

Emerging adults' use of communication technologies with their siblings: Associations with sibling relationship quality

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Abstract

Informed by the Couple and Family Technology (CFT) framework, the present study aimed to examine how the use of different communication modalities is associated with sibling relationship quality in emerging adulthood. The four communication modalities were face-to-face communication, synchronous communication technologies, asynchronous communication technologies, and social media. The sample consists of 275 emerging adults aged between 18- to 29-years-old, who had a living, biological sibling. Results of a Hierarchical Multiple Regression revealed that frequency of face-to-face communication was negatively associated with sibling relationship quality throughout all steps. In addition, geographic distance moderated the relationship between face-to-face communication and sibling relationship quality – the closer they live with each other, the stronger the negative relationship became. Another two moderation effects emerged in this study. First, gender dyads moderated the relationship between asynchronous communication frequency and sibling relationship quality. As the frequency of asynchronous communication increases, the relationship quality of sister-sister pairs was significantly less close than brother-brother and mixed-gender pairs. Second, gender dyads moderated the relationship between the frequency of social media usage and sibling relationship quality. For brother-brother pairs and mixed-gender pairs, the frequency of social media usage was negatively related to sibling relationship quality. Whereas for sister-sister pairs, frequency of social media usage was positively associated with sibling relationship quality.

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Chapter 1 - Introduction

Sibling bonds are often the longest-lasting and most enduring relationships that humans will experience in their lifetime (Cicirelli, 1995). In 2010, 82.22% of American youth aged 18 and under lived with at least one sibling, while 78.19% of them had a father figure living in the same household (McHale et al., 2012). However, sibling relationships have received little attention from family scholars or researchers studying close relationships - only around 2% of all studies on close relationships published between 1990 and 2011 focused directly on sibling relationships (McHale et al., 2012). Further, most of the existing literature on sibling relationships focuses on childhood or adolescence (Finzi-Dottan & Cohen, 2011; Spitz & Trent, 2006). Although recently some researchers started to focus on sibling relationships in middle and later adulthood (Dew et al., 2011; Gilligan et al., 2013; Lu, 2007), additional research on sibling relationships in young adulthood is still needed (Jensen et al., 2013; Portner & Riggs, 2016).

Emerging adults usually experience great instability and frequent life changes (Arnett & Mitra, 2020), and their sibling relationships can change dramatically during this time (Halliwell, 2016). Sibling relationships in adulthood are often maintained at a distance through the use of communication technologies and periodic visits (Cicirelli, 1995). The Couple and Family Technology (CFT) Framework posits that technology can affect couple and family relationships both negatively and positively in the dimensions of roles, rules, boundaries, as well as relationship development, maintenance, and dissolution (Hertlein & Ancheta, 2014). The purpose of this study is to examine how the use of different communication modalities (i.e., synchronous and asynchronous communication technologies, social media, and face-to-face) is associated with sibling relationship quality among emerging adults.

Chapter 2 - Literature Review

Sibling Relationships in Emerging Adulthood

Arnett (2000) identified and conceptualized a new period in the life course – emerging adulthood, which is thought to be theoretically and empirically distinct from adolescence and young adulthood. Emerging adulthood is a transition period between adolescence and young adulthood, but is also long enough to become a separate period of the life course (Arnett, 2000; Arnett, 2007). Arnett proposed that emerging adulthood lasts from 18- to 29-years-old (Arnett et al., 2014). Emerging adulthood is a time when people start to explore various possibilities and develop a more definite identity (Arnett & Mitra, 2020). The explorations also bring instability and frequent life changes (e.g., residential and job changes) to emerging adults (Arnett & Mitra, 2020).

Siblings can influence one's behaviors and development across the life span because sibling bonds are often the longest-lasting relationships in one's life (Cicirelli, 1995). Although most sibling relationships are ascribed (through birth or legal actions) at the beginning (Cicirelli, 1995), sibling relationships in adulthood become more voluntary (Hamwey et al., 2019; Killoren et al., 2014; Rocca et al., 2010). It is worthwhile to explore how emerging adults maintain their sibling relationships during this transition period compared with their relationships in adolescence (Scharf et al., 2005). Researchers have found that sibling relationships in emerging adulthood can change dramatically, and one reason is that they no longer live together (Halliwell, 2016). Compared with the sibling relationship in childhood or adolescence, emerging adults reported more positive sibling relationships (Halliwell, 2016; Hamwey et al., 2019; Milevsky & Heerwagen, 2013; Scharf et al., 2005), fewer conflicts and rivalry (Hamwey et al., 2019; Scharf et al., 2005), and more mature perceptions of their sibling relationships (Milevsky & Heerwagen,

2013; Scharf et al., 2005). Meanwhile, negative effects on sibling relationships such as reduced sibling closeness, struggles, and disappointment caused by the geographic distance in emerging adulthood were also found (Halliwell, 2016; Milevsky et al., 2005).

In addition, communication and contact between siblings become less frequent in emerging adulthood due to the geographic distance (Hamwey et al., 2019; Portner & Riggs, 2016). However, siblings often communicate with each other through communication technologies like phone calls, video calls, texting, email, and social media (Hamwey et al., 2019; Killoren et al., 2014; Lindell et al., 2015; Van Volkom & Beaudoin, 2016). It is important to know how different patterns of communication technology use affects sibling relationship maintenance (Lindell et al., 2015). Moreover, how siblings communicate with each other during their transition to adulthood may provide an indication of how they will build the basis of their adult sibling relationship (Halliwell, 2016).

Studies on sibling relationships also indicated that the role of gender needs to be considered for a better understanding of sibling relationships in emerging adulthood (Scharf et al., 2005). Among research on sibling relationships in emerging adulthood, some have examined the role of gender on sibling relationships (Hamwey et al., 2019; Killoren et al., 2014, 2016; Riggio, 2006; Scharf et al., 2005; Shortt & Gottman, 1997; Spitze & Trent, 2006; Stewart et al., 1998; Volkom & Beaudoin, 2016), but the findings were mixed. For example, some studies indicated that sister-sister pairs had greater intimacy and affection, more frequent contact (Killoren et al., 2014; Spitze & Trent, 2006; Stewart et al., 1998), and more positive and satisfying relationships than other gender pairs (Riggio, 2006). One study also found that both brothers and sisters had more frequent contact with their sisters than brothers (Hamwey et al., 2019). However, other studies found no differences between different gender pairs on sibling

relationship quality (Scharf et al., 2005; Shortt & Gottman, 1997) or frequency of contact (Van Volkom & Beaudoin, 2016).

