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Young Adults' Closest Sibling Relationships and Interactive Technology

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ABSTRACT

Sibling relationships are conceptualized as one of the longest lasting relationships, but empirical information about young adults' sibling relationships is limited. The current study aimed to understand how young adults ($n = 239$) conceptualized sibling closeness and how interactive technology influenced their self-identified closest sibling relationship. Through qualitative content analysis, three themes were identified regarding experiences with sibling closeness: (1) determinate and steady features, (2) congruence in relationship expectations, and (3) communication. In a second qualitative content analysis, participants' perceptions of how interactive technology influenced their closest sibling relationship were represented in three themes: (1) functionality, (2) technology that promotes quality communication, and (3) technology is not a benefit for sibling relationship.

KEYWORDS

closeness; qualitative; sibling; social media; technology; texting; young adult

In the United States, over 80% of children grow up with one or more sibling in their household (King et al., 2010; McHale et al., 2012) and sibling relationships can be an “individuals’ longest lasting relationships” (Kim et al., 2006, p. 1746). Closeness in sibling relationships can be a factor in promoting individual well-being in childhood and adulthood (Sherman et al., 2006; Shortt & Gottman, 1997). As adolescents age into young adulthood (18–25 years old) their sibling relationships become more voluntary and less related to the quality of their relationship with parents (Scharf et al., 2005). Yet, less is empirically known about sibling relationships during young adulthood (Hamwey et al., 2019; Milevsky, 2019; Scharf et al., 2005; Shortt & Gottman, 1997; Stewart et al., 1998; Wilkins-Clark et al., 2022).

As youth launch into young adulthood, they maintain their sibling relationships (Hamwey et al., 2019). Interactive technology (e.g., cell phones, social media, internet) can be a way that siblings maintain their ties while they experience geographic distance (Lindell et al., 2015; Stocker et al., 1997; Wilkins-Clark et al., 2022). Interactive technology has become a part of daily life for many families, and it is critical to understand the role of

technology in family relationships (Hertlein, 2012; N. F. Johnson & Francis, 2022; Storch & Ortiz Juarez-Paz, 2019). While research regarding technology and the parent-child relationship during young adulthood has begun to receive more scholarly attention, fewer published studies are available on the role of technology within sibling relationships in young adulthood (Hessel & Dworkin, 2018; Wilkins-Clark et al., 2022). The current qualitative study was designed to explore the factors young adults consider in determining closeness in a sibling relationship and their perceptions regarding how technology influences their self-reported closest sibling relationship.

Theoretical framework

Bronfenbrenner (1979) proposed an ecological theory of human development. Overtime Bronfenbrenner refined the theory into the *Process-Person-Context-Time* (PPCT) model (Bronfenbrenner & Morris, 1998; Rosa & Tudge, 2013). *Process* refers to *proximal processes* or the enduring interactions between the developing human and their most immediate environment (i.e., people, objects, and symbols). *Person* considers the personal characteristics that a developing human carries into social situations, and these characteristics are categorized into demand (e.g., physical appearance, age, assigned sex), resource (e.g., materials, knowledge, experience), and force (e.g., motivation, persistence) (Bronfenbrenner & Morris, 1998; Tudge et al., 2009). *Context* includes the immediate environments (microsystem), interactions between immediate environments (e.g., school and home; mesosystem), environments in which the developing human is not directly involved but still have developmental influence (e.g., parent's work; exosystem), and the larger culture or social structure (macrosystem). Finally, *time* accounts for present sociohistorical conditions and the developmental life course of the developing human.

Ecological investigations primarily focus on proximal processes and how these are influenced by personal characteristics, context, and time (Tudge et al., 2009). The current study focused on the proximal processes in young adults' closest sibling relationship. The participant's assigned sex and reported sibling's assigned sex were specifically considered. Furthermore, these proximal processes are examined during a sociohistorical time period where there is mass use of interactive technologies (Pew Research Center, 2021a, 2021b) and most young adults are moving out of their parent's residences (McCue, 2021). As siblings experience geographic distance, they may continue to experience closeness in the relationship by adapting to staying in contact via technology, but they may also decrease closeness by adapting to less contact due to geographic distance.

It has been posited that technology is now a part of the microsystem (McHale et al., 2009). Interactive technology has been proposed to theoretically form its own microsystem because a developing human has regular and frequent interactions with technology (e.g., young adult playing game on cell phone; Vaterlaus & Tulane, 2019). At a mesosystem level (young adult sibling microsystem interacting with sibling-technology microsystem) this could potentially lead to distraction in sibling communication (e.g., a young adult having a conversation with their sibling while the sibling is checking Instagram on their phone). Although, technology could also serve as an adaptive tool within the microsystem to promote connection when physically apart (e.g., a young adult texting their sibling in another state; Vaterlaus & Tulane, 2019).

Sibling closeness and young adulthood

Closeness is a term that is central to the study of interpersonal relationships, but there has been a lack of consensus in defining closeness (A. J. Johnson et al., 2009; Parks & Floyd, 1996). One approach to understanding what closeness means in relationships has been to ask people within specific relationships to define the term. Parks and Floyd (1996) asked young adults to define closeness in friendships and participants reported that self-disclosure, help and support, and shared interests were the most frequently mentioned components of closeness in friendships. Sex differences were also identified within these qualities with females reporting self-disclosure more frequently than males, and males reporting shared interests and activities more than females. Using similar methods to understand how young adults conceptualized relational closeness in geographically close same-sex friendships, A. J. Johnson et al. (2009) presented young adults with an open-ended survey item to describe what “being close” in the friendship meant to them. Female and male young adults most frequently mentioned self-disclosure, frequency of interaction, help and support, and comfort and ease (e.g., getting along well or interacting easily) as main indicators of closeness in their friendships. Among the top mentioned closeness qualities, females also mentioned trust, conversely males rated “shared interests” more highly.

As sibling relationships become more voluntary in young adulthood, one perspective is that friendships might be a reference group by which to understand young adults’ sibling relationships (Conger & Little, 2010). Less is known about what young adults perceive as factors of closeness in their sibling relationships, but they may be similar to qualities identified with friendship closeness (see A. J. Johnson et al., 2009; Parks & Floyd, 1996). However, Floyd (1995) compared young adults’ perceived qualities of

closeness among friendships and sibling relationships and reported that doing favors for each other, providing help in an emergency, and “just knowing” that they were close without talking about it were reflective of greater closeness in sibling relationships when compared to friendships.

