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Digital and traditional communication with kin: displacement or reinforcement?

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ABSTRACT

A salient question in the digital era is whether new forms of digital communication (e.g. instant messages, video calls, e-mails) have displaced or reinforced more traditional forms of communication (e.g. meeting face-to-face, contact by phone, sending letters/postcards). These opposing hypotheses, i.e. digital communication as a reinforcer versus a displacer, have attracted abundant attention among scholars; however, studies have scarcely explored these hypotheses in the context of communication among kin. Using large-scale and population-based data of 1,945 young to middle-aged (18–55 year-olds) and 2,663 older (68–73 year-olds) Finns, we tested the predictions derived from the displacement and reinforcement hypotheses in several kin dyads (parent–child, grandparent-grandchild, siblings, and aunt/uncle-niece/nephew). The results supported the reinforcement hypothesis in all kin dyads, and in both younger and older adults. Associations between digital and traditional communication were positive even after controlling for a wide range of potentially confounding factors. Hence, it can be concluded that digital means reinforce rather than displace traditional forms of contact.

Introduction

In roughly a decade, a multibillion-dollar digital communications industry has emerged, as can be evidenced in the mass adoption of smartphones and various messaging and communication services, such as instant messaging and video calls (e.g. Ofcom, 2018). This digital revolution has dramatically altered the ways in which individuals interact with one another. An ongoing debate has been focusing on whether the new forms of digital communication, such as instant messages, video calls, and e-mails, have been displacing or complementing the more traditional forms of communication, such as meeting face-to-face, phone calls, and sending letters/postcards (e.g. Ahn & Shin, 2013; Dienlin et al., 2017; Verduyn et al., 2021).

According to the media niche theory, first developed by Dimmick and Rothenbuhler (1984), communication methods can be seen to have distinct features and to occupy

'niches' within overall communication. As new methods of communication emerge, older methods may be displaced if the niches of the two methods overlap; alternatively, the new methods may occupy new niches whereby both the new and old methods are employed, but for different purposes. These antithetical processes are referred to as the displacement hypothesis and reinforcement hypothesis, respectively (Ramirez et al., 2008).

In the context of digital communication, the displacement hypothesis, as described by Dienlin et al. (2017), posits that the need to meet face-to-face may have been diminished because activities such as sharing content, gossiping, planning, catching up, and engaging in social validation are carried out on digital platforms more efficiently. While intuitively plausible, studies testing the displacement hypothesis have found limited support. For example, a small-scale study conducted in Korea (Ahn & Shin, 2013) indicated that for some individuals, online communication can displace face-to-face interactions, but for others, it augments existing relationships. Another small-scale study conducted in the Netherlands (Verduyn et al., 2021) found support for the displacement hypothesis, but only when looking at an individual's digital and face-to-face communication on the same day. The same study, however, also found that both heavy smartphone users and those using their smartphones relatively less engaged in face-to-face interaction with approximately equal frequency, therefore, showing no support for the displacement hypothesis when comparing individuals.

In contradiction to the displacement hypothesis is the reinforcement hypothesis, which proposes that digital communication methods cater to a different set of communication needs; hence, they complement, rather that displace, contact using traditional communication means. This is possible as digital means of communication have succeeded at attaining an unoccupied niche by overcoming the barriers of time and location, and thereby, increasing the overall potential for communication (e.g. Cui, 2016; Dienlin et al., 2017). For example, digital messaging allows smaller time pockets to be used for communication throughout the day and can provide a sense of 'connected presence' during times of separation (Cui, 2016). These communication needs were largely unmet before the emergence of digital communication.

The reinforcement hypothesis has received support in multiple settings, with studies showing that digital communication can complement face-to-face interactions between friends (e.g. Hall, Kearney & Xing, 2019; Kujath, 2011; Valkenburg & Peter, 2007), romantic couples (Boyle & O'Sullivan, 2016), and other close relationships (Dienlin et al., 2017). Further evidence in support of the reinforcement hypothesis shows that individuals tend to use multiple communication channels to communicate in relationships that are perceived as close (Haythornthwaite, 2005). This adds to the notion that, at least in close relationships, a new channel does not necessarily replace the old ones; instead, many forms of contact can coexist.

An important limitation of prior studies is that they have rarely differentiated between different kinds of relationships. Moreover, studies exploring the association between digital and traditional contact in kin relationships are severely lacking. A focus on kin relationships is warranted, as studies show that, on average, individuals tend to feel emotionally closer to their relatives than non-relatives, and significantly more contact is sustained in kin compared to non-kin relationships (Salmon & Shackelford, 2011; Tanskanen & Danielsbacka, 2019).

To the best of our knowledge, only one study has provided evidence for the reinforcement hypothesis in kin communication. This study used extensive survey data from Hong Kong and found face-to-face communication with family members to be positively associated with using all other communication methods (phone, instant messages, social media, video calls, and e-mail; Shen et al., 2017). In focusing on kin relationships, the pioneering work by Shen et al. (2017) has substantially improved our understanding of the association between digital and traditional communication with kin. However, a limitation of their study was the inclusion of all family members in the same category, even though it is well-known that relationships differ in important ways depending on the type of relatedness (e.g. parents and children or grandparents and grandchildren compared to siblings; Buchanan & Rotkirch, 2021; Tanskanen & Danielsbacka, 2019). Given the distinct dynamics of each type of relationship within a family and extended family, digital communication may impact each relationship uniquely, depending on its kinship status.

In this study, we tested the displacement and reinforcement hypotheses by exploring how digital contact is associated with face-to-face contact, phone calls, and sending postcards or letters among one's kin. Our study uniquely addressed *particular kin types separately* (parent–child, grandparent-grandchild, siblings, and aunt/uncle-niece/nephew). Furthermore, we considered *two family generations* separately, as the effects of digital communication patterns may be different for younger to middle-aged adults compared to older adults. With regard to the definitions adopted in our study, it is important to specify that by traditional means of contact, we refer to face-to-face encounters, phone calls, and sending postcards/letters. Based on the assumption that digital contact relates to each of them differently, i.e. it might increase one while decreasing the other, we tested *each form of communication separately*. The analyses were based on large-scale and population-based surveys conducted in Finland, which is a forerunner in digitalization.

Materials and method

Data and participants

The present study utilizes population-based survey data from the Generational Transmissions in Finland (Gentrans) project. The Gentrans data incorporate information on two family generations: the Finnish baby boomer generation born between 1945 and 1950 (i.e. the older generation) and their adult children born between 1964 and 1999 (i.e. the younger generation). Data were collected by Statistics Finland in autumn 2018 and 2019, and the data comprised a nationally representative sample of 1,945 younger and middle-aged adults aged 19–56 years (mean = 42, SD = 5.86) (younger generation), and 2,663 older adults aged 68–74 years (mean = 71, SD = 1.70) (older generation).