The birth order of siblings also can affect sibling relationships (Rocca et al., 2010). Female adolescents reported more emotional exchanges with younger sisters than with older sisters (Scharf et al., 2005). Compared with the oldest and youngest children, the middle children reported the highest level of emotional closeness to siblings, and they were most likely to turn to siblings for support during difficult times (Van Volkom & Beaudoin, 2016). The age spacing between siblings is another factor that influences sibling relationships (McHale et al., 2012). Siblings of similar age reported more conflict than siblings with a larger age gap (Milevsky et al., 2005). Another study found that age spacing was negatively correlated with recollections of childhood relationship quality and interaction (Riggio, 2006).

Completing education is one of the main life transitions that happen in emerging adulthood (Arnett, 2007). Though it is a common reason for emerging adults to leave home, siblings' education experiences may vary widely even in the same family (e.g., receiving different parental financial support for education), and their relationships can be influenced because of that (Conger & Little, 2010). Thus, some researchers also put education level into consideration when studying sibling relationships in emerging adulthood (Jensen et al., 2013, 2018).

Communication Technologies and Emerging Adults

Significant changes and development in communication technologies have occurred even in the last 10 years (Hessel & Dworkin, 2018). Communication technologies have become more and more affordable and user-friendly, and enable people to communicate with each other in a number of ways even at a great geographical distance (Hertlein, 2012).

Different types of communication technologies can be distinguished by several features (Rabby & Walther, 2003). The most distinctive feature is the media synchronicity, which is defined as the degree of synchronicity that a communication technology enables individuals to achieve (Dennis et al., 2008; Rabby & Walther, 2003). Synchronous communication technologies facilitate real-time communication, whereas asynchronous technologies do not require the sender and reader to be online at the same time (Rabby & Walther, 2003). When utilizing asynchronous technologies like email, the user is able to construct the message carefully and edit it before sending it (Rabby & Walther, 2003). Another distinction identified by Rabby and Walther (2003) is about who the audience is. Some communication technologies allow the sender to control who will receive and read the messages (e.g., email), and other forms allow the sender to post information that is open to anyone who has access to (e.g., Facebook, Twitter).

Emerging adults of today are raised in a world that is permeated with media – they have been socialized by media for 18 years by the time they leave adolescence (Coyne et al., 2013). Ninety-nine percent of 18- to 29-year-old American emerging adults are cellphone owners, 96% own a smartphone (Pew Research Center, 2019a), and 90% use social media (Pew Research Center, 2019b).

Considering the changes in family dynamics during emerging adulthood, the emergence of new communication technologies, and the prevalence of communication technology usage among emerging adults, updated research is needed (Hessel & Dworkin, 2018). Emerging adults have been found to utilize a variety of communication technologies to connect with parents (Gentzler et al., 2011; Kanter et al., 2012; Schon, 2014), siblings (Killoren et al., 2014; Lindell et al., 2015), and grandparents (Rempusheski et al., 2012). In general, communication frequency, the number of media used, and the frequency of emerging adults initiating contact were

positively associated with relationship quality between emerging adults and their family members (Hessel & Dworkin, 2018). However, there still remains a large gap in the current research of the interrelationship between emerging adulthood, communication technology, and family relationships (Hessel & Dworkin, 2018).

Communication Technology and Family Relations

Despite the prevalence of media and communication technologies in today's society and the tremendous impact they have brought to people's lives, empirical studies regarding the effects of communication technologies on family life are still very limited (Blumer et al., 2014; Hughes & Hans, 2001; Lanigan, 2009). For example, a literature review study only found 45 articles published between 1998 and 2013 that focused on the relationship between communication technologies and family functioning (Carvalho et al., 2015).

Among the existing literature, the effects of communication technologies on family relations have been examined in the context of maintaining family relationships at a great geographical distance (Bacigalupe & Lambe, 2011; Mickus & Luz, 2002; Şenyüreklii & Detzner, 2009), romantic relationships (Coyne et al., 2011; Rappleyea et al., 2014), parent-child relationships (Kanter et al., 2012; Lee et al., 2009; Rudi et al., 2015; Schon, 2014; Williams & Merten, 2011), co-parenting relationships after divorce (Ganong et al., 2012), and marital (or committed romantic) relationships after one committed cybersex (Schneider et al., 2012). When maintaining family relationships through communication technologies, females have more frequent and longer communication with immediate family members (Lee et al., 2009). For example, compared with males, females are more likely to use email to communicate with families and email more types of family members (e.g., siblings, extended families). In addition, women are more likely than men to report that the use of email enhances their family

relationship quality (Chesley & Fox, 2012). A study conducted among young people aged 11- to 17-years-old found that mobile phone was regularly used between young people and their parents for the reasons of convenience, safety, and managing family life and social lives (Devitt & Roker, 2009). Further, most parents preferred making phone calls than texting their children (Devitt & Roker, 2009). Others found that having a parent as a “friend” on Facebook was associated with decreased conflict in parent-child relationships (Kanter et al., 2012). When communicating with grandparents, 76.1% of the emerging adults used telephones, 19.1% used emails, while only 3% of the sample used texting (Rempusheski et al., 2012).

Although researchers have examined the use of communication technologies within families, a thorough search of the literature yielded only two studies dedicated to exploring how the use of communication technologies affects sibling relationships (Killoren et al., 2014; Lindell et al., 2015). A study conducted among Mexican American college students revealed that face-to-face communication and texting were mostly used by siblings, and video chat and email were the least used. The quality of the sibling relationship was positively related to communication frequency among participants (Killoren et al., 2014).

Through cluster analysis, Lindell and colleagues (2015) identified four distinct groups among first-year college students based on their communication patterns with their siblings. Participants in the synchronous communication group mainly made telephone calls, text messages, or had in-person communication with siblings. The technological communication group included participants who frequently communicated with siblings through technologies, but rarely had in-person communication. The passive communication group was characterized by participants who frequently reviewed their siblings’ posts on social media, but hardly used other forms of communication technology. Participants in the low communication group had a low

frequency of communication with their siblings through all types of communication technologies (Lindell et al., 2015). The authors found that participants in the technological communication group and the synchronous group reported the most positive sibling relationships, while participants in the low communication group reported less positive sibling relationships (Lindell et al., 2015). Although Lindell and colleagues shed light on how sibling relationship quality is related to different kinds of communication technology usage, only first-year college students were included in this study, which means the participants were mostly 18- to 19-years-old and students who were not in freshmen year were not included in this study. Besides, face-to-face communication was included in the synchronous communication group with telephone calls and texting, which lost nuanced insights of whether in-person communications and communication facilitated by communication technologies have different effects on sibling relationships.