Conger and Little (2010) indicated that young adults and their siblings may be more in synch or out of synch based on age spacing, personality, context, and life events. Similarities in age or other areas may be associated with more closeness. Hamwey et al. (2019) reported that young adult sibling relationships, “became more intimate and less conflictual based upon factors such as similarities in developmental stage; abilities and understanding for shared trials, tribulations, and triumphs” (p. 2502). In their review of sibling relationships in the transition between adolescence and young adulthood, Lindell and Campione-Barr (2017) concluded that conflict decreases and levels of intimacy and warmth increase (or at least remain stable) within sibling relationships in young adulthood. Although, whether the young adult coresided with their sibling may matter. In a longitudinal study (two data collection points over five years), young adults who did not live with their sibling at either time point experienced decreased relational conflict *and* closeness in their sibling relationships (Jensen et al., 2018). In contrast, those young adults who lived with their sibling at the beginning of the study and then transitioned to living apart experienced declines in conflict and stability in perceived closeness in their sibling relationships (Jensen et al., 2018).

Similarities in sibling assigned sex and/or gender may also be contributing factors to closeness, as some research highlights that adolescent same-gender sibling dyads spend more time together than mixed-gender dyads (Updegraff et al., 2005) or that sister-sister dyads are closer when compared to other sibling constellations (i.e., brother-brother or mixed-gender; Killoren et al., 2016). Additionally, some studies have highlighted the importance of communication in young adult sibling relationship quality (Hamwey et al., 2019; Stocker et al., 1997) and Stocker et al. (1997) reported higher warmth and less conflict when there was more contact between siblings. Further exploration of sibling closeness is warranted, as sibling closeness has been positively associated with young adult life satisfaction (Milevsky, 2019). Using similar research approaches for identifying factors contributing to closeness in young adult friendships (A. J. Johnson et al., 2009; Parks & Floyd, 1996) may illuminate young adults’ more specific experiences with closeness in sibling relationships.

Interactive technology and young adult sibling relationships

Young adults (18–29 years old) in the United States are voracious interactive technology users—100% own a cellphone (Pew Research Center, 2021a)

and 84% use at least one social media site (Pew Research Center, 2021b). There is limited information on technology use in sibling relationships. For example, only two studies focused on sibling relationships (e.g., Killoren et al., 2014; Lindell et al., 2015) were identified in a systematic review regarding young adults' use of interactive technology with family members (Hessel & Dworkin, 2018).

Lindell et al. (2015) focused on interactive technology use among young adults' sibling relationships that included first and second born siblings. Results indicated that young adults who relied on viewing social media sites to stay (or remain) up to date with their sibling's life reported lower positivity in their sibling relationship, but those that primarily relied on synchronous forms of sibling communication (e.g., in-person, calling) had the most positive sibling relationships. Although, in focus groups with young adults who reported at least having one sibling between ages 18 and 28, participants felt that there was not a good substitution for in-person sibling communication but acknowledged that interactive technologies could allow siblings to stay "somewhat 'closer'" to their siblings when in-person communication was not possible (Hamwey et al., 2019).

Killoren et al. (2014) examined specific closest-age sibling interactions among Mexican American young adults. Texting and face-to-face communication were the most frequent ways siblings communicated with each other (they did so weekly), where email and video chat were the least common ways siblings communicated. Siblings, regardless of gender constellation, had similar frequency in interacting with each other through private messages or Facebook chat, email, video chat, or face-to-face. However, sister-sister dyads had a higher frequency of using phone calls and texting when compared to brother-brother dyads. Mixed-gender sibling dyads' phone call or texting frequency were not significantly different when compared to brother-brother and sister-sister dyads.

More recently, Wilkins-Clark et al. (2022) quantitatively examined relational closeness and sibling communication via interactive technology within young adults' self-reported closest sibling relationships. Closeness was measured by asking participants to report their feelings and thoughts about the sibling/sibling relationship and about their interactions with the sibling. Young adults' beliefs that technology was beneficial and higher sibling-communication frequency were related to more closeness within sibling relationships.

Emerging research indicates the interactive technology is used in young adult sibling relationships, but face-to-face communication is the most frequent or preferred type of sibling communication, while synchronous interactive technologies were used/viewed when siblings were geographically distant (Hamwey et al., 2019; Killoren et al., 2014; Lindell et al., 2015;

Wilkins-Clark et al., 2022). These studies methods focused generally on having a sibling close to their age or specifically on a closest-aged sibling. Similar age has been conceptualized as a possible characteristic to promote sibling closeness, but there are likely other factors. It may be that there are different experiences with interactive technology with different sibling relationships in the same family. In this review, only one study (Wilkins-Clark et al., 2022) focused on interactive technology use in young adults' self-reported closest sibling relationship.

Purpose of the current study

There continues to be much to learn about young adults' experiences in their sibling relationships (Hamwey et al., 2019; Scharf et al., 2005; Shortt & Gottman, 1997; Stewart et al., 1998). It is presently unclear what qualities young adults consider to be contributing factors to closeness in sibling relationships. Emerging research also indicates that interactive technology is influencing young adult sibling relationships (Hamwey et al., 2019; Killoren et al., 2014; Lindell et al., 2015; Wilkins-Clark et al., 2022). The current exploratory study was designed to understand the experience of closeness within young adults' sibling relationships and to capture the experience of interactive technology use within young adults' self-reported closest sibling relationship. The research was guided by the following research questions:

RQ 1. How do young adults determine closeness in their sibling relationships?

RQ 2. How do young adults perceive that interactive technology (e.g., cell phones, social networking sites, internet, video chat) influences their closest sibling relationship?