Ethical permission for the first (2007) and subsequent (2012 and 2018/2019) Gentrans surveys were obtained by the Ethical board of Statistics Finland (decision 2.6.2006). The users of the data have also committed to follow the Statistics Finland ethical rules by accepting The Pledge of Secrecy of Holder of Permission to Use Data.

Variables

In the Gentrans survey, contact frequencies with different kin members were measured in several ways. First, respondents were asked: 'In the last 12 months, how often have you had contact with xx personally, by phone or by e-mail/through the Internet?' Following this, the respondents were asked: 'In the last 12 months, how often have you had contact with him/her? a) personally, b) by phone (without video), c) by video call (e.g. via Skype), d) by some text message service (e.g. SMS or e-mail), e) letter or postcard'. In the analyses, we combined the answers for c) by video call and d) by some text message service, categorizing both under 'digital contact.' The reasons for combining these two categories were the paucity of observations in c) by video call, and the fact that both responses indicate digital contact. We have provided the mean frequencies of contact for both of the categories (video call and text message service) in the Appendix Tables 1 and 2. The response options for these questions were: 0 = never, 1 = less than once a month, 2 = about 1–3 times a month, 3 = once a week, 4 = daily or several times a week, and 5 = several times a day. Face-to-face contact, contact by phone, and sending or receiving a postcard or letter were used as the outcome variables. Digital contact was used as the main independent variable. For sensitivity purposes, we also conducted the analyses using the digital contact variables (video call and text message service) separately as independent variables. The results were similar as with the combined variable (not shown in the tables or figures, available upon request).

We studied the association between digital contact and traditional forms of contact (face-to-face, phone calls, postcards/letters) between defined kin members by type of relatedness. For the younger generation, the different types of kin studied were: mother, father, mother-in-law, father-in-law, sister, brother, sisters' children, and brothers' children. In each analysis, the data for only those respondents who had the relative in question were included. In the case of multiple siblings and children of siblings, the eldest four were considered for each category and their average scores were used in the analyses.

In the analyses concerning contact with parents, the following variables were controlled for: gender, age, marital status (living with/without spouse), education, employed/not employed, financial situation, number of children, number of siblings, parents' divorce (yes/no), parents' age, parents' financial situation, parents' health, and living distance. In the case of parents-in-law, we additionally controlled for relationship duration between the respondent and her/his spouse along with the same control variable as with parents, i.e. whether the parents-in-law are divorced, their ages, financial situation, health, and living distance.

In the analyses concerning siblings, we controlled for gender, age, marital status (living with/without spouse), education, employed/not employed, financial situation, number of children, number of siblings, parents' divorce (yes/no), sibling age, sibling type (full sibling, maternal half-sibling, paternal half-sibling, or step-sibling), and living distance from siblings. In addition, concerning the siblings' children, we controlled for the age of the sibling's youngest child.

We examined the following relationships for the respondents belonging to the older generation: children (separately for mother-daughter, father-daughter, mother-son, and father-son), grandchildren (separately for maternal grandmother, maternal

grandfather, paternal grandmother, and paternal grandfather), siblings, and siblings' children. In each analysis, data for only those respondents who had the relative in question were included; in the case of multiple children and grandchildren, the eldest four were considered for each category and their average scores were used in the analyses.

Regarding the controls employed for the older generation, in the case of children, we controlled for the respondents' age, marital status (living with/without spouse), education, employed/not employed, health, financial situation, child's age, distance from the child, and number of children. In the case of grandchildren, we added the age of the child's youngest child and number of grandchildren to the control variables. In the analyses of contact with siblings, we controlled for the respondents' gender, age, marital status (living with/without spouse), education, employed/not employed, financial situation, number of children, number of siblings, number of grandchildren, sibling age, sibling type (full sibling, maternal half-sibling, paternal half-sibling, stepsibling), and living distance from the sibling. In addition, concerning siblings' children, we controlled for the age of the sibling's youngest child.

Analytical strategy

First, the descriptive statistics were obtained by calculating the mean frequency scores for overall contact, face-to-face contact, phone calls, digital contact, and contact via letter/postcards in all studied types of relatives.

Second, we analyzed the association between digital contact and traditional forms of contact with linear regression models for each type of relative and each contact form separately. Through the analyses, we intended to explain the frequency of face-to-face contact, phone calls, and sending or receiving a postcard or letter; thus, linear regression was conducted using these variables as the dependent variables. The independent explanatory variable was digital contact. For each type of relative, we postulated three separate regressions in which face-to-face contact, contact by phone, and contact by letter or postcard were the dependent variables. For the analyses concerning the younger generation, siblings, and siblings' children, the data were reshaped from a wide format into a long format, such that the observations were of the original respondent's siblings. In addition, for the analyses concerning the older generation, the data were reshaped into a long format, such that the observations were of the original respondent's children. Consequently, the long format data were clustered within kin lineages, i.e. data included more than one observation from the same respondent. Thus, we used Stata's statistical software cluster option to compute the standard errors. The analytical results are presented in figures that represent the magnitude of the regression coefficients with 95% confidence intervals. Full results from regression models are available in Appendix Tables 3–7.

Finally, for the purpose of determining sensitivity, we conducted the same linear regression analyses with the independent variable as a categorical variable to determine whether the association was non-linear. There were no clear non-linear patterns; hence, we considered the association to be mainly linear. In other words, the association between digital and traditional forms of contact was not different at low frequencies of contact versus high frequencies of contact (results of the sensitivity analyses are available upon request).

Table 1. Contact with mother, father, mother-in-law, father-in-law, sister(s), brother(s), sisters' child(ren), and brothers' child(ren), overall and by different contact forms, in the younger generation. Mean and (standard deviation).

	Overall contact	Face-to-face	By phone	Digital contact	Letter or postcard
Mother	3.1 (1.05)	2.0 (1.09)	2.7 (1.13)	2.2 (1.40)	0.5 (0.54)
Father	2.6 (1.12)	1.9 (1.09)	1.9 (1.13)	1.4 (1.22)	0.4 (0.50)
Mother-in-law	2.2 (1.09)	1.6 (0.93)	1.1 (1.02)	1.1 (1.11)	0.4 (0.50)
Father-in-law	1.9 (1.09)	1.5 (0.93)	0.7 (0.88)	0.6 (0.90)	0.2 (0.43)
Sister	2.2 (1.21)	1.4 (0.87)	1.6 (1.09)	2.1 (1.32)	0.3 (0.49)
Brother	1.8 (1.05)	1.3 (0.82)	1.3 (0.95)	1.6 (1.17)	0.2 (0.42)
Sisters' child(ren)	1.3 (1.00)	1.2 (0.88)	0.6 (0.84)	1.0 (1.07)	0.3 (0.45)
Brothers' child(ren)	1.1 (0.88)	1.0 (0.82)	0.4 (0.69)	0.7 (0.88)	0.2 (0.41)

Note: Scale is 0 = never, 1 = less than once a month, 2 = about 1–3 times a month, 3 = once a week, 4 = daily or several times a week, and 5 = several times a day.