The Couple and Family Technology Framework

The lack of theoretical and conceptual models that aim to describe how communication technology plays a role in family relationships has caught researchers' attention (Hertlein, 2012; Lanigan, 2009). Lanigan's (2009) Sociotechnological Model and Hertlein's (2012) Multitheoretical Model allowed for rich explorations on how families function in a new online world (Hessel & Dworkin, 2018).

Hertlein and Blumer (2013) further developed the Multitheoretical Model into the Couple and Family Technology (CFT) framework. The basic assumption of the CFT framework is that technology can affect couple and family relationships both negatively and positively in the dimensions of roles, rules, boundaries, as well as relationship development, maintenance, and dissolution (Hertlein & Ancheta, 2014). The development of the CFT framework was on the basis of integrating three perspectives in family science: the family ecology perspective, the

structural-functional perspective, and the interaction-constructionist perspective (Hertlein & Blumer, 2013). The family ecology perspective emphasizes how the environment (which is the properties of internet and technologies in this framework) brings changes to family relationships. The framework identified two types of changes that technologies can bring into families – changes to relationship structure and changes to relationship processes (Hertlein, 2012). The structural-functional perspective (Johnson, 1971) informs the changes to relationship structures, which include the family rules, boundaries, and roles. The changes to relationship processes include relationship initiation, maintenance, and dissolution, stemmed from the interaction-constructionist perspective (Berger & Kellner, 1970). The seven properties of internet and communication technologies, which is the ecological influences, are accessibility, affordability, anonymity, acceptability, approximation, ambiguity, and accommodation (Hertlein, 2012). The three components aforementioned – ecological influences, structure changes, and process changes – are interconnected with one another (Hertlein, 2012; Hertlein & Blumer, 2013).

Although newly developed, Carvalho and colleagues (2015) regarded the CFT framework as the most useful framework for understanding how family functioning can be effected through the usage of communication technologies. The CFT framework has been utilized as a guiding framework for studies focused on romantic and couple relationships (Northrup & Smith, 2016; Norton et al., 2018), parent-child relationships (Padilla-Walker et al., 2018), immigrant families (Khvorostianov, 2016), and relationships between adoptive family and birth family members (Black et al., 2016).

Among the seven ecological influences proposed by Hertlein (2012), I mainly focused on how the approximation is associated with sibling relationship quality in emerging adulthood. Approximation is the capability for internet and communication technologies to approximate

face-to-face and real-world situations, which is an essential and powerful characteristic for separated family members to maintain closeness (Hertlein, 2012). Talking through synchronous communication technologies are approximate to face-to-face communication, whereas asynchronous communication technologies more closely resemble paper and pencil exchanges (Rabby & Walther, 2003).

Present Study

Communication technologies are playing an important role in maintaining preexisting relationships and strengthening family bonds among families that are geographically separated (Carvalho et al., 2015). Siblings usually have intimate daily contact within the home in childhood and adolescence, while sibling relationships in adulthood are often maintained at a distance through the use of communication technologies and periodic visits (Cicirelli, 1995). The CFT framework proposed that communication technologies can bring changes to family structures as well as family processes. In order to gain a better understanding of the role of communication technologies in sibling relationships among emerging adults, the present study aimed to examine how the use of different communication technologies is associated with sibling relationship quality among emerging adults. More specifically, the communication technologies will be divided into three categories based on their features: synchronous communication, asynchronous communication, and social media. Besides, a qualitative study revealed that some siblings believed face-to-face communication is more meaningful for their sibling relationships (Hamwey et al., 2019). But researchers have yet to examine quantitatively how face-to-face communication is related to sibling relationship quality compared with communication facilitated by communication technologies. Thus, the present study also aims to fill these gaps through using a much broader sample that includes the full range of emerging adults aged

between 18- and 29-years-old and separately examining how face-to-face communication related to sibling relationship quality.

The following research questions will be tested:

1. How is the frequency of synchronous communication technology usage with siblings associated with sibling relationship quality in emerging adulthood?
2. How is the frequency of asynchronous communication technologies usage with siblings associated with sibling relationship quality in emerging adulthood?
3. How is the frequency of social media usage with siblings associated with sibling relationship quality in emerging adulthood?
4. How is the frequency of face-to-face communication with siblings associated with sibling relationship quality in emerging adulthood?
5. How do the gender dyad of siblings and geographical distance moderate the relationship between communication technology usage and sibling relationship quality in emerging adulthood?

Chapter 3 - Method

Participants

Participants for this study were drawn from a larger research project ($N = 444$) that aimed at examining emerging adults' relationships with their grandparents and siblings. Amazon Mechanical Turk (MTurk) was utilized to recruit participants and collect data. Participants were paid \$0.75 to \$1.00 for completing the survey. Participants who agreed to participate were directed to an online Qualtrics survey. An informed consent statement was provided to participants before they took the survey.

To be eligible for the present study, participants had to have had a living, biological sibling. Of the 444 participants in the original sample, 312 participants met this criterion. Another 13 participants were removed because they did not provide key demographic information (e.g., their own or their siblings' gender, siblings' age) and 10 participants were removed because of excessive missingness (no responses or only limited responses were provided for entire scales). Further, 14 participants were excluded due to nonsensical responses. A total of 275 participants were included in the sample for the present study. Participants were asked to report on the sibling they feel closest to.

All participants were between 18- and 29-years-old ($M = 25.0$, $SD = 3.0$), and the siblings that they reported on aged from 7 to 52- years-old ($M = 23.7$, $SD = 6.7$). The sample consisted of slightly more men (53.8%; $N = 148$) than women (46.2%; $N = 127$). The siblings that they reported on consisted of 158 (57.5%) men and 117 (42.5%) women. The majority of the participants (72%) identified as Non-Hispanic White. Most attended college and either graduated with an associate's degree (13.8%), a Bachelor's degree (41.1%), or had not graduated (22.2%), and most were employed full-time (75.3%). Most of the participants lived in close proximity to

their siblings (59.6%); 30.9% of the emerging adults were living in the same household with the siblings that they reported on, and 28.7% of them were living under 25 miles from their sibling.

Please see Table 1 for complete participants' demographic information.

