Original

Communication with children for older adults' life satisfaction: Non-face-to-face and/or face-to-face?

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K. Sun, M-Y Zuo, D. Kong. Communication with children for older adults' life satisfaction: Non-face-to-face and/or face-to-face? Gerontechnology 2016;14(4):191-203; doi:10.4017/gt.2016.14.4.002.00 **Objectives** Communication with children is an important way to reduce the effect of empty nest syndrome and increase life satisfaction of older adults. Under new network environment, more and more young people rely on non-face-to-face (nFTF) technology to communicate with parents, instead of face-to-face (FTF) communication due to the constraints of living condition and busy schedule of job. We are wondering whether it is good for older adults' life satisfaction. Specifically, can nFTF provide the same benefit as FTF does to increase older adults' life satisfaction? How to use nFTF to benefit older adults best? **Theories** From the perspective of family support (for instance, emotional support and instrumental support), this paper mainly uses Media-Richness Theory and Social Presence Theory to analyse the different capability of FTF and nFTF to increase older adults' life satisfaction. Besides, we try to examine in which situation increasing nFTF can benefit older adults. **Design** The data of China Health and Retirement Longitudinal Study (CHARLS) is used to test our hypotheses. **Results** FTF is better than nFTF to increase life satisfaction. Only in the context that FTF is harder or less available (frequency of FTF is less than once every six months), nFTF is positively related to increasing life satisfaction; when the frequency of FTF is more than once every six months, more nFTF will not provide an extra benefit for older adults. In the present paper, we systematically analyse the difference of FTF and nFTF, and extend previous studies, which focus on nFTF's advantage, to in what context nFTF can cooperate with FTF to increase older adults' life satisfaction.

Keywords: face-to-face, non-face-to-face, older adults, life satisfaction

Along with the increasing of aging population, the implementation of the nationwide 'one child per couple' policy and continuing migration of young Chinese, the empty nester phenomenon has been an important and significant social problem in China[1]. "Empty nesters" refer to old adults who live alone when all of their children leave home. According to the data of the National Health and Family Planning Commission of the PRC[2], half of the elderly population (the total is 214 million aged 60 years or older) are empty nesters, of which 41.9% live with their spouse and 10% live alone.

The empty nest syndrome results in serious consequences for older adults. For example, empty nesters have lower life quality[3], higher loneliness[4], lower well-being[5] and life satisfaction[6]. Life satisfaction is believed to be an evaluation of life in general[6], therefore it is one of the widely used concepts to analyze the effect of the empty nest syndrome on older adults[5,6].

Communication with children is believed to be one important way to reduce the effect of the empty nest syndrome and increase life satisfaction of older adults[3,5,6]. White and Edwards[7] find that when there is frequent contact with non-co-resident children or when there were young teens in older adults' household, overall life satisfaction will improve significantly. That shows that as for empty nesters do need the support from their family members through close contact and frequent visits to increase life satisfaction[3].

Under the new network environment, communication between older adults and their children can be divided into two channels: Face-to-Face (FTF) communication and other medium-mediated communication, such as via phone, text message, video-chat, social-network site and so

on (we name it as non-Face-to-Face communication, nFTF).

The main problem that contemporary China faces is "the accessibility of the younger family members who are far away from their parents' home or not willing to go home frequently for physical togetherness"[8]. The continuing migration of young Chinese both across and within the national borders has been transforming the dynamics of Chinese living in tremendous ways[1]. More and more young adults live apart and even far away from their parents, which make the FTF communication harder and less available[1]. Even in the same city or with the availability of FTF, because of their busy job schedule, young people tend to prioritize their job demand over the willingness to come back home to visit their parents[1,9].

With the progress of information and communication technology, people are more and more confident that the nFTF is a perfect way to improve the intergenerational relationship and can resolve the empty nest syndrome[10]. As nFTF communication allows young people to communicate with parents in distant places and without time constraints, they gradually rely on nFTF methods to communicate with their parents[11,12]. For example, when we send messages to parents via nFTF channels, such as the instant chat tools WeChat and QQ, we do not expect their response instantly, which makes our communication more flexible.