Results

Descriptive results

The respondents from the younger generation were most frequently in contact with their mothers, and the most popular method of contacting their mothers was the phone. Contact with fathers, mothers-in-law, or fathers-in-law was most likely to happen face-to-face. Among siblings, the most popular method of contact was digital communication (text message or video call), and contact with sisters was the most frequent. Contact with nieces or nephews was most likely to happen face-to-face (Table 1).

Table 2 presents the older generation's contact frequency with different kin. In the older generation, contact with children was most likely to occur by phone. Mothers and daughters were the most frequently in contact with one another, but the other parent–child dyads were also frequently in contact. Grandparents and grandchildren were most likely to engage in face-to-face contact. Maternal grandmothers were most frequently in contact with their grandchildren, but the gap between maternal grandmothers and the other types of grandparents was relatively small. The older generation's

Table 2. The older generation's contact frequencies, overall and by different contact forms, with: children, by dyads of mother-daughter, father-daughter, mother-son, and father-son; grandchildren by grandparent types; and sisters, brothers, sisters' child(ren), and brothers' child(ren). Mean and (standard deviation).

	Overall contact	Face-to-face	By phone	Digital contact	Letter or postcard
Mother-daughter	3.1 (0.97)	2.0 (1.16)	2.7 (1.27)	2.1 (1.58)	0.4 (0.57)
Father-daughter	2.7 (1.03)	2.0 (1.16)	2.0 (1.28)	1.5 (1.39)	0.3. (0.48)
Mother-son	2.8 (0.98)	2.0 (1.17)	2.2 (1.23)	1.7 (1.43)	0.3 (0.52)
Father-son	2.6 (1.07)	1.9 (1.19)	2.0 (1.27)	1.3 (1.34)	0.2 (0.42)
MGM	2.5 (1.04)	1.9 (1.19)	1.5 (1.35)	1.3 (1.35)	0.4 (0.60)
MGF	2.3 (1.09)	1.9 (1.14)	1.2 (1.24)	0.9 (1.18)	0.3 (0.48)
PGM	2.4 (1.05)	1.8 (1.15)	1.3 (1.26)	1.2 (1.28)	0.4 (0.54)
PGF	2.2 (1.09)	1.7 (1.10)	1.0 (1.18)	0.8 (1.09)	0.3 (0.47)
Sister	1.8 (1.10)	1.1 (0.92)	1.6 (1.18)	0.9 (1.14)	0.4 (0.53)
Brother	1.5 (0.96)	1.1 (0.88)	1.3 (0.99)	0.6 (0.89)	0.3 (0.49)
Sisters' child(ren)	0.9 (0.72)	0.6 (0.66)	0.5 (0.66)	0.4 (0.69)	0.2 (0.42)
Brothers' child(ren)	0.7 (0.70)	0.6 (0.63)	0.4 (0.61)	0.4 (0.62)	0.2 (0.40)

Note: MGM: maternal grandmother, MGF: maternal grandfather, PGM: paternal grandmother, PGF: paternal grandfather. Scale is 0 = never, 1 = less than once a month, 2 = about 1–3 times a month, 3 = once a week, 4 = daily or several times a week, and 5 = several times a day.

respondents were more often in contact with their sisters than their brothers, and the most likely method of contacting siblings was the phone. Similarly, they were more often in contact with their sisters' children than their brothers' children. With nieces and nephews, face-to-face contact was the most popular form of contact.

Analytical results

To explore the association between digital and traditional forms of contact, we formed linear regression models. Figure 1 shows the magnitude of the regression coefficients regarding the association between digital and traditional contact frequencies for mothers, fathers, mothers-in-law, and fathers-in-law in the younger generation. All traditional forms of contact (face-to-face, phone, postcards/letters) were positively associated with digital contact, even when controlling for a wide range of variables (e.g. living distance). In other words, those engaging in digital contact more frequently were also likely to meet face-to-face, call each other, and send postcards or letters more frequently. Similarly, digital contact with siblings and siblings' children in the younger generation was positively associated with all other contact forms (Figure 2).

The older generation's digital contact with children was also positively associated with all traditional forms of contact when controlling for several characteristics. The contact frequencies for each parent–child dyad are presented in Figure 3 according to gender. Positive associations between digital and traditional contact were also found in grandparent-grandchild dyads. An exception were paternal grandfathers, whose digital contact
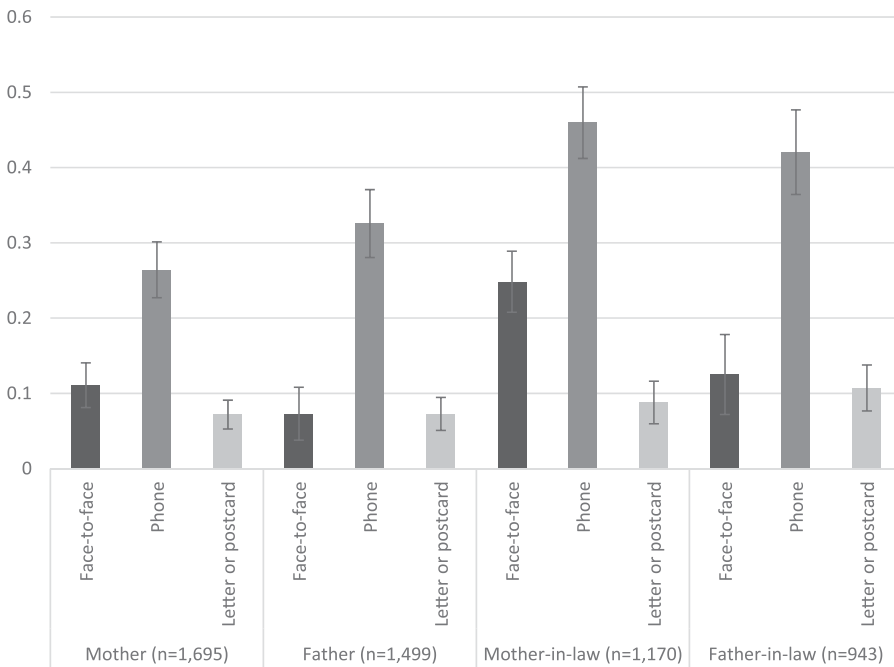
Figure 1. Associations between face-to-face, phone, letter or postcard contact and digital contact for mother, father, mother-in-law, and father-in-law. Younger generation. ß-coefficients and 95% confidence intervals.
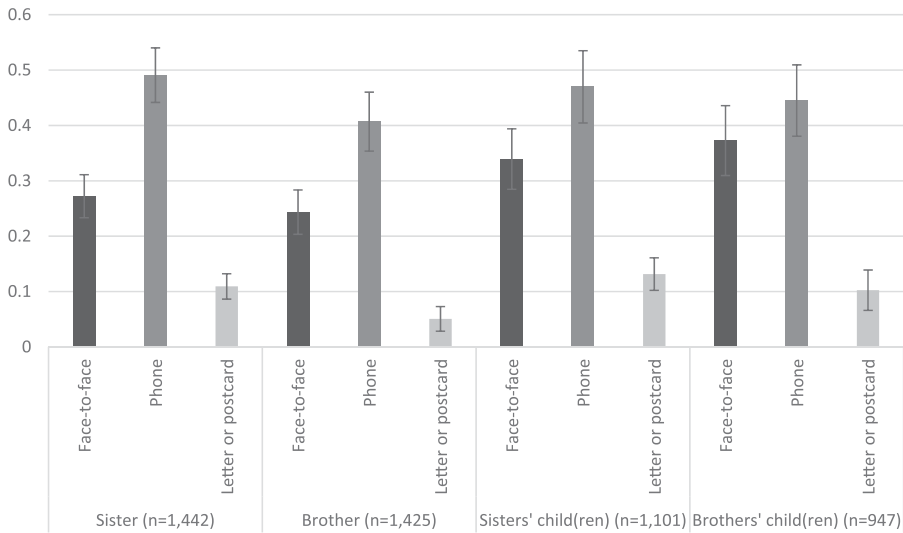
Figure 2. Associations between face-to-face, phone, letter or postcard contact and digital contact for sisters, brothers, sisters' child(ren), and brother's child(ren). Younger generation. ß-coefficients and 95% confidence intervals.

