibling relationships than others. Specifically, it was hypothesized that sibling relationships with greater genetic relatedness would provide more social support than sibling relationship with less or no genetic relatedness.

The contribution of the current study lies in the demonstration that such a perspective can account for the discrimination in the use of socially supportive behaviors, which can have important implications for the health of individuals. As stated in the literature review, social support is associated with numerous physical, emotional, and physiological benefits, a logical conclusion of which is that those who receive more social support are advantaged in the evolutionary process in comparison to those who receive less social support. As such a resource, the communication of social support should be subject to the same adaptive mechanisms that cause people to invest discriminately in those to whom they are genetically related. In the case of sibling relationships, the result would be that siblings would invest more in biologically related siblings than non-biologically related siblings, and that siblings would invest more in biologically related siblings with greater genetic relatedness than in siblings with lesser genetic relatedness.

The hypothesis was logically derived from DPS. The prediction received support in the form of emotional, network, informational, and tangible support. Notably, the prediction in this study was supported even after controlling for the effects of closeness, age difference between siblings, the amount of time siblings had interacted as siblings, their proximity, the number of siblings a participant had, and the length of time siblings had lived together. Each of these covariates could be considered an alternative explanation for why some sibling relationships would give and receive more social support than others.

For example, it could be argued that full siblings are more socially supportive than stepsiblings because full siblings have known and lived with each other longer. This increased contact between full siblings as compared with stepsiblings could foster more supportive behaviors. Furthermore, research has demonstrated that siblings who are closer in age tend to be closer to one another than siblings of a greater age difference (Folwell, Chung, Nussbaum, Bethea, & Grant, 1997), which could foster the use of socially supportive behaviors. Many half-and stepsibling relationships have a greater variance in the age difference between siblings than full sibling relationships, and twins have no difference in age. Finally, people who have a larger number of siblings have more sources of support, making social support from a stepsibling relationship, for example, less important.

After accounting for these possible alternative explanations, we found that the sibling relationship type still exerted an influence on the amount of social support received for all types of social support when the social and relational variables were accounted for, and all but esteem

support when closeness was controlled. This is not to say that social or relational factors have no influence on the amount of social support people communicate to one another, but only that genetic relatedness has an influence on these behaviors over and above that of social and relational factors. Because siblings are a primary source of support along with the important health benefits of social support, these differences in support could have clinical significance in terms of the number of people's health that is improved.

Given the strong relationship between social support and closeness in the results, it is possible that genetic relatedness is one of several variables influencing closeness, which is one of the primary influences on the use of social support in the adult sibling relationship. The use of closeness as a covariate could be problematic because closeness both a relational factor and could also be a genetic factor.

For instance, researchers have found that similarity influences feelings of closeness in many relationships, and researchers studying adult sibling relationship have found a similar pattern (Folwell et al., 1997). For example, Folwell et al. (1997) found that siblings who share similarities in interests were closer than siblings who did not. Further, genetic relatedness plays into the relationship between similarity and closeness in that genetic relatedness is part of that similarity. Specifically, identical twins (100% genetic relatedness) are going to be very similar to one another, both in the way they look and in their personality characteristics.

Further, people are more likely to be similar to biological siblings than to nonbiological siblings, as biological siblings share approximately 50% of their genes. Thus, genetic relatedness plays a part in why siblings feel similar to one another, which has direct influence on closeness and consequently the use of social support (Cicirelli, 1995; Goetting, 1986). Consequently, genetic relatedness might have a different influence on social support than originally thought. One possibility is that closeness acts as a mediator between sibling relationship type and social support. However, further research will be needed to fully understand the relationship between these variables.

Buss (1999) argued that the sibling relationship would provide a rich context in which to test evolutionary ideas. In this study, sibling type accounted for an average of 3 to 4% of the variance in the amount of social support received. Although the effect sizes in this study are not particularly large, they still demonstrate that differences in genetic relatedness can influence our social behavior, in this case the use of social support in our sibling relationships. To determine what effect controlling for closeness had on the main effect of sibling type, we recomputed the analyses without including closeness as a covariate.