At present, dispersed family members increasingly use nFTF (such as Internet) as the primary conduit through which they sustain intergenerational bonds[13]. And some people even believe that the nFTF (such as Internet) communication is as good and can replace FTF communication in enhancing the quality of life for Chinese Internet Users[11]. So with the help of an nFTF communication tool, many people believe that young people can focus on their work and do not have to spend so much time to visit their parents frequently, without decreasing their parents' life satisfaction. But is this true? Is the nFTF as good as FTF for older adults? And if nFTF is not as useful as FTF to improve older adults' life satisfaction, how can people use it to achieve the best results?

Previous research

Many authors are trying to find the relationship between different communication channels and life satisfaction. However, previous studies pay more attention to the effects of different communication channels on young people, or people in general, instead of older adults[11,14,15]. And most of the existing studies just analyzed one of the

FTF or nFTF communication channels alone, but did not compare the two communication channels' efficiency and effectiveness for older adults' life satisfaction and other health consequences[16]. Besides, most previous studies focus on the new relationship formation in a working context when changing from FTF to nFTF[17-19]. However, little research considers the parent-child intimate relationship maintenance in a family, via different communication channels.

Admittedly, nFTF can improve older adults' psychological health[8,20]. Many researchers have found that nFTF communication (such as mobile phone, online-social network and other Internet-mediated communication) can decrease older adults' depression and increase their well-being[21-23]. But existing studies do not take into consideration in different contexts of FTF if nFTF can improve older adults' life satisfaction. In other words, in different contexts of FTF, is there a different relationship between life satisfaction and nFTF?

Aim of study

Therefore, in the present paper we expect to solve two questions: (i) can nFTF provide the same benefits as FTF does? and (ii) how does nFTF cooperate with FTF to increase life satisfaction?

In the present paper, we try to make the following contributions: (i) we analyze the difference between FTF and nFTF communication from the perspective of older adults' life satisfaction. Different communication channels have difference influences on older adults' life satisfaction; (ii) we extend the understanding of FTF and nFTF from young-people-oriented, working-context-focused to the context of older adults-children interaction; (iii) we extend the understanding of FTF and nFTF, which is now limited to the domain of information exchange, to the broader context of interpersonal interaction with physical support and help; (iv) we extend previous studies that focus on nFTF's advantage to those contexts wherein nFTF cannot offer benefit to older adults' life satisfaction, and wherein nFTF cooperating with FTF can get the best result.

The paper is organized in the following way: It starts with reviews of the relationship between parent-child interaction and life satisfaction; the different relationships between FTF or nFTF and life satisfaction. Then, through discussing the difference between FTF and nFTF, we propose our research hypotheses. This is followed by methodology and data analysis results. Finally, we discuss our research results and analyze the research limitations.

LITERATURE REVIEW
Life satisfaction of older adults

Life satisfaction is conceptualized as older adults' sense that they are living meaningful and satisfying lives, which could range from utter dissatisfaction to complete life satisfaction[24]. It is one of the most important and frequently used indicators to measure older adults' well-being in literature[1].

Among factors of increasing older adults' life satisfaction, relationship with children is one of the most important[25]. Sener and colleagues[26] find that a high frequency of contact with children will significantly increase older adults' life satisfaction. Liu and Guo[6] find an intimate relationship with children has a significant positive influence on increasing life satisfaction for either empty-nest elderly or non-empty-nest elderly. And for women, no matter what age, marital status, education, or whether children have left home or not, it is the mere presence of offspring that enhances women's life satisfaction and self-esteem[6].