with their grandchildren was significantly positively associated with phone calls, but not significantly— although positively—associated with face-to-face contact and sending letters or postcards (Figure 4). In the case of contact with siblings and siblings' children in the older generation, digital contact was positively associated with all traditional forms of contact (Figure 5).
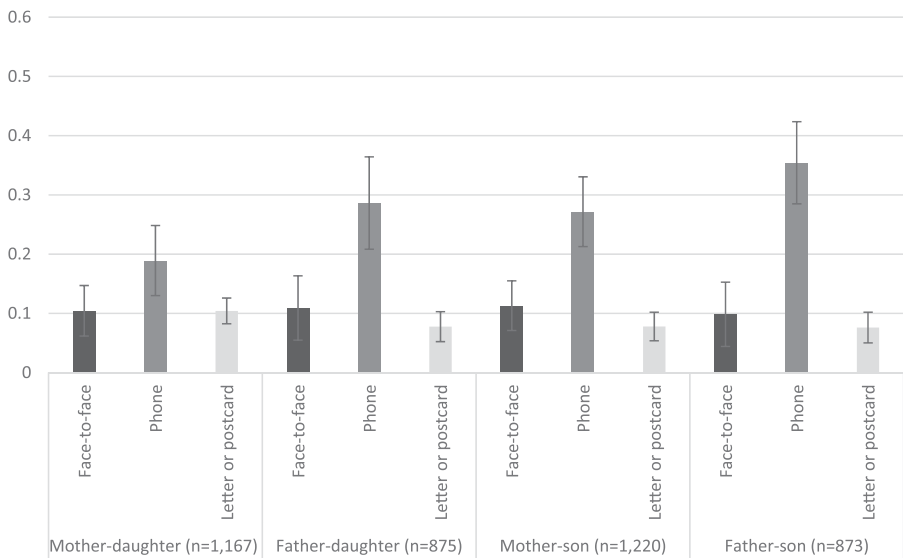
Figure 3. Associations between face-to-face, phone, letter or postcard contact and digital contact for the dyads of mother-daughter, father-daughter, mother-son, and father-son. Older generation. ß-coefficients and 95% confidence intervals.
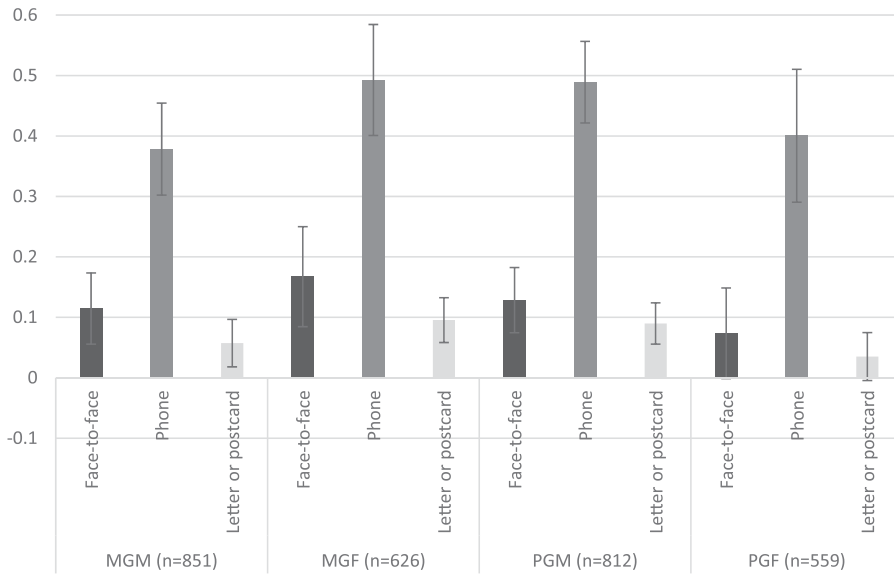
Figure 4. Associations between face-to-face, phone, letter or postcard contact and digital contact for maternal grandmother (MGM), maternal grandfather (MGF), paternal grandmother (PMG), and paternal grandfather (PGF). Older generation. ß-coefficients and 95% confidence intervals.
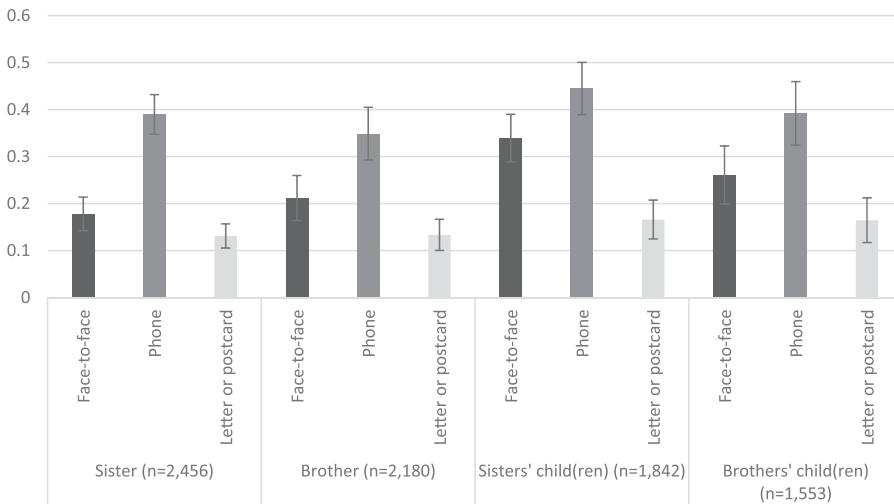
Figure 5. Association between face-to-face, phone, letter or postcard contact and digital contact for sister, brother, sisters' child(ren), and brothers' child(ren). Older generation. ß-coefficients and 95% confidence intervals.