Table 3.1

Participants Descriptive Statistics (N = 275)

Variables	N	%
Gender		
Men	148	53.8
Women	127	46.2
Race/Ethnicity		
American Indian or Alaska Native	5	1.8
Asian or Pacific Islander	14	5.1
Black or African American	23	8.4
Hispanic or Latino	28	10.2
Non-Hispanic White	198	72
More than one racial identity	6	2.2
Missing	1	0.4
Education		
Less than high school	1	0.4
Graduated high school or passed high school equivalency test	27	9.8
Some college	61	22.2
Graduated from college with an associate degree	38	13.8
Graduated from college with a B.S., B.A., or equivalent	113	41.1
Post graduate professional degree (such as M.A., M.S., Ph.D., M.D.)	35	12.7
Employment status		
Employed full-time	207	75.3
Employed part-time	34	12.4
Out of work and looking for work	5	1.8
Out of work, but currently not looking for work	1	0.3
Stay at home parent/person	10	3.7
Student	19	7
Distance from sibling		
Same household	85	30.9
Under 25 miles (easy driving)	79	28.7
25 to 50 miles (within an hour's drive)	37	13.5
50 to 250 miles (within half a day's drive)	34	12.4

250 to 500 miles (within a day's drive)	7	2.5
More than 500 miles (an airplane flight, or more than a day's journey)	33	12
Siblings' gender		
Men	158	57.5
Women	117	42.5
Birth order		
Participants were older	163	59.3
Participants were not older	112	40.7

Measures

Communication Frequency

The frequency of communication technology usage, as well as face-to-face communication with siblings, was assessed by a modified version of the Interactive Strategies for Interpersonal Communication Scale (ISICS; Wilkins-Clark et al., 2020). This measurement was designed to assess how often individuals utilize various communication methods to communicate with another person (Wilkins-Clark et al., 2020). Each method was rated from 1 (*never*) to 10 (*multiple times a day*; $\alpha = 0.86$). Based on the features of different communication technologies, four subscales were created for the purpose of this study. The synchronous subscale included telephone and video calls ($\alpha = 0.59$). The asynchronous subscale consisted of text and email ($\alpha = 0.51$). The social media subscale included Facebook, Twitter, Instagram, and Snapchat ($\alpha = 0.87$). The frequency of face-to-face interaction was assessed through a single item (see Appendix A for a full list of survey questions used).

Sibling Relationship Quality

The Lifespan Sibling Relationship Scale (LSRS) was utilized to measure the current sibling relationship quality (Riggio, 2000). The LSRS was designed to assess individuals' overall attitudes toward their adult sibling relationship through three subscales: affection, cognition, and behavior (Riggio, 2000). Participants reported on the sibling that they feel closest to. Examples

for each subscale include “I enjoy my relationship with my sibling” (affection), “my sibling is very important in my life” (cognition), “my sibling talks to me about personal problems” (behavior). Participants rated on a 5-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*) for each item ($\alpha = .93$). One item (“I call my sibling on the telephone frequently”) was removed from the original scale in order to avoid repetition with another item in the ISICS.

Covariates and Moderator

The education level, birth order, and age spacing between siblings were measured and examined as covariates. First, education level was assessed on a scale of 1 (*less than high school*) to 6 (*postgraduate professional degree*). Whether the participants have attended college was the main concern of the present study. Participants’ education level was dummy coded as 1 (*attended college*) and 0 (*did not attend college*). Second, participants were asked to report their own as well as their sibling’s age. Third, birth order was dummy coded as 1 (*older*) and 0 (*not older*).

The gender dyads of siblings and geographic distance were examined as moderators between communication frequency and sibling relationship quality. Whether the sister-sister dyads are different from other gender dyads was of the main interest of the present study, as some studies have found out that sister-sister pairs had more frequent contact and more positive and satisfying relationships than do other gender pairs (Killoren et al., 2014; Spitze & Trent, 2006; Stewart et al., 1998). Thus, the gender dyads were coded as 1 (sister-sister dyads) and 0 (not sister-sister dyads). Lastly, geographic distance was measured on a scale of 1 (*same household*) to 6 (*more than 500 miles*).

Analysis

As the first step, bivariate correlations were computed among communication frequency, sibling relationship quality, and all covariates and moderators. Next, the Hierarchical Multiple Regression (HMR) was utilized for data analysis. The sibling relationship quality was treated as the outcome variable. The first step controlled for participants' education level, birth order, and age spacing between siblings. The second step included the frequency of face-to-face communication, synchronous communication technology usage, asynchronous communication technology usage, and social media usage between siblings. The gender dyads and geographic distance were added in the third step. As the last step, the interaction of gender dyads, geographic distance, and frequency of each communication modality were computed to test if gender dyads and geographic distance moderated the relationship between communication frequency and sibling relationship quality. All data analysis was conducted through SPSS Statistics.

Chapter 4 - Results

Bivariate Correlations

As shown in Table 4.1, the frequency of face-to-face communication was positively correlated with the frequency of synchronous communication ($r = .39, p < .01$), asynchronous communication ($r = .38, p < .01$), and social media communication ($r = .14, p < .05$), while negatively correlated with sibling relationship quality ($r = -.17, p < .01$) and geographic distance between siblings ($r = -.45, p < .01$). Synchronous communication was positively related to asynchronous communication frequency ($r = .69, p < .01$) and social media communication frequency ($r = .61, p < .01$), while negatively related to geographic distance between siblings ($r = -.13, p < .05$). Geographic distance and gender dyads was positively related to each other ($r = .18, p < .01$).

On average, participants in this study most frequently used social media ($M = 7.5, SD = 2.3$) to communicate with their siblings, followed by asynchronous communication technologies ($M = 6.9, SD = 2.2$) and synchronous communication technologies ($M = 6.8, SD = 2.3$). In-person communication ($M = 6.1, SD = 2.9$) happened the least frequent between siblings.

Table 4.1

Bivariate Correlations and Descriptive Statistics for Main Variables

Variables	1	2	3	4	5	6	7
1. Face to face	-						
2. Synchronous	.39**	-					
3. Asynchronous	.38**	.69**	-				
4. Social media	.14*	.61**	.60**	-			
5. Sibling Relationship Quality	-.17**	-.07	-.08	-.01	-		

6. Geographic distance	-.45**	-.13*	-.07	.09	.10	-	
7. Gender dyads ^a	-.09	.04	.02	.09	.03	.18**	-
M	6.1	6.8	6.9	7.5	2.4	2.6	.24
SD	2.9	2.3	2.2	2.3	0.7	1.6	.43
α		.59	.51	.87	.93		

^aGender dyad: 1=sister-sister dyads, 0=not sister-sister dyads

* $p < .05$. ** $p < .01$

Hierarchical Multiple Regression Analysis

The results of the hierarchical regression (Table 4.2) showed that the three control variables had no significant contribution to the model, $R^2=.01$, $F(3,271) = 1.32$, $p = .267$. When the frequency of four communication modalities usage was introduced, the R square increased a little bit. Among the four communication modalities, the frequency of face-to-face communication was negatively associated with sibling relationship quality, $\beta = -.16$, $p < .05$.