Methods

Participants

The participants included 239 college-attending young adults between the ages of 18 and 25 ($m_{age} = 20.5$, $SD = 1.84$) who reported having one or more siblings. The participants were primarily female (84.9%) and single (88.5%). The majority of the participants reported their ethnicity as White (88.3%), with the remaining reporting ethnicity as Latinx/Hispanic (5.0%), Asian and Pacific Islander (2.1%), American Indian (1.7%), African American (0.4%), Middle Eastern (1.7%), or other (0.8%). The participants reported their class standing as follows: 31.1% first year, 21.8% second year, 13.9% third year, and 33.2% fourth year. The participants reported having between one and nine siblings ($m = 2.23$ siblings, $SD = 1.50$).

Procedures

The study was approved by the Institutional Review Board. Participants were recruited from one large, public university in the western United States where approximately 57% of enrolled students are from in-state. Students enrolled in five general education, social science undergraduate courses ($N=414$; 72% response rate) at the university were invited to participate in the study in 2017. Survey participation included completing an online survey hosted on Qualtrics (www.qualtrics.com) for course credit or extra credit. One researcher went to each class to introduce the study and the link to the survey was posted on the courses' online learning management systems. In order to protect participant confidentiality, at the conclusion of the survey the participants were directed to a separate online survey to record their name to document their participation.

In line with Fergus et al. (2007), young adulthood is defined as ages 18–25 where developing humans are taking on new roles and developing adult identities. Participants between the ages of 18 and 25 were included in the study and 33 participants were excluded from the study because they were outside of the age range ($m_{age} = 32.2$). Participant inclusion criteria required that students had one or more siblings and 11 students reported having no siblings. Finally, 14 participants did not respond to the open-ended items, which was necessary to be included in the study.

The online survey asked participants to report if they had siblings or not and the total number of siblings. Next, the young adults were asked to consider the sibling with which they had the closest relationship. They responded to items regarding their sibling's assigned sex (male, female, or other [open-ended response option was provided]), their current proximity (in miles) to their sibling in their current residence, and the sibling's age. Participants were also asked an open-ended item—*What makes this sibling relationship your closest sibling relationship?* To identify the potential influence of technology in participants' closest sibling relationship, participants then responded to additional open-ended items (e.g., *What is your preferred method(s) of communication with this sibling? Please explain why this method(s) is preferred. How do you think technology influences your relationship with this sibling? Please explain.*).

Data analysis

Positionality

Prior to data analysis the research team met to discuss their identities and potential areas for biases related to this topic area. All researchers self-identified as cisgender (one male, two females) U.S. citizens, and White. Two of the researchers were young adults (college-attending) and one was in

middle adulthood (university faculty). Researchers reported that they all had sibling relationships and used interactive technology in these relationships. It was agreed that independent data immersion and coding (Terry et al., 2017), and continued discussion among the three researchers would be methods used to manage potential biases during the data analysis process.

Conventional qualitative content analysis

A convention qualitative content analysis approach (Hsieh & Shannon, 2005) was selected for both research questions. This analytic approach is used when the goal is to understand lived experience and there is limited information on the phenomenon. As an inductive approach, no preconceived coding categories are used and instead researchers allow “coding categories and names for categories to flow from the data” (Hsieh & Shannon, 2005, p. 1279). The approach was appropriate because the phenomena of interest (i.e., the characteristics young adults attribute to sibling closeness and experiences of interactive technology in closest sibling relationships) are relatively understudied, and the approach allowed the focus to be on “gaining direct information from study participants without imposing preconceived categories” (Hsieh & Shannon, 2005, p. 1279).

Research question 1

All responses related to sibling closeness were compiled in one document. Participants reported their own assigned sex and the assigned sex of their closest sibling. To account for any potential differences in perspective, data were organized by the sex configuration of the sibling relationship (i.e., female–female sibling relationship, male–male sibling relationship, and female–male sibling relationship). Consistent with conventional qualitative content analysis, three researchers independently immersed themselves in the data to identify key ideas and words (Hsieh & Shannon, 2005). The three researchers met together to identify codes that represented the participants’ experiences. Seventeen codes were agreed upon and the coding scheme was determined to represent perspectives across sibling relationship sex configurations. Initially, two researchers coded 20 participant responses independently to check the utility of the scheme and refine code definitions. After this process, the data were independently coded by sentence which allowed participant responses to contribute to more than one coding area. As recommended by Creswell (2013), the researchers achieved over 80% interrater percentage agreement (85.37%). Coding disagreements were resolved through discussion and consulting the raw data. In line with qualitative conventional content analysis procedures (Hsieh & Shannon, 2005),

the three researchers then met again to identify key categories or themes amongst the codes. Three themes were identified. Quantitative comparisons between codes were used as a method of triangulation (Creswell, 2013). Because of some expected cell counts less than five (Upton, 1992), Fisher's exact test was used to assess for potential differences in codes by sex configuration of sibling relationships.

Research question 2

Qualitative conventional content analysis procedures (Hsieh & Shannon, 2005) were implemented to identify the perceived role of technology on young adults' self-reported closest sibling relationship. Again, data related to perceived technology influence were organized by the sex configuration of the closest sibling relationship. The analytic procedures were identical to research question one. Researchers immersed themselves in the data to identify key words and ideas, met together to develop a coding scheme (17 codes identified), and did an initial check of the coding scheme with 20 responses. Data were coded line-by-line by two independent researchers (81.4% agreement), and disagreements were resolved through discussion and consulting the data. They then met and identified three themes that accurately represented the participants' experiences. As a method of triangulation (Creswell, 2013), potential quantitative differences in codes between participants reporting on male–male, female–female, and female–male sibling relationships were explored using Fisher's exact test because some expected cell counts were less than five (Upton, 1992).

Results

Table 1 includes the characteristics of participants' self-reported closest sibling. Young adults reported that their closest siblings' ages ranged from five to 43 years old ($m_{age} = 21.1$, $SD = 5.37$), but the majority of identified closest siblings were between the ages of 15–19 (27.23%), 20–25 (45.53%), and 26–30 (13.19%). In total, 15 of the participants were living in the same residence with their sibling. On average the remaining participants lived 425.68 miles ($SD = 394.12$ miles; Mode = 1,002 miles) away from their sibling. In terms of assigned sex, approximately half of the self-reported closest siblings were males (46.0%) and females (54.0%). In total, 116 young adults reported on female–female sibling relationships, 25 reported on male–male sibling relationships, and 98 reported on female–male sibling relationships.