The interaction between older adults and their children can provide family support (social support among family members), which is the important factor in maintaining intimate relationship and increasing older adults' life satisfaction[27,28]. Family support includes emotional, instrumental, informational and financial support[27]. Emotional support refers to expressions of love, empathy, trust and caring; instrumental support means aid and services of tangible form, such as helping parents with daily chores, sick care and other daily life assistance; financial support includes getting money from children for daily expenses. Informational support refers to getting advice, suggestion and knowledge from children[21,29].Older Chinese adults believe in family support and expect family support from their adult children[1,27]. Previous studies demonstrate that emotional support and instrumental support are the two most important factors in increasing older adults' life satisfaction[1,25,29]. Yoo[29] finds that in Korea, a country having a similar culture as China, emotional support and instrumental support are older adults' desired supports.

Although older adults understand their children's situation in the competitive world, they hope they can be taken care of by their children and have their emotional support through close contact and frequent visit, no matter whether they live together or not[3]. In Chinese culture, family is the bedrock of elderly support systems and older adults who are satisfied with their children's assistance are more likely to report higher life satisfaction. Generally speaking, no matter how far away their children live and how busy job

schedules their children have, the more frequent contact with children, the more social support or family support older adults could obtain, and the higher life satisfaction they would have[26].

Although previous studies find a positive relationship between contact or communication with children and older adults' life satisfaction[27,28], most of them do not divide communication into FTF and nFTF communication. Then there is little research to explore the different effects of nFTF and FTF on increasing older adults' life satisfaction. Furthermore, they seldom examine the relationship between nFTF with children and older adults' life satisfaction, let alone in which context nFTF cooperating with FTF can get the best result.

nFTF and life satisfaction

Can nFTF provide the same benefit as FTF with children to improve older adults' life satisfaction? We have not found studies that can answer this question. Little attention has been directed toward the health consequences of nFTF[23]. But, some authors have studied the relationship among Internet- or computer-mediated communication, FTF Interaction and their consequences for general Internet or computer users[30,31].

Some authors believe nFTF has its own advantages and can benefit elderly people. Bobillier et al.[31] find the use of Information Communication Technology (ICT) can improve the quality of life of older adults living in residential home care units. Moreover, Minagawa and Saito[23] find that cell phone use can reduce older adults' depressive symptoms, especially for elderly women.

Also, some authors compare the different effect of FTF and nFTF on health consequence. Lee et al.[11] find that the use of Internet for interpersonal communication has a negative influence on the quality of life; however, frequent FTF with family or friends has a positive effect. Undergraduate participants consistently value the Internet as less beneficial than FTF for maintaining relationships, which are a key element of well-being; and the amount of Internet use is found to be related to decreased well-being[14].

However, in these studies, nFTF does not in particular refer to family communication or interaction. Therefore, we cannot conclude whether nFTF for family communication has a negative effect on older adults' life satisfaction or quality of life or not. And existing studies usually just analyze one of the two communication channels, but seldom compare the two communication channels' efficiency and effectiveness[16]. As shown in

Table 1, although there are some papers that start to analyze the different effect of FTF and nFTF, they pay more attention to young people instead of older adults, whose adoption of new technology always lags to that of the young generation and is relatively passive[10]. nFTF communication has become the shared norm for the 'next generation', but older adults may have experienced a hard transforming period from non-adoption to adoption as they switch from FTF to nFTF[10,14].

FTF - nFTF theoretical difference
To assess the impact of the proliferation of nFTF media, and of the escalation of their use, we need to understand the differences between FTF and nFTF[20]. Media Richness Theory[32,33] and Social Presence Theory[34] are suitable to analyze the difference between FTF and nFTF, from the perspectives of media characteristics and users' perception. However, FTF and nFTF are not just the way of information exchange. Especially, in the FTF context people could provide physical support and help to others[1,29].

From the perspective of media characteristics, communication media differ in their ability to assist understanding[32,33]. Based on the capability to provide rapid feedback, carry non-verbal cues, convey personality traits, and support the use of natural language, they can be characterized as high or low in 'richness'[32].