When gender dyads and geographic distance were added in the model, the R square almost remained the same, and the significance of face-to-face communication frequency ($\beta = -.16$, $p < .05$) remained as well. However, the R square significantly increased after all the interaction terms were added, $R^2 = .14$, $F(17,257) = 2.41$, $p < .01$. The last step explained the 13.8% variance in the Regression model. The negative contribution from the frequency of face-to-face communication to sibling relationship quality remained significant after the interaction terms were added ($\beta = -.19$, $p < .05$).

Table 4.2

Hierarchical Multiple Regression for Predicting Sibling Relationship Quality (N = 275)

Steps and predictors	R ²	R ² Change	B	SE	β	p
Step 1	.01	.01				

Age spacing			.02	.01	.10	.115
Birth order			-.06	.09	-.04	.480
Education level			.15	.14	.07	.281
Step 2	.04	.03				
Age spacing			.02	.01	.09	.137
Birth order			-.05	.09	-.04	.532
Education level			.19	.14	.08	.175
Face-to-face ^a			-.04	.02	-.16	.017**
Synchronous ^a			-.00	.03	-.01	.903
Asynchronous ^a			-.00	.03	-.03	.755
Social media ^a			.01	.03	.05	.580
Step 3	.05	.01				
Age spacing			.02	.01	.09	.141
Birth order			-.05	.09	-.03	.586
Education level			.19	.14	.08	.175
Face- to- face ^a			-.04	.02	-.16	.040*
Synchronous ^a			-.00	.03	-.00	.920
Asynchronous ^a			-.00	.03	-.03	.743
Social media ^a			.01	.03	.04	.602
Geographic distance ^a			.00	.03	.02	.828
Gender dyad			-.00	.10	-.00	.977
Step 4	.14	.09**				
Age spacing			.01	.01	.08	.173
Birth order			-.03	.09	-.02	.757
Education level			.18	.14	.08	.205
Face-to-face ^a			-.05	.02	-.19	.029*
Synchronous ^a			-.04	.03	-.14	.202
Asynchronous ^a			.05	.03	.15	.134
Social media ^a			-.01	.03	-.04	.628
Geographic distance ^a			.01	.03	.02	.737
Gender dyad			-.02	.10	-.01	.858
Face-to-face ^a ×			.02	.01	.20	.005**
Geographic distance ^a						
Synchronous ^a ×			-.00	.02	-.00	.961
Geographic distance ^a						
Asynchronous ^a ×			-.01	.02	-.06	.519
Geographic distance ^a						
Social media ^a ×			.01	.02	.07	.363
Geographic distance ^a						
Face-to-face ^a ×			-.01	.04	-.03	.722
Gender dyad						
Synchronous ^a ×			.11	.06	.20	.072
Gender dyad						

Asynchronous ^a × Gender dyad	-.19	.07	-.29	.004**
Social media ^a × Gender dyad	.139	.06	.21	.023*

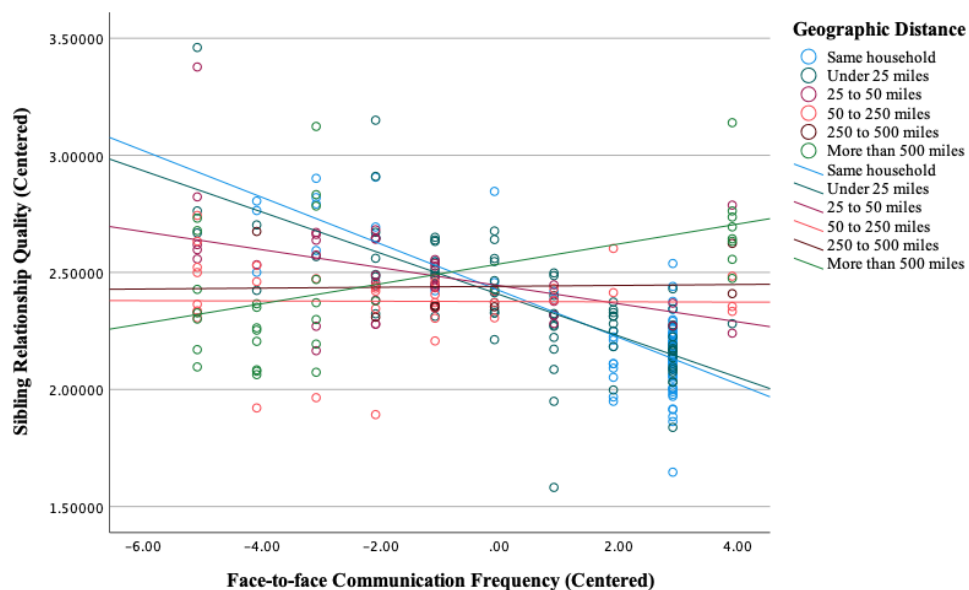
^aCentered variables.

* $p < .05$. ** $p < .01$

Among all the interaction terms, the interaction between face-to-face communication and geographic distance ($\beta = .20, p < .01$), the interaction between gender dyads and asynchronous communication frequency ($\beta = -.29, p < .01$), as well as the interaction between gender dyads and social media communication frequency were significant ($\beta = .21, p < .05$).

According to Figure 4.1, geographic distance moderated the relationship between face-to-face communication and sibling relationship quality. When siblings lived in close proximity to each other, face-to-face communication frequency was negatively related to sibling relationship quality. As the geographic distance became larger, the negative relationship became more moderate. And when siblings lived more than 500 miles away from each other the sibling relationship quality was positively associated with face-to-face communication.

Figure 4.1 Interaction Between Face-to-face Communication Frequency and Geographic Distance When Predicting Sibling Relationship Quality



As shown in Figure 4.2, gender dyads moderated the relationship between asynchronous communication frequency and sibling relationship quality. The sibling relationship quality was negatively correlated with asynchronous communication frequency for all gender dyads, but the negative relationship was more significant for sister-sister dyads.