Two separate qualitative content analyses were completed for the two research questions. First, participants' reports on qualities that they use to determine closeness in their sibling relationship are reported.

Table 1. Characteristics of participants' ($n = 239$) self-reported closest sibling relationship.

	Total ($n = 239$)	Female–female siblings ($n = 116$)	Male–male siblings ($n = 25$)	Female–male siblings ($n = 98$)
	m (SD)	m (SD)	m (SD)	m (SD)
Total number of siblings in family	2.23 (1.50)	2.38 (1.73)	1.97 (1.45)	2.52 (2.06)
Distance (in miles) from self- reported closest sibling	425.68 (394.18) ($Mo = 1,002$)	376.66 (387.22) ($Mo = 1,002$)	435.40 (393.62) ($Mo = 1,002$)	615.48 (382.90) ($Mo = 1,002$)
Age of self-reported closest sibling	21.16 (5.37)	21.05 (5.40)	21.36 (5.46)	20.83 (5.04)
Age frequency among self-reported closest sibling				
	%	%	%	%
Under 10	0.85	1.75	0.00	0.00
10–14	8.51	8.77	12.50	7.22
15–19	27.23	24.56	29.17	29.90
20–25	45.53	47.37	37.50	45.36
26–30	13.19	12.28	16.67	13.40
31–40	4.26	5.26	4.17	3.09
41–43	0.43	0.00	0.00	1.03

Note. Four participants ($n = 2$ female–female, $n = 1$ male–male, and $n = 1$ female–male) did not report the age of their self-selected closest sibling.

Second, young adults' perceptions of the influence of technology on their closest sibling relationship are presented.

Research question 1

Participants reported what they perceived as factors that determined closeness in their closest sibling relationship. Three themes emerged from the participants' responses (see [Tables 2](#) and [3](#)). These three themes included: determinate and steady features, congruence in relationships expectations, and communication. Themes are presented in order of prevalence and participants' age, assigned sex, and reported sibling age (e.g., [sib: age]) were presented parenthetically to provide context when quotes were shared.

Determinate and steady features

When young adults determined who their closest sibling was, they focused primarily on determinate and steady features. Determinate features indicate defined limits that are out of the control of young adults such as age or blood relation, where steady features show little variation, but may have some possibility for movement or change (e.g., geographic proximity to sibling). Young adults (25%) focused on age as a factor in determining sibling closeness. For instance, they talked about their identified closest sibling using words like “closest in age,” “only one year older,” and “14 months apart.” Age was less important in determining closeness in male–male sibling relationships, when compared to female–female ($p = .009$) and female–male ($p = .014$) sibling relationships (see [Table 3](#)). However, for a

Table 2. Young adults' ($n = 239$) perceptions of factors contributing to closest sibling relationship: codes and themes from a qualitative content analysis.

Codes	Example quotes
Theme 1. Determinate and steady features	
Closest siblings in age	"[My brother and I] are only 18 months apart, so our closeness in age allows us to be friends as well as siblings." (female, 20; sib: 18)
Only siblings	"[My brother] is the only sibling I have." (male, 20; sib: 18)
Proximity to sibling	"[My brother and I] live in the same town." (female, 24; sib: 27)
Sibling with the same assigned sex	"[My brother and I] understand each other better because we are both males." (male, 22; sib: 24)
Distance in age	"My sister and I are super close even though we are 5 years apart in age." (female, 21; sib: 26)
Biological sibling	"I have lots of step siblings, but my biological sister and I always have each other." (female, 22; sib: 24)
Theme 2. Congruence in relationship expectations	
Similar personalities	"[My sister and I] have a lot in common and think the same." (female, 22; sib: 18)
Similar interests	"[My brother and I] have always shared similar interests." (female, 21; sib: 20)
Time spent with sibling	"[My brother and I] have always spent the most time together." (female, 23; sib: 21)
Respect	"[My brother] is someone I will always respect and care for." (male, 19; sib: 23)
Best friends	"[My sister and I] have always been best friends." (female, 22; sib: 22)
Not close to sibling	"I wouldn't say [my sister and I] have a close relationship." (female, 22; sib: 25)
Theme 3. Communication	
Talk constantly	"[My brother and I] are always communicating back and forth." (male, 22; sib: 24)
Self-disclosure	"I can share anything with this [sister]." (female, 18; sib: 21)
Absence of conflict	"[My brother and I] have always gotten along." (female, 21; sib: 20)
Effective listener	"[My sister] is always available to listen to my problems." (female, 19; sib: 22)

Note. To provide context, parenthetical information follows each quote: (participant assigned sex, participant age, and sib: age [sibling age]).

smaller portion of the participants (approximately 5%) closeness in age was not a prerequisite for closeness in the relationship—"He was a baby when I was 10" and "[my sibling is] 13 years older." Young adults who reported on same-sex sibling relationships specifically stated that they took sibling assigned sex into consideration when considering sibling closeness. Specifically, 28% of males and 16% of females who reported the that their sibling had the same assigned sex as them discussed this importance using words like "she is my only sister" and "he is my only brother."

In addition to age and sex, some participants (25%) expressed that they only had one sibling in their family. Collectively, these participants shared that having only one sibling did promote closeness in the relationships because "there's only two of us" and "we only have each other." Some participants were a part of stepfamilies and indicated that they focused on biological relationships (e.g., "he is my only biological brother") when considering closeness in sibling relationships.

Table 3. Factors contributing to young adults' ($n = 239$) self-identified closest sibling relationship: frequencies and comparisons by sibling relationship sex configuration.