We found a significant effect for esteem support and in this case the average effect size for the five social support variables increased to about 11%. Furthermore, the covariate of closeness accounted for more 45% of the variance at the multivariate level. Again, it could be that closeness acts as a mediating variable in the relationship between genetic relatedness and social support and, more specifically, that genetic relatedness is one of many variables that influence closeness. In other words, genetic relatedness may have a direct influence on closeness, which has a direct influence on social support; consequently, genetic relatedness may have an indirect influence on social support by way of its direct influence on closeness.

There are several possible reasons that the effects sizes for genetic relatedness were not larger in this study. First, the nature of social support itself as a low-cost behavior could be a reason for the small effect sizes. Inclusive fitness theory and DPS argue that it is important that the behavior have a cost to the giver. Some behaviors, such as giving money, can have a high cost, as the givers

cannot use that money themselves, nor can they give that money to someone else. However, it is difficult to apply the same cost principles to social support. If people give away social support to one person, this does not necessarily limit their ability to give it to others. Furthermore, the only direct costs of giving social support are time and energy, as opposed to more tangible resources such as money. Consequently, the use of social support (or any other social behavior) might not be the strongest test of these ideas.

Second, a different test of these relationships may yield stronger effects. Specifically, the current study was conceived and conducted as a between-subjects test. Although this procedure allowed us to examine all six sibling relationships at once, and has been used in other tests of evolutionary theory (e.g., Floyd & Morman, 2001) the widely different situations of each participant could be a source of disruption in the statistical tests. Thus, a within-subjects test that compares the use of social support in individuals who have both a full and stepsibling, for example, might provide a more accurate picture of the differences between these sibling types.

There were several strengths worth noting in the present study. First, this study is probably one of the few that has examined all six different types of sibling relationships in comparison to one another, as there are no published studies that have conducted this type of research. Buss (1999) argued that the examination of sibling relationships would provide a good test of evolutionary theory, because sibling relationships have such diversity in genetic relatedness. Consequently, this study not only represents a new direction for studies using evolutionary arguments, it also demonstrates support for these ideas.

In addition, the use of covariates in the study allowed for the differentiating of social and biological differences in the use of socially supportive behaviors. The use of covariates provides confidence that alternative explanations have been accounted for, and that the results are due to the explanation provided. In other words, researchers can have confidence that at least part of the reason that siblings are more supportive with some types of siblings more than others is due to the type of relationship, and thus the amount of genetic relatedness they share or do not share.

Future Research

Although the current study lends support for the application of socioevolutionary theory to the study of siblings' communication, future research should try to further differentiate the influence of biological and social factors in the use of social support behaviors between sibling types. As discussed in the literature review, this is a difficult proposition because of the interconnected nature of biological and social differences. However, in this study we controlled for many of the social/relational differences and still discovered significant differences between sibling types. Thus, we believe that at least part of these differences in social support use is due to biological differences between sibling types. However, the question still remains, how much variance do to biological and social differences account for with respect to the use of socially supportive behaviors? Future studies are needed to get a more complete understanding.

Second, this study has assumed that all social support is helpful and beneficial for sibling relationships. While we believe that most social support is desired and beneficial, we understand that is not always the case. For example, a sibling might give social support that is not needed or desired. Thus, there is a possible downside of social support which might be interesting for future research to explore.

Third, researchers could explore in greater detail the links between contact between siblings, communication, and social support. Because full siblings remain in greater contact with each other than half-siblings or stepsiblings (White & Riedmann, 1992), the extent to how they communicate (e.g., self-disclose, confide) with each other may be linked with not only their use of socially supportive behaviors, but also to the type of sibling relationship in which they are engaged. In addition, there are other variables that could be explored as potential resources in sibling relationships. Affectionate communication, self-disclosure, and even relational maintenance could be potential variables worth exploring in a similar manner.

We are encouraged by the discoveries made in the present study, the support for evolutionary ideas, and the application these findings can have for sibling relationships. These findings can lay the foundation for future research examining sibling relationships and the benefits of prosocial behavior such as social support.

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