Figure 4.2 Interaction Between Asynchronous Communication Frequency and Gender Dyads When Predicting Sibling Relationship Quality

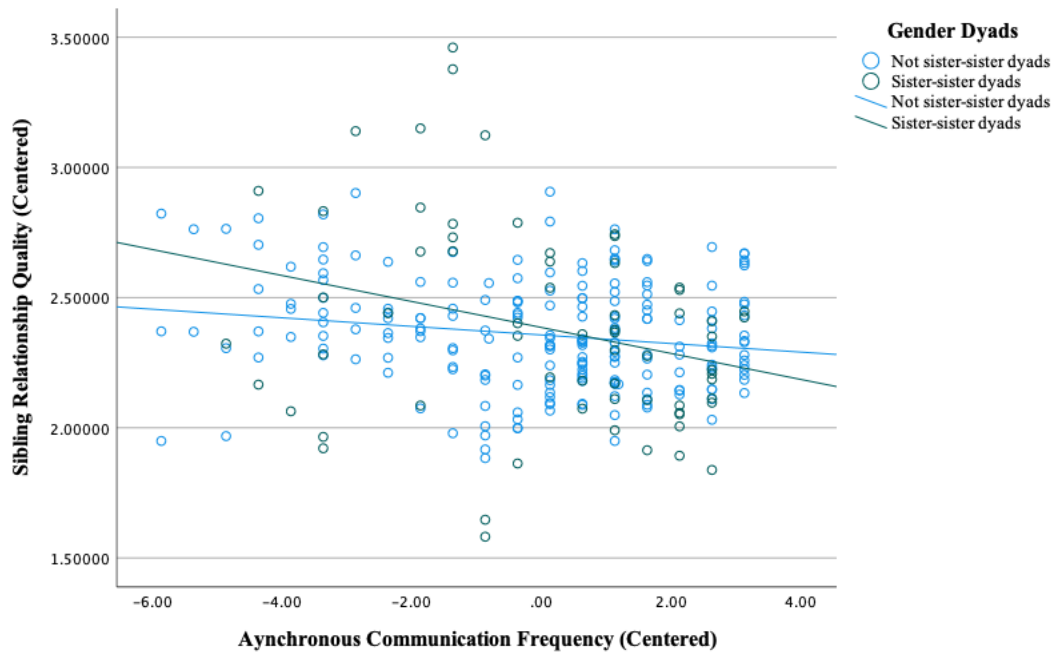
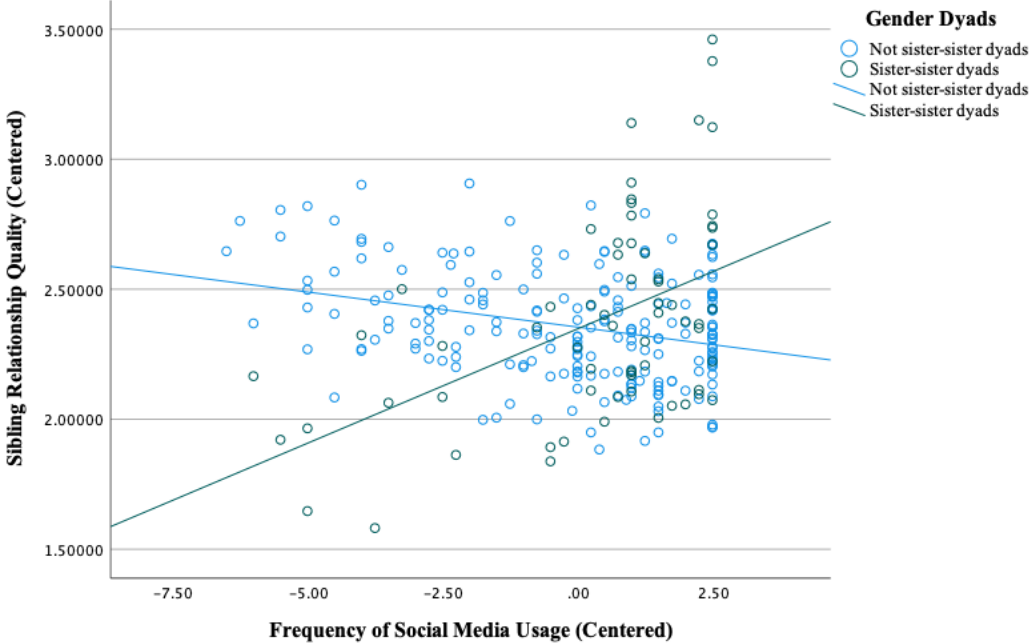


Figure 4.3 revealed that gender dyads moderated the relationship between the frequency of social media usage and sibling relationship quality. The sibling relationship quality was positively correlated with social media usage for sister-sister dyads, but negatively correlated with social media usage for other gender pairs.

Figure 4.3 Interaction Between Frequency of Social Media Usage and Gender Dyads When Predicting Sibling Relationship Quality



Chapter 5 - Discussion

The Couple and Family Technology framework posits that technology can affect couple and family relationships both negatively and positively in relationship maintenance (Hertlein & Ancheta, 2014). Emerging adults often maintain relationships with their siblings through communication technologies like phone calls, video calls, texting, email, and social media (Hamwey et al., 2019; Killoren et al., 2014; Lindell et al., 2015; Van Volkom & Beaudoin, 2016). The present study aimed to examine how face-to-face communication, as well as the use of different communication technologies, are associated with sibling relationship quality among emerging adults. The results revealed that the frequency of face-to-face communication was negatively correlated with sibling relationship quality, and the geographic distance moderated the relationship between face-to-face communication and sibling relationship quality. Another two moderation effects of gender dyads emerged in this study. The gender dyads moderated the relationship between the frequency of asynchronous communication and sibling relationship quality, and also moderated the relationship between the frequency of social media usage and sibling relationship quality.

Communication Frequency and Sibling Relationship Quality

In the present study, the communication technologies were divided into three categories based on their approximation, which is one of the seven features of technologies identified by the CFT framework (Hertlein, 2012). The synchronous communication technologies are phone calls and video calls; the asynchronous communication technologies are text and email; and social media are Facebook, Twitter, Instagram, and Snapchat. The age spacing, birth order, and education level were tested as control variables. However, the results revealed that none of those three variables had significant contributions to sibling relationship quality.

Face-to-face communication and sibling relationship quality

Currently, no quantitative study directly examined how face-to-face communication is related to sibling relationship quality compared with communication facilitated by communication technologies. Hamwey and colleagues (2019) conducted a qualitative study and reported that some siblings believed face-to-face communication is more meaningful for their sibling relationships. However, results from this study showed that the frequency of face-to-face communication was negatively associated with sibling relationship quality throughout all steps. Moreover, the moderation effect revealed that when siblings lived in the same household, face-to-face communication had the strongest negative relationship with sibling relationship quality. As the geographic distance became larger, the negative relationship became more and more moderate. And when siblings lived more than 500 miles away from each other, the sibling relationship quality had a significant positive relationship with face-to-face communication.