Code	Total (<i>n</i> = 239)		Female–female (FF) siblings (<i>n</i> = 116)		Male–male (MM) siblings (<i>n</i> = 25)		Female–male (SB) siblings (<i>n</i> = 98)		FF vs. MM Fisher's exact test (<i>p</i>)	FF vs. FM Fisher's exact test (<i>p</i>)	FM vs. MM Fisher's exact test (<i>p</i>)
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%			
Theme 1. Determinate and steady features											
Closest siblings in age	60	25.10	33	28.45	1	4.00	26	26.53	.009	.762	.014
Only siblings	60	25.10	27	23.28	7	28.00	26	26.53	.613	.635	1.000
Proximity to sibling	39	16.32	16	13.79	5	20.00	18	18.37	.771	.453	.782
Sibling with the same assigned sex	26	10.88	19	16.38	7	28.00	0	0.00	.253	–	–
Distance in age	11	4.60	7	6.03	0	0.00	4	4.08	.353	.555	.581
Biological sibling	5	2.09	3	2.59	0	0.00	2	2.04	1.000	1.000	1.000
Theme 2. Congruence in relationship expectations											
Similar personalities	37	15.48	21	18.10	4	16.00	12	12.24	.785	.260	.741
Similar interests	31	12.97	19	16.38	6	24.00	6	6.12	.390	.031	.016
Time spent with sibling	25	10.46	13	11.21	4	16.00	8	8.16	.504	.498	.262
Respect	17	7.11	9	7.76	1	4.00	7	7.14	.691	1.000	1.000
Best friends	14	5.86	3	2.59	2	8.00	9	9.18	.215	.070	1.000
Not close to sibling	10	4.18	5	4.31	1	4.00	4	4.08	1.000	1.000	1.000
Theme 3. Communication											
Talk constantly	19	7.95	14	12.07	2	8.00	3	3.06	.737	.021	.268
Self-disclosure	18	7.53	14	12.07	0	0.00	4	4.08	.075	.000	.581
Absence of conflict	16	6.69	11	9.48	0	0.00	5	5.10	1.000	.299	.582
Effective listener	10	4.18	5	4.31	0	0.00	5	5.10	.586	1.000	.582

Note. Young adults ($n = 239$) reported on the assigned sex of their closest sibling. In this table, their responses were separated by sibling relationship sex configuration (e.g., if the participant was female and reported their closest sibling was female, the participant's responses were presented under female-female siblings). Percentages exceed 100% because participants' responses could contribute to more than one code.

Lastly, closeness in proximity was a perceived factor in young adults determining sibling closeness. Participants explained this in terms of proximity while they were growing up and current proximity to their sibling. For example, one participant (male, 23; sib: 25) explained, “I spent a lot of time with him growing up” and another participant disclosed (female, 18; sib: 11), “Before college, I have never been separated from my sister.” In terms of using current proximity as a factor in determining sibling closeness, a female (19; sib: 18) participant indicated, “me and my brother are roommates here at college.”

Congruence in relationship expectations

Young adults explained that the level of congruence (i.e., perceived agreement or compatibility) in relational expectations with a sibling was a key factor in determining their closest sibling relationship. Participants focused on similar personalities and the similar interests shared with their sibling as a factor. For instance, they used phrases like “we relate more,” “we have a lot in common,” “our personalities are the most similar,” “we have similar interests,” and “we have the same opinions on things.” Twenty-four percent of participants reporting on male–male sibling relationships indicated the importance of similar interests, compared to 16% for sister–sister and 6% for female–male closest sibling relationships. Female–male sibling relationships reported less importance in determining closeness through similar interests when compared to female–female ($p = .031$) and male–male ($p = .016$) sibling relationships (see Table 3). There were expectations related to the amount of time close siblings spent together— “we always hang out!” Participants reported that respect for the sibling increased closeness (e.g., “I have always looked up to her”) and the bond in a close sibling relationship was a friendship (e.g., “we have always been best friends”). It is important to note that a small portion ($n = 10$) of participants reported not being close at all with any of their siblings. They explained that the lack of closeness was because they did not perceive congruence (e.g., had no similar interests, did not spend time together) in relationship expectations with any of their sibling relationships.

Communication

When explaining closeness in sibling relationships, participants focused on both the quantity and quality of communication as key factors. Young adults used phrases like “we talk every day,” “I call her or facetime her once a day,” “I can tell her everything,” and “we know everything about each other” to indicate the important role regular communication and self-disclosure played in perceived sibling closeness. Although, participants

reporting on male–male relationships did not mention the importance of self-disclosure in their sibling relationships, which was significantly different from participants reporting on female–male sibling relationships ($p = .000$) (see Table 3). While constant communication was important, participants indicated that effective listening (e.g., “takes time to listen to what I say”) and the absence of conflict (e.g., “have always gotten along”) were also important communication components for sibling closeness.

Research question 2

Participants reported on how they perceived interactive technology affected their relationship with their closest sibling. Three themes emerged from the participants’ responses (see Tables 4 and 5). These three themes included: functionality, technology that promotes quality communication, and technology not being a benefit to their relationship. Themes are presented in order of prevalence and participant age, assigned sex, and reported sibling age (e.g., [sib: age]) were presented parenthetically to provide context when quotes were shared.

Functionality

When participants reported on how technology influenced their closest sibling relationship, they centered their responses on communication and how functional the different communication modalities were in sibling communication. Almost half (47%) of participants preferred to communicate face-to-face with their closest sibling, using phrases like “face-to-face, because we actually get to interact”, and “I would like to see my sibling face-to-face as much as possible.” However, despite participants’ preference for face-to-face sibling communication, distance interfered, which lead them to find other meaningful ways to communicate. One participant (male, 21; sib: 16) said, “I would prefer face-to-face but he [my sibling] lives so far away. So, I like to call him.” Participants (34%) addressed that technology was a functional way to maintain connection with a sibling at a distance. “[Technology] strengthens [our relationship] because I would not get to talk to him while I was away at college if it weren’t for technology” (female, 19; sib: 17).

When face-to-face was not feasible, participants made decisions about which technology to use in the sibling relationship based on the functions they afforded. For example, participants (44%) utilized technology for sibling interactions that was perceived to be quick and easy. Young adults used phrases like “[technology] is quick and easy” and “[texting] is convenient and fits in with both our busy schedules.” Young adults also preferred technology that was convenient, such as Facebook. One participant

Table 4. Young adults' ($n = 239$) reports of the influence of technology on their self-reported closest sibling relationship: Codes and themes from a qualitative content analysis.