FTF is considered a richer communication medium than nFTF. According to Birdwhistell[35], about 65% of the social meaning of a situation in a two-person setting is conveyed nonverbally. People can use multiple cues to communicate with each other, such as physical presence, voice inflection, body gestures, facial expressions, eye contact, touching, olfaction and other unspoken information[32,36,37], while in nFTF there are only limited communication cues[11]. This not only makes FTF more socially oriented and personal[11], but also the best way to transfer personal feelings and emotions[18]. Moreover, comparing to nFTF, in the FTF context there may be higher intensity and duration of emotion[38,39]. Sacco and Ismail[39] find in the FTF condition participants report greater basic belongingness, needs satisfaction and positive mood compared to both nFTF and no interaction.

From the perspective of users' perception, people have a different level of social presence while using different media to communicate. Social presence refers to the feeling of 'being with another'[34] or to that one has that other persons are involved in a communication exchange[40]. It is primarily used to measure how users sense the existence of other people in distant locations[40,41].

Higher social presence communication can improve people's relationship and trust[17]. Okdie et al.[42] find that participants report more positive interactions when using FTF. On the contrary, the Internet cannot convey the social presence 'warmth' and 'humanness' of FTF communication, which are conducive to deeper understanding and development of relationships between parent and child, because with Internet it is hard to express nonverbal implicit emotions from such a small screen[11,14]. Along with the decrease of social presence, the probability of reduced focused attention is higher[20]. Because of the lack of communication monitoring, people cannot control their communication as easy as with FTF. So when they feel their partners do not pay enough attention to the communication, maybe they will be less satisfied with the interaction[20]. In a higher social present context, people offer more self-disclosure, which is an important building block for relationship[14]. In Schiffrin and colleagues'[14] study, they find people may disclose less to their existing friends online than they do in FTF interaction with friends.

Most previous studies just treat FTF and nFTF as a communication channel, and analyze their characteristics from the function of information exchange[43]. But sometimes FTF and nFTF are not just constrained to information exchange activities[20]. Especially for FTF, it also happens in the interaction between participants that they support each other physically[1,29]. In FTF, young people could offer more tangible aid and services, which nFTF is not capable of doing, to increase older adults' life satisfaction[11]. For example, young people could help their parents cooking, cleaning the room or other daily assistance and take care of parents or other relatives when they are sick, which all of them are difficult to be done in nFTF communication, yet important to increase older adults' life satisfaction.

Table 1. Literature analysis of Face-to-Face (FTF) and non-Face-to-Face (nFTF) communication

Communication		Older adults		Young persons & General population		
		Quality of Life	**Depression abatement**	**Quality of Life**	**Depression abatement**	**Well-being**
nFTF	With family With general population	Not studied Bobillier Chaumon et al.[31]	Not studied Minagawa & Saito[23]	Not studied Kraut et al.[30]	Not studied Morgan & Cotton[15]	Not studied Schiffrin et al.[14]
FTF-nFTF comparison		Not studied	Not studied	Lee et al.[11]	Not studied	Schiffrin et al.[14]

Older adults' life satisfaction

As nFTF communication becomes increasingly commonplace, researchers gradually pay more attention to the difference between FTF and nFTF[16]. Along with the advancing of technology, nFTFs' efficiency and effectiveness of exchanging information is becoming higher and higher. Therefore, it can fulfill people's need for information exchange[32]. But the qualities of emotional support and instrumental support, which are most important factors in affecting older adults' life satisfaction, are still different in the two communication ways. We believe that the different capability of emotional and instrumental support result in their different effect on increasing older adults' life satisfaction.