According to Table 4.1, the frequency of face-to-face communication and geographic distance had a negative relationship with each other. Participants who lived in the same household or close to each other had more chances to have in-person communication with siblings, while the further they are living from their sibling, the less frequent face-to-face communication they had. Almost one-third of the sample (30.9%) lived in the same household with their siblings and 28.7% of them were living within 25 miles with siblings. This is not surprising as more and more young adults choose to leave their parental home later since the 1990s, and some return to their parental home after living independently for a while for a variety of reasons (Seiffge-Krenke, 2015). The results indicated that living closer to each other, and more face-to-face communication are associated with worse sibling relationships, while living further away, and less face-to-face communication is related to better relationships. It is

consistent with some literature indicating that when a sibling moved outside of their parental home, their relationship quality actually improved (e.g., increased intimacy and decreased conflict) even though they had less contact (Hamwey et al., 2019; Whiteman et al., 2011). One of the features during emerging adulthood is self-focus. Young people concentrate on developing independence, agency, and identity during this period, and many U.S. emerging adults thrive on their self-focused independence (Arnett et al., 2014). When emerging adults have to live in the same household with their siblings, they may feel their independence and agency are hindered as they may continue to “compete” for shared space and materials, and they may have more arguments with their siblings, which can bring harm to their relationships. However, when emerging adults are living far away from each other (e.g., more than 500 miles), they have very limited chances to meet their siblings in person. Very likely, they are able to have more independent lives. When they have face-to-face communication with their siblings, it is more likely to be a happy reunion and will enhance their sibling bonds.

Moderation Effects of Gender Dyads

Two moderation effects relating to gender dyads emerged in this study: gender dyads moderated the relationship between asynchronous communication frequency and sibling relationship quality, and it also moderated the relationship between the frequency of social media usage and sibling relationship quality.

The results revealed a negative relationship between asynchronous communication frequency and sibling relationship quality, with a significant interaction based on gender dyad constellation. That is, as the frequency of asynchronous communication increases, the relationship quality of sister-sister pairs is significantly less close than brother-brother and mixed-gender pairs. When siblings utilize asynchronous communication technologies with each

other, they do not need to be online at the same time. When they receive emails or messages from their siblings, they do not have to reply right away. However, sometimes people can use this nature of asynchronous communication technologies as an excuse for avoidance (e.g., “I did not receive that message” or “I haven’t checked my e-mail since yesterday”; Rabby & Walther, 2003). Researchers also found a low emotion recognition in email negotiations (Laubert & Parlamis, 2019). Moreover, the lack of nonverbal cues and real-time feedback/corrections may easily cause misunderstandings and escalate conflicts when using asynchronous communication technologies (Friedman & Currall, 2003). It is reasonable that when siblings utilized asynchronous communication technologies, arguments or misunderstandings are more likely to happen during communication. Another explanation could be that siblings tend to send emails and text messages to each other when they have negative perceptions about their siblings.

During emerging adulthood, young men may be more likely to develop their identity through the approach of self-other separateness, as males are socialized to maintain a degree of separation from others (Norona et al., 2015). On the contrary, females are socialized to maintain connections with others, and young women may be more likely to develop their identity through the approach of self-other connectedness (Norona et al., 2015). Thus, sister-sister pairs may have a stronger desire for good relationship maintenance and high-quality communications than other gender pairs. It is possible that the lack of emotions, nonverbal cues, and real-time feedback of asynchronous communication are more likely to bring negative effects to sibling relationship quality among sister-sister pairs.

Gender dyad constellation also moderated the relationship between the frequency of social media usage and sibling relationship quality. For sister-sister pairs, the frequency of social media usage and sibling relationship quality had a significant positive relationship, whereas for

mixed-gender pairs and brother-brother pairs, the frequency of social media usage was negatively correlated with sibling relationship quality.

To our knowledge, this is the first study to examine how the use of social media is associated with sibling relationship quality, and there is limited research on the role of social media in family relationships in general. One study conducted in the UK compared females and males on their image-sharing activities on Facebook, Twitter, Instagram, Snapchat, and WhatsApp (Thelwall & Vis, 2017). On average, females posted their own photos more frequently than males, and females were much more likely to comment on others' photos as well as their own photos than males. Besides, females were more likely to post pictures of friends and families, selfies, and pets, whereas males were more likely to post pictures of hobbies and work (Thelwall & Vis, 2017).

It is possible that the use of social media facilitated positive and frequent communication between sister-sister pairs as they are more likely to share their personal lives and comment on each other's posts, which is beneficial to their relationship quality. For mixed-gender pairs and brother-brother pairs, the negative relationship between social media usage and sibling relationship quality may be caused by disappointment (e.g., "I left comments on my brother's posts, but he never replied") or a lack of "true" communication (e.g., siblings only reviewed or "liked" each other's posts, but hardly left comments). It should be noted that only the frequency of social media usage was collected, but how participants utilized social media with their siblings is unknown. There are multiple ways in which siblings could communicate through social media (e.g., viewing posts, liking posts, leaving comments, direct messaging). It will be important for future research to collect additional data about how siblings communicated with each other

through social media to better understand how sibling relationship quality is associated with social media usage.

Limitations and Future Directions

There are several limitations of this study that are worth addressing, and some questions remain unanswered. Only the frequency of communication was measured and examined in this study, while the quality of communication was not considered. We don't know how much time siblings were arguing or having a nice chat with each other, or what kinds of topics they were talking about when they communicated. Future studies can examine how the quality of each communication modality usage between siblings is associated with sibling relationship quality in emerging adulthood.

The results revealed that gender dyads played an important role in the relationship between different kinds of communication modality usage and sibling relationship quality. But the gender dyads were only dummy coded as sister-sister dyads and not sister-sister dyads because the sample size did not have enough power to support more predictors to be included in the regression model. Whether the sister-sister dyads are different from other gender dyads became the main interest of the present study, as sister-sister pairs were found to have more frequent contact and more positive and satisfying relationships than other gender pairs (Killoren et al., 2014; Spitze & Trent, 2006; Stewart et al., 1998). However, the nuance of how relationship quality would associate with different communication modality usage in brother-brother dyads and mixed-gender dyads was lost. It is worthwhile to make further examinations among brother-brother dyads and mixed-gender dyads in future studies.

Ninety percent of U.S. emerging adults use social media (Pew Research Center, 2019b), and participants in this study most frequently used social media to communicate with their

siblings. The results also revealed that social media usage is associated with sibling relationship quality differently among different gender dyads. However, only the frequency of social media usage was collected, while how participants utilized social media with their siblings is unknown. In order to better understand how sibling relationship quality is associated with social media usage, it is essential to get more specific information about how siblings communicated with each other through social media in future studies. Besides, only four social media platforms were included in this study, and they were categorized into the same group. Future studies can also examine each social media individually and include other social media platforms that are popular among emerging adults. For example, the 2021 social media report conducted by Pew Research Center (2021) showed that 48% of U.S. emerging adults use TikTok, 36% of them use Reddit, 32% use Pinterest, 30% of them use LinkedIn, and 24% use WhatsApp. Some of those social media platforms can also be included in future studies.