Codes	Example quotes
Theme 1. Functionality	
Face-to-face	"Face-to-face is the best because I can tell what [my brother] feels based off his facial expressions." (male, 20; sib: 22)
Quick communication	"Technology is a quick way to communicate [with my brother]." (female, 22; sib: 14)
Proximity to sibling	"Going away to college has already been hard because I miss [my brother]. So, technology has helped us stay connected." (female, 19; sib: 17)
Convenient	"Technology definitely helps me and makes it easier to communicate with [my sister]." (female, 19; sib: 14)
Facebook	"[My sister and I] can tag each other on Facebook which makes us closer." (female, 19; sib: 23)
Mail and email	"I don't mail [my brother] letters because I am not going to pay for stamps and letters." (female, 19; sib: 17)
They don't use what I use	"My brother doesn't enjoy technology. So, it is hard to get into contact with him unless I go home to visit." (male, 21; sib: 23)
I don't use what they use	"I don't like communicating with [my sister] through technology." (female, 22; sib: 20)
Theme 2. Technology that promotes quality communication	
Texting	"I prefer texting because [my sister and I] can respond when we can and can still keep a conversation going." (female, 22; sib: 21)
Connection and closeness	"It [technology] helps keep [my sister and I] close when we live miles apart." (female, 23; sib: 29)
Phone call	"I like to talk to [my brother] on the phone. I get more emotion through voice than I would just reading a message." (female, 25; sib: 22)
Video chat	"Skype is my preferred choice since I can still hear [my brother's] voice while communicating and perform other tasks while talking." (male, 21; sib: 23)
Snapchat	"I Snapchat [my brother] because it incorporates images of his face and written messages." (male, 20; sib: 14)
Theme 3. Technology not a benefit for sibling relationship	
No perceived influence	"Technology doesn't really have an influence on my relationship [with my sister]." (female, 22; sib: 26)
Distracts from relationship	"Sometimes [technology] makes me feel disconnected from [my brother] because he always has his phone, but often times he won't text or call me back." (female, 22; sib: 13)
No sibling contact	"I do not talk to [my sister] at all." (female, 22; sib: 28)

Note. To provide context, parenthetical information follows each quote: (participant assigned sex, participant age, and sib: age [sibling age]).

(female, 19; sib: 14) explained, "Texting and Facebook Messaging are what I use [to communicate with my sister] most, mainly for convenience." Some participants also addressed other factors that related to functionality, such as choosing to use (or not use) a certain type of technology because of their sibling. For example, they would say things like "I don't have Facebook, so that's not a choice [in my sibling relationship]" and "[My

Table 5. Young adults' ($n = 239$) perceptions of the influence of technology in their self-reported closest sibling relationship: frequencies and comparisons by sibling relationship sex configuration.

Codes	Total (<i>n</i> = 239)		Female–female (FF) siblings (<i>n</i> = 116)		Male–male (MM) siblings (<i>n</i> = 25)		Female–male (FM) siblings (<i>n</i> = 98)		FF vs. MM Fisher's exact test (<i>p</i>)	FF vs. FM Fisher's exact test (<i>p</i>)	FM vs. MM Fisher's exact test (<i>p</i>)
	<i>N</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%			
Theme 1. Functionality											
Face-to-face	113	47.28	57	49.14	11	44.00	45	45.92	.666	.068	1.000
Quick communication	106	44.35	53	45.69	10	40.00	43	43.88	.662	.089	.883
Proximity to sibling	81	33.89	39	33.62	12	48.00	30	30.61	.251	.176	.155
Convenient	63	26.36	35	30.17	4	16.00	24	24.49	.218	.363	.435
Facebook	17	7.11	10	8.62	3	12.00	4	4.08	.702	.268	.148
Mail and email	37	15.48	21	18.10	3	12.00	13	13.27	.569	.355	1.000
They don't use what I use	11	4.60	3	2.59	3	12.00	5	5.10	.069	.474	.205
I don't use what they use	8	3.35	4	3.45	3	12.00	1	1.02	.106	.378	.026
Theme 2. Technology that promotes quality communication											
Texting	89	37.24	54	46.55	4	16.00	31	31.63	.006	.035	.143
Connection and closeness	72	30.13	42	36.21	7	28.00	23	23.47	.495	.053	.612
Phone call	69	28.87	34	29.31	7	28.00	28	28.57	1.000	1.000	1.000
Video chat	59	24.69	28	24.14	19	76.00	12	12.24	.000	.034	.000
Snapchat	33	13.81	23	19.83	1	4.00	9	9.18	.076	.035	.685
Theme 3 Technology not a benefit for sibling relationship											
No perceived influence	26	10.88	12	10.34	2	8.00	12	12.24	1.000	.671	.733
Distracts from relationship	12	5.02	7	6.03	1	4.00	4	4.08	1.000	.555	1.000
No sibling contact	6	2.51	1	0.86	3	12.00	2	2.04	.018	.594	.059

Note. Young adults ($n = 239$) reported on the assigned sex of their closest sibling. In this table, their responses were separated by sibling relationship sex configuration (e.g., if the participant was female and reported their closest sibling was female, the participant's responses were presented under female-female siblings). Percentages exceed 100% because participants' responses could contribute to more than one code.

brother] doesn't have any social media." Participants tended to not use email or mail as their choice of technology due to the lack of functionality they provide. They said things like "email to me seems pointless if I have a cellphone and [can use] texting" and "writing letters is too expensive and time consuming."

Technology that promotes quality communication

When considering technology use in their closest sibling relationship, young adults focused on quality of communication provided by different technology mediums. Participants (37%) reported that they perceived that texting provided quality communication within their sibling relationship. A young adult (female, 23; sib: 13) disclosed that texting provided more meaningful communication than other modalities. She continued, "I prefer to text [my brother]. Whenever we talk on the phone, he can't think of anything to talk about, or he gets easily distracted." Participants reporting on male-male sibling relationships did not mention their preference of texting siblings as much as participants reporting on female-female ($p = .006$) or female-male ($p = .035$) sibling relationships (see Table 5). Siblings also valued connection through Snapchat because it merged text and images. For instance, "I like Snapchat because I can see what [my sister] is doing during the day while still sending [snaps] back and forth" (female, 24; sib: 17). Similarly, a participant (female, 19; sib: 16) shared:

I really enjoy being able to use Snapchat to keep in touch [with my sister] throughout the day... sometimes you don't think of all of the little "Snapchat worthy" moments when catching up on your week. So, it's cool for me to keep up on those.