Discussion

In the present study, we examined traditional and digital forms of kin communication among younger and older Finns. The descriptive findings revealed important gender and age differences. First, mothers, daughters, sisters, and maternal grandmothers

were found to communicate more frequently than their male (or paternal) counterparts. Second, in terms of age, digital methods were more prevalent in the younger generation.

The main goal of our study was to investigate whether digital contact is associated with increased or decreased contact with kin via traditional means i.e. meeting face-to-face, phone calls, and sending letters or postcards. Our main analyses revealed that overall, digital contact was positively associated with all traditional forms of contact in all kin dyads, regardless of gender, age, and type of kin, with one exception: paternal grandfathers' digital contact with grandchildren was not significantly, although positively, associated with face-to-face contact and sending letters or postcards. Thus, we found no support for the displacement hypothesis in the two Finnish generations that formed our study's sample. In other words, digital forms of contact do not appear to displace traditional forms of contact; rather reinforcing them regardless of age and kin relationship status. This implies that the higher the frequency of digital contact the higher the frequency of also traditional forms of contact.

Our results are in line with the study conducted in Hong Kong by Shen et al. (2017), who also investigated the associations between various methods of contact in kin communication. They found that communicating face-to-face with family members was positively associated with using all other common methods of contact with them (phone, instant messages, social media, video calls, and e-mail). Their study and the current study contribute to each other's generalizability in that they investigate culturally distinct populations. Shen et al.'s (2017) study used data from a population-based telephone survey (N = 2017), and investigated the use of various contact methods for family-related communication and their associations with family well-being. Hong Kong represents a combination of a collectivistic culture and highly advanced technology, where technology may serve an important function in family life; in contrast, Finland represents a Western individualistic culture with highly advanced technology. Regardless of the cultural differences between the two places, the results are contingent and support the reinforcement hypothesis. In other words, in both individualistic and collectivistic cultural contexts, digital communication among kin appears to have taken a complementary and reinforcing role in overall communication.

It must be noted that in our analyses, we narrowly focused on exclusive communication within specific kin dyads, and our findings (i.e. support for the reinforcement hypothesis) apply within that context. Some of the earlier studies that have explored the issue of displacement versus reinforcement in the context of digital communication have focused on measures such as social media use, Internet use, or smartphone use, and how these measures relate to interactions with family members (e.g. see Hall, Johnson & Ross, 2019; Robinson & Lee, 2014; Vilhelmson et al., 2016). Compared to our study, these studies have led to a very different set of conclusions regarding the displacement and reinforcement hypotheses. For example, these studies have found that the greater the time spent on using the Internet or social media, the lesser the time available for activities such as visiting relatives or childcare; therefore, these studies, unlike our study, have supported the displacement hypothesis. Future research can determine whether social media facilitates or displaces communication with specific kin members. For example, researchers may explore the question of whether cousins are more likely to have contact with one another if each of them uses social media.

Although our study's findings did not support the displacement hypothesis, a within-person and longitudinal research design could provide different research results. For instance, Verduyn et al. (2021), on employing a within-person design, found support for the displacement hypothesis when they investigated associations between individuals' smartphone use and their face-to-face interactions on the same day. Similarly, Hall, Kearney & Xing (2019) also detected differential support for the displacement and reinforcement hypotheses in relation to social media use depending on whether they compared different individuals (between-person design) or the same individuals at different time points (within-person design). Further evidence for the displacement hypothesis is provided by Finnish statistics (Hanifi, 2019) that show a stark decline in face-to-face interactions among family members and friends between 2002 and 2017. This time period coincides with the surge of digital communication, suggesting that the rise of digital communication and decline in face-to-face communication may be linked to one another longitudinally. Hence, within-person and longitudinal designs could be useful in future research for understanding the association between digital and traditional forms of contact.

The strengths of the present study include its representative data, and its isolation of a range of kin dyads by kinship status to study them separately. In addition, our study included data from two generations, and we were able to investigate the associations within a wide range of people of different ages.

Furthermore, the data included an extensive number of control variables which also contributes to the robustness of the results. For example, social and economic factors have been found to moderate the relationship between the use of digital and overall contact, such that digital means of communication enhance face-to-face contact for those with existing social networks and a better economic standing, while reducing face-to-face contact for the more socially isolated individuals and those with a low economic status (Ahn & Shin, 2013; Hampton & Ling, 2013). Although we do not examine the moderating roles of socio-economic variables, instead merely controlling for their effects, our results nevertheless contribute to the 'digital divide' literature. We show that digital divides can have consequences for communication with kin networks: A divide in digital communication may widen the divide also in overall communication.

Out of all of our control variables, geographical distance between relatives was most prominently and consistently associated with the frequency of traditional forms of contact. A negative association was found, as expected, between geographical distance and meeting face-to-face, because long distances naturally make face-to-face encounters more cumbersome to organize. More surprisingly, geographical distance was negatively associated with phone calls, yet positively associated with sending/receiving letters or postcards. These findings are consistent with Hurme et al.'s (2010) study which also found all forms of contact, including digital contact, to decrease as geographical distance increased with the only exception being letters and postcards. This variable (geographical distance), among others, supports the notion that digital contact has taken a complementary role, rather than a compensatory role in which fewer opportunities to meet face-to-face due to long distances would be compensated with digital contact (e.g. Yu et al., 2016).

Other control variables, such as health and number of relatives, were relatively weakly and inconsistently associated with the traditional forms of contact across the studied types of kin dyads.

Our results contradict the popular concern about the eroding effect of technology on face-to-face communication. With this study, we bring nuance to this popular belief and show that, at least among kin, digital communication has taken a complementary role in overall communication. We acknowledge that most digital platforms are primarily used to uphold non-kin ties (Brandtzaeg et al., 2010), and the impact of digitalization may have, therefore, altered communication with non-kin more dramatically. Nevertheless, our results suggest, that more inclusive digital devices and platforms could benefit, for example, older adults' communication and strengthen their kin networks.

Disclosure statement

Funding

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Appendix

Appendix Table 1. Contact with mother, father, mother-in-law, father-in-law, sister(s), brother(s), sisters' child(ren), and brothers' child(ren), by video call and text message, in the younger generation. Mean and (standard deviation).