The Media Multiplexity Theory (Haythornthwaite, 2005) posits that people tend to use more kinds of media to communicate in stronger relationships. The present study only examined the relationship between communication frequency and sibling relationship quality but did not compute how many communication technologies were utilized for each participant, and whether the number of communication technologies is associated with sibling relationship quality. Future studies can take additional examinations on the relationship between the number of communication technologies used and sibling relationship quality.

Based on the features of different communication technologies, four subscales were created for measuring the frequency of communication technology usage: the synchronous subscale, the asynchronous subscale, and the social media subscale. The social media subscale included four items, but the synchronous subscale ($\alpha = 0.59$) and asynchronous subscale ($\alpha =$

0.51) only had two items. The Cronbach's alphas of these two subscales are lower than the generally accepted standard of 0.70. Although some researchers argued that using Cronbach's alpha is inappropriate for a two-item scale (Eisinga et al., 2013; Rammstedt & Beierlein, 2014), sometimes it still can be problematic to only use two items to measure an underlying construct (Eisinga et al., 2013). It is necessary to include more items in each subscale in future data collection and analysis.

Sibling relationships, as well as how siblings communicate with each other in emerging adulthood, can be different across countries and cultures. Even within the United States, cultures are different among different racial or ethnic groups. There are typically differences between people of color as compared to the White population. For example, siblings may be an important source of support during emerging adulthood among Mexican Americans as siblings usually have greater knowledge of U.S. contexts than their parents, and their emphasis on familism (Killoren et al., 2016). Besides, it may be common for siblings to still live in the same household or close to each other during adulthood in other countries. Considering the sample of the present study was predominantly Non-Hispanic White (72%), what applies to this sample maybe not applicable in other cultures and countries. Future studies should be conducted within different cultural backgrounds or include more participants from various ethnic groups.

It should also be noted that the data utilized in the present study were collected before the COVID-19 pandemic. Under the impact of social distancing and stay-at-home orders, emerging adults might have less chance to have in-person communication, relying more on communication technologies to communicate with siblings and other family members. Or they might need to stay in their parental home longer and had more face-to-face communication with siblings and family members. Very likely, the relationship between face-to-face communication as well as

communication facilitated by communication technologies and sibling relationship quality has changed during the past year, and additional research is needed.

Implications

The results of this study highlight the importance of independence and boundary seeking in emerging adults' sibling relationship maintenance, the different relationship maintenance preferences among different gender dyad constellations, as well as the complex influence of communication technology usage on sibling relationship quality. Sibling relationships are the most enduring relationships in people's lifetime (Cicirelli, 1995), but they can become less central and more voluntary in emerging adulthood (Scharf & Shulman, 2015). Strategies and cautions are needed for those advising emerging adults as well as their family members about healthy relationship maintenance practices.

For family life educators, family therapists, or academic advisors that working closely with emerging adults, it is important to emphasize the need of having comfortable boundaries when maintaining their sibling relationships. For emerging adults that are living apart from their siblings, family practitioners may recommend they use asynchronous communication technologies less often, especially for sister-sister pairs. Face-to-face communication can be highly recommended for siblings who are living far away from each other, as it is beneficial to their sibling relationships. For siblings who love to communicate with each other through social media, they can be encouraged to leave (and reply to) comments for their siblings as more communications will be facilitated. For emerging adults that are living together with their siblings, it is essential to encourage them to negotiate boundaries and expectations with their siblings to ensure independence and a comfortable way to communicate. Not only their personal development but also their sibling relationships may be protected from it. Overall, practitioners

should help emerging adults to find the communication technologies and a communication frequency that work best for them as well as their siblings. The ultimate goal is to adjust the communication ways to better align with their need for independence and maintaining a close and healthy relationship with their siblings at the same time.

Conclusion

The present study adds to our knowledge of sibling relationships in emerging adulthood and how it is associated with different communication modalities between siblings. Siblings utilize a variety of communication technologies to maintain their relationships, but different kinds of communication technologies were associated with sibling relationships differently. The face-to-face communication frequency was negatively related to sibling relationship quality, and the closer they live with each other, the stronger the negative relationship became. This result highlighted the importance of independence and boundary-keeping in sibling relationship maintenance during emerging adulthood. It is also worth addressing the significant gender differences that emerged in this study. It reflects the different socialization and communication patterns between males and females. The findings from this study provide some directions for future studies and implications for family practitioners.

Chapter 6 - References

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Appendix A - Survey Questions Used

1. What is your current age?
 - 17 or younger
 - 18-20
 - 21-29
 - 30-39
 - 40-49
 - 50-59
 - 60 or older

2. Please type your current age into the box below
Age _____

3. What is your gender identity?
 - Woman
 - Man
 - Transgender Woman
 - Transgender Man
 - Other not listed (Please specify)_____

4. Do you have any siblings (including biological, half, adopted, and step-siblings)?
 - Yes
 - No

5. Please identify the gender and age of the biological sibling to whom you will be answering these questions.
Gender _____
Age _____

6. How far do you currently live from this sibling? Please pick the residence where you spend the most time.
 - Same household
 - Under 25 miles (easy driving)
 - 25 to 50 miles (within an hour's drive)
 - 50 to 250 miles (within half a day's drive)
 - 250 to 500 miles (within a day's drive)
 - More than 500 miles (an airplane flight or more than a day's journey)

7. Using the options below, select the choice that indicates how often you *currently* use each of the following forms of communication with your sibling.

	Multiple times a day	Daily	A few times each week	Once a week	A few times each month	Once a month	A few times each year	Once a year	Less than once a year	Never
Face-to-face/in person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Telephone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Text (including GroupMe, WhatsApp)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Email	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Facebook	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Twitter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instagram	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Snapchat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Video call (e.g., FaceTime or Skype)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A method not listed (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. Please rate each statement based on your current relationship with your sibling.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
My sibling makes me happy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My sibling's feelings are very important to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoy my relationship with my sibling.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am proud of my sibling.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My sibling and I have a lot of fun together.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My sibling frequently makes me angry.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I admire my sibling.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I like to spend time with my sibling.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I presently spend time with my sibling.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My sibling and I share secrets.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

My sibling
and I do a lot
of things
together.

I never talk
about my
problems
with my
siblings.

My sibling
and I borrow
things from
each other.

My sibling
and I 'hang
out' together.

My sibling
talks to me
about
personal
problems.

My sibling is
a good friend.

My sibling is
very
important in
my life.

My sibling
and I are not
very close.

My sibling is
one of my
best friends.

My sibling
and I have a
lot in
common.

I believe I am
very
important to
my sibling.

I know that I
am one of my
sibling's best
friends

My sibling is
proud of me.