Some of the young adults preferred synchronous technology modalities that allowed them to hear their sibling's voice or see their face because they "get more emotion through voice than I would just reading a message" (female, 25; sib: 22). Young adults reported that talking on the phone ("Talking of the phone ... is the best way for us to talk if we can't be face-to-face" [female, 19; sib: 20]) or using video chat ("I prefer FaceTime that way you get to see each other and interact better" [female, 19; sib: 25]) allowed for this higher quality communication. Participants reporting on male-male sibling relationships reported a preference for video chat sibling conversations more than participants reporting on female-female ($p = .000$) or female-male ($p = .000$) dyads (see Table 5).

In consensus, young adults reported that technology allowed them to stay connected with their sibling and could strengthen their sibling relationship. For instance, a male (23; sib: 18) participant was clear that "Technology makes [my relationship with my brother] stronger." In the

same vein a female (24; sib: 27) shared, “[technology] enhanced our [sibling] relationship because it gives us different ways to communicate.”

Technology is not a benefit for sibling relationship

In general, participants discussed how technology enhanced their sibling relationship; however, a portion of participants saw no benefit or a decline in relational quality within their sibling relationship from technology. Some participants (10.88%) reported that they used technology in their sibling relationship but did not believe it influenced their relationship. A participant (male, 18; sib: 21) explained, “I can keep in contact, but [technology] doesn’t do much to affect the relationship.” Some (5.02%) argued that their sibling’s technology use distracted from their time spent together. A participant (female, 20; sib: 18) stated, “She [my sister] is on her phone quite a bit, so we don’t always talk very much when we are together.” Finally, a few participants (2.51%) had no relationship with their siblings and used phrases like, “I tend not to communicate with my siblings.”

Discussion

Sibling relationships are often people’s most enduring relationships (Kim et al., 2006), but less is known about young adults’ sibling relationships (Hamwey et al., 2019; Scharf et al., 2005; Shortt & Gottman, 1997; Stewart et al., 1998). The current exploratory study focused on identifying qualities young adults attribute to closeness in their self-identified closest sibling relationship. Then, participants shared their perceptions of how interactive technology has influenced this self-reported closest relationship. The results are discussed in relation to the *Process-Person-Context-Time* (PPCT) model (Bronfenbrenner & Morris, 1998; Tudge et al., 2009).

Sibling closeness

Young adults in the current study focused on proximal processes within their closest sibling relationship. In contemporary sociohistorical conditions, as adolescents age into young adulthood, most leave their parent’s homes (McCue, 2021). A change in physical distance influences young adult sibling microsystems and they must adapt to less physical time spent together. The current study aimed to identify what factors young adults attributed to sibling closeness when thinking about their self-reported closest sibling relationship.

Considering the PPCT model (Bronfenbrenner & Morris, 1998), person characteristics (i.e., demand, resource, and force) emerged as important influences on perceived young adult sibling closeness. Addressing demand

characteristics (e.g., assigned sex, age), previous research has suggested that siblings may be in more synch or intimate when there are similarities in age or developmental stage (Conger & Little, 2010; Hamwey et al., 2019). Participants in this study reported that they experienced sibling closeness because of similarities to their sibling in terms of age and assigned sex. Some also indicated that being biologically related was a factor they considered in closeness when their family included stepsibling relationships.

Resource characteristics include past experiences (Bronfenbrenner & Morris, 1998), which may allow young adults to determine what they want out of current relationships. Participants explained that sibling closeness was also experienced when there was congruence in relationship expectations, which included shared interests, respect, and a sense of friendship. Previous research on young adults' perceptions of friendship closeness identified that having shared interests was more important to males than females (Parks & Floyd, 1996). In terms of sibling relationships, the current participants indicated that shared interests were a less reported quality of closeness in male–female sibling relationships when compared to same-sex sibling relationships.

Demand characteristics focus on persistence and motivation (Bronfenbrenner & Morris, 1998) and these person qualities could relate to the effort made to more frequently connect in a sibling relationship. Stocker et al. (1997) stated that more contact between siblings was related to higher warmth in the sibling relationship, and young adults have reported that frequency of interaction was a top factor in determining closeness in young adult friendships (A. J. Johnson et al., 2009). In line with these findings, participants in the current study shared that the frequency of time spent together, proximity, and communication were factors that contributed to closeness in their sibling relationships. Within communication, self-disclosure is a practice that is important within young adult friendships (A. J. Johnson et al., 2009; Parks & Floyd, 1996), but females have reported the importance of self-disclosure in friendship closeness more than males (Parks & Floyd, 1996). Those reporting on male–male sibling relationships did not report self-disclosure as a factor contributing to closeness in their relationships, while those reporting on female–female and female–male sibling relationships did.

Interactive technology use in young adults' self-reported closest sibling relationships

Empirical research on interactive technology use in sibling relationships is just beginning to emerge (Hessel & Dworkin, 2018; Wilkins-Clark et al., 2022). This study focused on young adults' perceptions of interactive

technology use within their self-reported closest sibling relationship. In previous research, young adults have reported that face-to-face communication was the preferred communication modality in their sibling relationships (Hamwey et al., 2019; Wilkins-Clark et al., 2022). This was also true for nearly half of young adults in the current study, but it was acknowledged that face-to-face communication was not possible as often because most experienced geographic distance from their sibling.

Time (within PCCT model) accounts for the sociohistorical conditions and the developing human's developmental life course (Bronfenbrenner & Morris, 1998; Tudge et al., 2009). Contemporary young adults' sociohistorical conditions include the mass availability and use of several interactive technologies (Pew Research Center, 2021a, 2021b) and most young adults move out of their parent's residences during this stage of development (McCue, 2021). Interactive technology has been conceptualized as an adaptive tool within microsystems to facilitate closeness or connection when there is geographic distance in the microsystem (Vaterlaus & Tulane, 2019). In line with this proposition, many of the participants in the present study viewed interactive technology as way to facilitate connection in their sibling relationship while physically apart. They viewed interactive technology as a "quick and easy" or convenient tool to maintain interaction. Considering the PCCT model (Bronfenbrenner & Morris, 1998), force could explain the desire for efficient technology-mediated communication. Participants were motivated to communicate with their sibling but wanted the medium to promote quick and easy interactions. Furthermore, person characteristics limited some siblings from interacting via technology. Some young adults reported that they or their sibling did not use (e.g., access, motivation to use) the same interactive technologies (e.g., the young adult used a social media platform, but their sibling did not), which limited some of the interactions between siblings.