	Video call	Text message
Mother	0.3 (0.70)	2.2 (1.40)
Father	0.2 (0.56)	1.4 (1.21)
Mother-in-law	0.2 (0.51)	1.0 (1.12)
Father-in-law	0.1 (0.46)	0.5 (0.87)
Sister	0.2 (0.61)	2.1 (1.32)
Brother	0.1 (0.40)	1.6 (1.17)
Sisters' child(ren)	0.2 (0.51)	0.9 (1.07)
Brothers' child(ren)	0.1 (0.39)	0.6 (0.87)

Note: Scale is 0 = never, 1 = less than once a month, 2 = about 1–3 times a month, 3 = once a week, 4 = daily or several times a week, and 5 = several times a day.

Appendix Table 2. The older generation's contact frequencies, by video calls and text messages, with: children, by dyads of mother-daughter, father-daughter, mother-son, and father-son; grandchildren by grandparent types; and sisters, brothers, sisters' child(ren), and brothers' child(ren). Mean and (standard deviation).

	Video call	Text message
Mother-daughter	0.3 (0.87)	2.0 (1.6)
Father-daughter	0.3 (0.79)	1.4 (1.4)
Mother-son	0.2 (0.69)	1.6 (1.43)
Father-son	0.2 (0.70)	1.3 (1.33)
MGM	0.3 (0.83)	1.1 (1.32)
MGF	0.3 (0.82)	0.8 (1.1)
PGM	0.3 (0.75)	1.1 (1.26)
PGF	0.2 (0.69)	0.6 (1.02)
Sister	0.1 (0.47)	0.8 (1.12)
Brother	0.1 (0.36)	0.6 (0.88)
Sisters' child(ren)	0.03 (0.23)	0.4 (0.68)
Brothers' child(ren)	0.03 (0.21)	0.4 (0.61)

Note: MGM: maternal grandmother, MGF: maternal grandfather, PGM: paternal grandmother, PGF: paternal grandfather. Scale is 0 = never, 1 = less than once a month, 2 = about 1–3 times a month, 3 = once a week, 4 = daily or several times a week, and 5 = several times a day.

Appendix Table 3. Associations between face-to-face, phone, letter or postcard contact and digital contact for mother, father, mother-in-law and father-in-law, younger generation.

	Mother			Father			Mother-in-law			Father-in-law		
	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.
Digital contact	0.11***	0.26***	0.07***	0.07***	0.33***	0.07***	0.25***	0.46***	0.09***	0.13***	0.42***	0.11***
Gender												
Female (ref.)												
Male	−0.06	−0.41***	−0.03	0.00	0.20***	−0.09***	0.20***	−0.07	−0.09**	0.15**	0.24	−0.09**
Age	−0.01**	0.00	−0.001	−0.01***	0.01	0.00	−0.01	−0.01	0.01	−0.02***	0.00	0.00
Marital status												
Living without spouse (ref.)												
Living with spouse	−0.10*	0.03	0.02	−0.04	0.10	0.04	−0.04	0.31	−0.04	0.16	0.26	0.19
Working												
Not employed (ref.)												
Employed	−0.11	0.02	−0.07	−0,16*	0.10	−0.04	0.07	0.13	0.00	0.06	0.09	−0.07
Education	−0.03	−0.05**	0.01	−0.04	−0.02	0.01	−0.02	−0.05**	0.01	−0.03	−0.06**	0.01
Financial situation												
Low income (ref.)												
Middle income	0.04	0.10	0.07*	0.03	0.01	0.02	0.03	0.02	−0.02	0.02	0.10	0.03
Comfortably off or wealthy	0.05	0.10	0.05	−0.02	−0.13	0.00	−0.05	−0.04	0.05	−0.04	0.10	0.08
Number of children	0.11*	0.17*	0.02	0.05	0.02	0.01	0.12*	0.24	0.01	0.20	0.06	0.05
Number of siblings	−0.15*	−0.26**	−0.07	−0.18	−0.26**	−0.03	0.01	0.01	−0.08	0.02	−0.04	−0.09
Relationship duration with current spouse							0	0.01	0	0,01***	0.01	0.00
Parents divorced												
No (ref.)												
Yes	−0.29***	−0.21***	0.01	−0.52***	−0.10	−0.04	−0.29***	−0.18	0.00	−0.39	−0.05	−0.02
Parent's/parent's-in-law age	−0.01	0.002	0.01*	0.00	0.01	0.00	0.00	0.01**	0.01*	0.01	0.00	0.00
Parent's/parent's-in-law financial situation												
Low income (ref.)												
Middle income	−0.06	−0.05	−0.02	0.00	−0.14*	−0.08	−0.08	−0.01	−0.02	−0.04	0.07	0.04
Comfortably off or wealthy	−0.11*	−0.14*	−0.03	−0.04	−0.08	−0.04	0.04	0.11	−0.1	0.03	0.12	0.03

(*Continued*)

Appendix Table 3. Continued.

	Mother			Father			Mother-in-law			Father-in-law		
	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.
Parent's/parent's-in-law health												
Poor or very poor (ref.)												
Fair	−0.13*	0.13	0.01	0.07	0.14	0.02	0.05	0.12	0.06	0.18*	0.13	0.00
Good or very good	−0.13	0.18*	0.05	0.12	0.26**	0.04	0.06	0.08	0.05	0.27	0.09	−0.02
Distance to parent/ parent-in-law												
0–5 km (ref.)												
5.1-25 km	−0.69***	−0.16*	0.03	−0.73***	−0.21**	−0.02	−0.40***	−0.05	0.09*	−0.47	−0.06	0.12**
25.1-100 km	−1.19***	−0.29***	0.11**	−1.21***	−0.38***	0.05	−0.73***	−0.18*	0.16***	−0.88	−0.21*	0.08
over 100 km	−1.83***	−0.45***	0.23***	−1.76***	−0.56***	0.15***	−1.28***	−0.43***	0.18***	−1.33	−0.35***	0.11**
Adjusted R-squared	0.46	0.21	0.08	0.4613	0.1883	0.06	0.4183	0.3435	0.057	0.3967	0.2699	0.0742
n	1,695	1,695	1,695	1,499	1,499	1,499	1,169	1,169	1,169	943	943	943

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Appendix Table 4. Associations between face-to-face, phone, letter or postcard contact and digital contact for sister, brother, sister's children, brother's children, younger generation.

	Sister			Brother			Sister's children			Brother's children		
	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.
Digital contact	0.27***	0.49***	0.11***	0.24***	0.41***	0.05***	0.34***	0.47***	0.13***	0.37***	0.44***	0.10***
Gender												
Female (ref.)												
Male	0.040	−0.09	0.0003	0.13**	0.20***	−0.08**	−0.09	−0.08	−0.09**	0.03	−0.02	−0.15***
Age	0.00	0.01*	−0.002	−0.01*	0.01	0.000	0.000	0.00	0.00	−0.01	0.01**	0.01*
Marital status												
Living without spouse (ref.)												
Living with spouse	0.07	0.17*	−0.01	−0.04	0.02	0.02	0.12	0.01	0.07	0.05	−0.03	0.02
Working												
Not employed (ref.)												
Employed	0.01	0.18*	−0.07	−0.06	0.09	−0.07	−0.02	0.04	−0.07	−0.09	0.03	−0.10
Education	0.00	−0.05**	0.00	−0.05**	−0.06**	0.02*	−0.03	−0.03	−0.02	−0.04*	−0.05**	0.02
Financial situation												
Low income (ref.)												
Middle income	0.06	−0.02	0.04	0.09	0.02	0.01	0.07	−0.05	0.01	0.08	0.06	0.02
Comfortably off or wealthy	0.03	0.06	0.07	0.000	0.00	0.02	0.14	0.05	0.06	0.02	0.04	0.00
Number of children	−0.07	0.08	0.03	−0.01	0.10	−0.06	−0.17**	0.00	−0.03	−0.05	−0.01	−0.06
Number of siblings	−0.01	−0.05***	−0.02***	−0.01	−0.06***	−0.02**	0.00	−0.02	−0.01*	0.00	−0.02**	−0.01**
Parents divorced												

Appendix Table 4. Continued.

	Sister			Brother			Sister's children			Brother's children		
	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.
No (ref.)												
Yes	−0.16***	0.00	0.01	−0.06	−0.06	−0.08**	−0.15**	−0.08	0.01	−0.07	−0.09	−0.05
Sibling's age	0.000	0.01	0.01*	0.000	−0.001	0.00	−0.01*	0.00	0.00	0.000	0.000	0.00
Sibling type												
Full sibling (ref.)												
Maternal half-sibling	0.000	0.09	−0,13*	−0,21***	−0.08	0.10	−0.08	0.05	−0.08	−0.05	−0.01	0.08
Paternal half-sibling	−0.28***	−0.28**	−0.04	−0.36***	−0.38***	−0.08*	−0.34***	−0.08	−0.12*	−0.33**	0.02	−0.01
Step sibling	−0.10	−0.34	−0.16	−0.18	−0.33	−0.07	0.00	−0.07	0.00	−0.10	−0.03	−0.05
Distance to sibling												
0–5 km (ref.)												
5.1–25 km	−0.51***	−0.11	−0.04	−0.40***	−0,20*	0.05	−0.48***	−0.19*	−0.07	−0.27**	−0.25**	−0.04
25.1–100 km	−0.79***	−0.19**	0.06	−0.69***	−0.28	0.02	−0.74***	−0.12	0.05	−0.54***	−0.30***	−0.01
over 100 km	−1.15***	−0.34***	0.12**	−0.95***	−0.40***	0.11**	−0.94***	−0.24*	0,10*	−0.74***	−0.25**	0.04
Age of the sibling's youngest child							−0.01**	−0.01	−0.01***	−0.02***	−0.002	−0.01*
Adjusted R-squared	0.453	0.44	0.1138	0.3982	0.3787	0.0721	0.4131	0.42	0.158	0.3675	0.3943	0.1306
n	1,442	1,442	1,442	1,425	1,425	1,425	1,101	1,101	1,101	947	947	947

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Appendix Table 5. Associations between face-to-face, phone, letter or postcard contact and digital contact for the dyads of mother-daughter, father-daughter, mother-son, father-son, older generation.

	Mother-daughter			Father-daughter			Mother-son			Father-son		
	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.
Digital contact	0.10***	0.19***	0.10***	0.11***	0.29***	0.08***	0.11***	0.27***	0.08***	0.10**	0.35***	0.08***
Age	0.03	0.03	0.00	−0.01	0.02	0.01	−0.02	0.01	−0.01	0.02	0.00	−0.01
Marital status												
Living without spouse (ref.)												
Living with spouse	0.03	0.07	0.05	0.23	−0.05	−0.02	0.13	0.04	0.00	0.42**	0.06	0.00
Working												
Not employed (ref.)												
Employed	−0.72*	0.12	−0.3*	0.32	0.11	0.14	−0.83**	−0.21	−0.21**	0.09	0.08	0.00
Health												
Poor or very poor (ref.)												
Fair	−0.08	−0.33	−0.19*	0.10	0.09	−0.01	−0.19	−0.41	−0.01	−0.04	0.18	0.03
Good	−0.13	−0.34	−0.12*	0.10	0.08	0.00	−0.20	−0.47*	−0.04	−0.11	0.08	−0.03
Very good	−0.13	−0.24	−0.32**	0.03	0.11	−0.01	−0.22	−0.52*	−0.04	−0.28	−0.07	0.01
Education	0.01	0.01	0.03*	−0.01	−0.06	0.03**	−0.01	0.03	0.04**	−0.02	−0.04	0.00
Financial situation												
Low income (ref.)												
Middle income	−0.05	0.06	−0.02	−0.17	0.17	−0.04	0.01	0.02	−0.05	−0.10	0.19	0.09*
Comfortably off or wealthy	−0.05	0.01	0.02	−0.12	0.14	−0.08	0.00	−0.01	−0.05	−0.08	0.27	0.08
Number of children	−0.04	−0.07*	0.03*	−0.06**	−0.07*	0.02	−0.03	−0.08**	0.01	−0.05**	−0.08**	0.02
Daughter's age	−0.03***	−0.02*	0.00	−0.01	0.00	0.00	−0.02***	−0.02***	0.00	−0.02**	0.00	0.00
Distance to daughter												
0–5 km (ref.)												
5.1–25 km	−0.48***	−0.02	0.09*	−0.49***	0.13	0.05	−0.49***	−0.02	0.08	−0.57***	−0.10	−0.01
25.1–100 km	−1.00***	−0.31**	0.13**	−0.89***	0.00	0.05	−1.05***	0.00	0.00	−1.11***	−0.07	0.06
over 100 km	−1.77***	−0.44***	0.29***	−1.68***	−0.32*	0.22***	−1.64***	−0.30**	0.20***	−1.67***'	−0.37**	0.11**
Adjusted R-squared	0.4409	0.1157	0.1692	0.374	0.1266	0.1268	0.3744	0.1481	0.0952	0.3842	0.1752	0.0936
n	1,166	1,167	1,167	875	875	874	1,219	1,219	1,219	872	873	873

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Appendix Table 6. Associations between face-to-face, phone, letter or postcard contact and digital contact for maternal grandmother, maternal grandfather, paternal grandmother, paternal grandfather, older generation