Personal characteristics (i.e., demand; Bronfenbrenner & Morris, 1998) also influenced preference for the types of interactive technology with which young adults used to communicate within their closest sibling relationship. Killoren et al. (2014) reported that closest-aged young adult siblings most frequently communicated through texting, which is an asynchronous interactive technology. They also indicated that sister-sister dyads texted more than brother-brother dyads. Among young adults in the current study, texting was reported as a quality method of sibling communication. Female-female and female-male sibling dyads reported this more than those reporting on male-male sibling relationships. Another asynchronous modality that was mentioned as being used in sibling communication was Snapchat. Vaterlaus et al. (2016) stated that Snapchat is typically reserved for a young adults' closest relationships, including siblings.

Participants in the current study reported enjoying the confluence of pictures and text offered by Snapchat and felt that this promoted richer communication.

Previous research on sibling relationships and communication has highlighted that siblings who relied on synchronous communication modalities (e.g., face-to-face, calling) had the most positive relationships (Lindell et al., 2015). Some of the participants in this study argued that the most quality technology-facilitated communication was via phone calls or video chat. Previous studies reported that video chat was one of the least used technologies for young adult sibling contact (Killoren et al., 2014). In the current study, more participants reporting on brother-brother dyads indicated a preference for communicating with their sibling via video chat than participants reporting on sister-sister or brother-sister dyads.

Although, most perceived that interactive technology could contribute to increased communication and closeness in their closest sibling relationships, some reported that it created opportunities for communication, but did not feel that it increased closeness in their relationship. Some went further to explain that technology could be a distraction in their sibling relationship when they were spending in-person time together. It has been proposed that interactive technology can form its own microsystem and lead to distraction at the mesosystem level (e.g., young adult-interactive technology microsystem and young adult sibling microsystem; Vaterlaus & Tulane, 2019), and participants' responses supported this proposition.

Limitations

The current study did have limitations. The participants were recruited from one university, did not include young adults who elected to not attend university, and there was lower participation from traditionally marginalized racial groups. While a consistent practice (see Hamwey et al., 2019; Killoren et al., 2014; Lindell et al., 2015; Wilkins-Clark et al., 2022), and appropriate for an exploratory study, the study also relied only on one person's report from the sibling dyad, which does not allow for understanding whether the experiences of closeness and technology use were congruent between siblings. Some of the participants indicated that they determined sibling closeness by biological relationship, but the current study did not specifically focus on diversity of sibling relationship types (e.g., half-sibling, stepsibling; Steinbach & Hanks, 2018). Lastly, young adult sibling relationships can change over time (Jensen et al., 2018). While the present study did acknowledge the sociohistorical element of time within the PPCT model, a limitation was the cross-sectional design. Longitudinal

designs are needed to better highlight the continuity and change within young adult sibling microsystems.

Implications

A strength of the current study was allowing participants to self-report their closest sibling relationship and explain what factors made this sibling relationship close. Some qualities young adults associated with sibling closeness are more fixed (e.g., age, assigned sex), but others are potentially more malleable (e.g., communication frequency, self-disclosure, shared interests). Future research should explore these more malleable elements of perceived sibling closeness to determine if changes (e.g., more frequent communication, developing shared interests) indeed increase closeness in the sibling relationship. As sibling relationships have the potential to be the longest lasting or enduring relationships (Kim et al., 2006), identifying factors that promote sibling closeness in young adulthood could potentially inform relational educational offerings and interventions.

Relationship education and intervention could consider inclusion of technology topics to enhance sibling relationships, while recognizing sex differences in interactive technology-communication preferences. Young adults in this study indicated, that despite geographic distance, interactive technology (both synchronous and asynchronous) could facilitate quality communication and closeness. It is unclear if this is because the siblings already had established a close sibling relationship or if it is possible to use these technologies to create closeness in sibling relationships—more research is needed to clarify this.

The data in this study were collected before there was a global pandemic that required many young adults to move back with their parents and then to later return to independent living (McCue, 2021). These unique sociohistorical conditions may have shifted perspectives on closeness in sibling relationships or led to changes in technology adoption/use because of physical distancing requirements. Emerging research indicates that some young adults grew closer in their family relationships and that they used interactive technologies to communicate at a distance during the pandemic (Vaterlaus et al., 2021). However, some young adults were experiencing feelings of isolation when they returned to college in Fall 2020. More research focusing on young adult sibling relationships and interactive technology in the context of the pandemic is needed. Strengthening young adult sibling relationships may be a way to enhance social support as many contemporary young adults are experiencing loneliness and mental health challenges (American College Health Association, 2021). Furthermore, establishing closer sibling relationships during young adulthood (when they

become more voluntary and less conflictual; Hamwey et al., 2019; Scharf et al., 2005) may create a strong relationship which young adults can rely on as they navigate the tasks of middle and late adulthood.

Conclusion

Examining and enhancing the proximal processes between young adults' and their siblings could potentially increase young adults' current well-being (Sherman et al., 2006; Shortt & Gottman, 1997) and future life satisfaction (Milevsky, 2019). In this study, young adults generally reported similarities in age and assigned sex, shared interests, respect, and a sense of friendship, frequent contact, and self-disclosure were characteristics important to sibling closeness. Although, these were related to specific personal characteristics (e.g., age, assigned sex, motivation to frequently connect, past experiences in relationships/shared interests) among the young adults. Interactive technology was reported to be an adaptive tool within the young adult sibling microsystem that could facilitate easy and convenient connection while they were geographically distant. Asynchronous (texting and Snapchat) and synchronous (phone calls and video chat) technologies were viewed as promoting quality sibling communication. Still, some young adults explained that interactive technology could be a distraction in their sibling relationships.

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