	MGM			MGF			PGM			PGF		
	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.
Digital contact	0.12***	0.38***	0.06**	0.17***	0.49***	0.10***	0.13***	0.49***	0.09***	0.08*	0.40***	0.04
Age	0.02	0.02	−0.01	−0.01	0.00	0.03*	0.00	0.01	−0.01	0.00	−0.01	0.01
Marital status												
Living without spouse (ref.)												
Living with spouse	0.13	−0.07	−0.01	0.31*	0.20	−0.03	0.22*	−0.11	0.00	0.21	0.23	−0.01
Working												
Not employed (ref.)												
Employed	−0.10	1.12**	−0.23	−0.04	−0.33	0.15	0.18	0.42	−0.16	0.10	−0.02	0.02
Health												
Poor or very poor (ref.)												
Fair	0.06	−0.12	−0.16	0.18	0.15	0.12	0.28	−0.37	0.02	−0.02	0.19	−0.01
Good	0.01	−0.21	−0.19	0.08	0.10	0.07	0.26	−0.39	0.05	−0.26	0.06	−0.07
Very good	−0.01	−0.32	−0.31*	0.23	−0.11	0.14	0.38	−0.29	0.01	−0.31	−0.38	−0.06
Education	0.01	−0.03	0.04**	0.02	0.00	0.03*	0.00	−0.067*	0.03*	−0.02	−0.04	0.00
Financial situation												
Low income (ref.)												
Middle income	−0.02	0.11	−0.01	−0.15	0.06	0.06	0.15	0.14	−0.06	0.09	0.04	0.10
Comfortably off or wealthy	0.02	0.18	0.14	−0.11	0.12	0.05	0.01	−0.05	−0.12	0.21	0.22	0.13
Number of children	0.01	−0.13**	0.03	−0.17**	−0.14**	0.01	−0.07	−0.11*	−0.04	−0.13**	−0.18**	−0.01
Daughter's age	−0.04***	−0.01	0.00	0.00	0.00	−0.01*	−0.02	−0.01	0.00	−0.04***	0.00	0.01
Distance to daughter												
0–5 km (ref.)												
5.1-25 km	−0.36***	0.04	−0.02	−0.29*	0.12	0.06	−0.39***	−0.24*	0.14**	−0.46***	−0.08	0.13*
25.1-100 km	−0.94***	−0.22	0.06	−0.61***	0.09	0.13*	−0.78***	−0.22	0.12*	−0.78***	−0.01	0.06
over 100 km	−1.48***	−0.28*	0.15*	−1.25***	−0.04	0.27***	−1.31***	−0.23*	0.27***	−1.33***	−0.06	0.23***
Age of the daughter's youngest child	−0.02**	0.00	−0.01**	−0.02**	0.01	0.00	−0.03***	0.00	−0.01*	−0.02*	−0.01	−0.01
Number of grandchildren	−0.02*	0.01	0.00	0.02*	0.02	0.00	0.00	0.00	0.01	0.01	0.02	0.00
Adjusted *R*-squared	0.342	0.1745	0.1019	0.3072	0.266	0.1541	0.329	0.2798	0.1092	0.3553	0.2204	0.0743
n	851	850	851	626	626	626	812	812	812	559	559	559

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

	Sister			Brother			Sister's child			Brother's child		
	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.
Digital contact	0.18***	0.39***	0.13***	0.21***	0.35***	0.13***	0.34***	0.44***	0.17***	0.26***	0.39***	0.16***
Gender												
Female (ref.)												
Male	−0.14***	−0.41***	−0.02	0.08*	0.00	−0.05	−0.03	0.03	−0.09***	0.01	0.00	−0.07**
Age	0.03*	0.01	0.00	0.02	0.02	0.01	0.02	−0.01	0.01	0.01	0.00	0.01
Marital status												
Living without spouse (ref.)												
Living with spouse	0.03	−0.06	−0.04	0.01	−0.07	0.01	0.01	−0.03	−0.03	−0.01	0.01	0.00
Working												
Not employed (ref.)												
Employed	0.07	0.21	0.02	0.14	0.18	−0.07	0.13	0.14	−0.11*	−0.17	−0.05	−0.10***
Education	0.00	−0.04**	0.03***	−0.01	−0.01	0.02**	0.00	0.00	0.02*	0.00	−0.02	0.01
Financial situation												
Low income (ref.)												
Middle income	0.01	0.02	0.01	0.04	0.06	−0.01	−0.02	0.05	0.01	0.04	0.09*	0.03
Comfortably off or wealthy	0.10	0.06	−0.05	0.05	0.05	−0.01	−0.01	0.02	−0.05	0.00	−0.03	0.02
Health												
Poor or very poor (ref.)												
Fair	0.15	0.05	−0.07	0.25**	0.20	0.00	0.13*	0.04	−0.03	0.13	0.19*	0.09*
Good	0.20*	0.05	−0.11	0.26**	0.15	−0.02	0.17*	0.02	−0.07	0.16	0.16*	0.04

Appendix Table 7. Continued.

	Sister			Brother			Sister's child			Brother's child		
	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.	Face-to-face Coeff.	Phone Coeff.	Letter or post card Coeff.
Very good	0.07	−0.09	−0.10	0.13	−0.05	0.07	0.15	0.03	−0.02	0.12	0.18*	0.04
Number of children	−0.02	−0.05*	−0.02	0.00	−0.03	0.00	−0.01	−0.06***	−0.02	−0.01	−0.03*	−0.03*
Number of siblings	0.00	−0.04***	−0.01	0.01	−0.02	0.01	0.00	−0.02**	−0.01	0.00	−0.01	−0.01
Number of grandchildren	0.00	0.01	0.00	0.00	0.00	−0.01*	0.00	0.09*	0.00	0.00	0.00	0.00
Sibling's age	0.00	0.02	0.00	0.00	0.01*	0.00	0.00	0.01**	0.00	0.00	0.00	0.00*
Sibling type												
Full sibling (ref.)												
Maternal half-sibling	−0.14*	−0.44	0.15*	−0.20*	−0.13	0.06	−0.13*	−0.06	0.00	0.00	0.00	0.05
Paternal half-sibling	−0.11	−0.33	−0.08	−0.10	−0.26*	−0.05	−0.24*	−0.29**	−0.14*	−0.09	−0.04	−0.04
Step sibling	0.10	0.35	−0.49***	−0.20	−0.30	−0.24***	0.17*	−0.66***	−0.40***	−0.05	−0.25***	−0.26***
Distance to sibling												
0–5 km (ref.)												
5.1–25 km	−0.58***	−0.21	0.05	−0.53***	−0.23**	0.06	−0.19**	−0.09	0.04	−0.26**	−0.11	−0.01
25.1–100 km	−0.96***	−0.33	0.14***	−0.76***	−0.24**	0.12***	−0.22***	−0.14*	0.08*	−0.39***	−0.16**	0.09**
over 100 km	−1.26***	−0.51	0.19***	−1.03***	−0.34***	0.17***	−0.38***	−0.17**	0.09**	−0.47***	−0.20***	0.08*
Age of the sibling's yougest child							−0.00*	0.00	0.00	−0.01**	0.00	−0.00*
Adjusted R-squared	0.2902	0.2493	0.1272	0.214	0.1202	0.099	0.2075	0.277	0.1295	0.1484	0.2051	0.1228
n	2,455	2,456	2,456	2,181	2,180	2,180	1,842	1,842	1,842	1,553	1,553	1,554

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$