Emotional support is one of the important factors in affecting older adults' life satisfaction. Emotional support refers to expressions of love, empathy, trust and caring[21]. Older adults in an empty nest value and need emotional support from their children[3]. And when they get more emotional support, they report higher life satisfaction[24]. FTF is a better communication channel to convey emotion than nFTF[18]. FTF is a richer communication medium, which can provide rapid feedback, carry non-verbal cues, convey personality traits, and support the use of natural language[32]. In FTF there are higher intensity and duration of emotion[38,39]. FTF has higher social presence and people in FTF have the strongest feeling of being with others[34]. Higher social presence gives FTF communication 'warmth' and participants offer more disclosure, which is conducive to deeper understanding and development of relationships[11,14].

Instrumental support is one of the important parts of parent-child communication[3,25]. Instrumental support means aid and services of the tangible form, such as helping their parents with daily chores, sick care and other daily life assistance[21,29]. In Chinese culture, older adults who are satisfied with their children's assistance are more likely to report higher life satisfaction[27]. Children are expected to be the main source of family support and to fulfill the needs of the elderly[1]. So the relationship with children is important in predicting life satisfaction among older adults[6]. More frequent FTF with children means a higher possibility of getting their children's instrumental support which can significantly positively affect older adults' life satisfaction[1]. Lee and colleagues[11] find that the lack of support online may be one of the factors that result in less satisfied users compared to offline communication.

According to the aforementioned statement, we believe that FTF with children is a better way to improve the intergenerational relationship and increase older adults' life satisfaction than nFTF, because FTF has higher media-richness and social presence and provides more instrumental support. Some authors[11] believe that "the 'quality' and 'support' of Internet communication were inadequate compared with offline interpersonal communication to enhance psychological well-being". Hence, we propose:

Hypothesis 1 (H1): FTF is more beneficial to older adults' life satisfaction than nFTF.

Cooperation between nFTF and FTF

Communication can provide emotional support and instrumental support, which are the two important factors in maintaining intimate relationship and then increasing life satisfaction[3]. According to Ku et al. [44], people's use of communication channels is a subjective choice determined by their communication needs. When one communication channel (for instance, FTF) cannot be available to meet people's needs, they will find other available choices (for instance, nFTF). However, when FTF is available, because of its favorable characteristics, FTF can fulfill people's needs better[39]; so then maybe increasing nFTF will not provide more benefit.

When FTF is infrequent, more nFTF can provide additional interaction to increase life satisfaction. Living apart and even far away from parents[1] and a busy job schedule both make FTF communication harder and less available[1,9]. Because there is no limitation by space and time nFTF communication allows young people to communicate with remoted parents and partially recover the loss of unavailable FTF[11,12]. No matter whether from studies results or practical observation, the benefits of nFTF on a family are reflected in its ability to communicate with remote family members or friends[10,23,31]. For example, Lee et al.[11] find that Internet communication can strengthen people's social relationship because it allows people to communicate with family members in distant places and without time constraints. Quadrello et al.[45] find people likely use e-mail and telephone to maintain contact with close others at a distance. European grandparents will choose nFTF with their grandchildren for complementarity when they live far away[45]. Living far away means that the difficulty of FTF is high and the availability of FTF is low. Intimate relationship maintenance needs a certain level of interaction[46,47]. Therefore, when FTF is hard, more nFTF can be adopted to recover the loss of FTF in some way and increase older adults' life satisfaction.

But, when there is a lot of FTF, more nFTF will not increase older adults' life satisfaction signifi-

cantly. Rather than becoming ever more intimate, however, Knapp, Ellis, and Williams[46] suggest that when an interpersonal relationship develops, the relational and communicative behavior increase toward greater affiliativeness until reaching plateaus of relational stabilization[43,47]. In other words, when an intimate relationship reaches a plateau, more interaction will not be helpful to improve relationship[40,43,46,48]. When people's needs (for instance, intimate relationship, emotional support, instrumental support) are fulfilled by FTF, they will not take extra nFTF to fulfill their needs[49]. Therefore, when the frequency of FTF is relatively high, more nFTF will not help to increase intimacy of parent-child relationshipor increase older adult's life satisfaction. Furthermore, because nFTF will occupy each other's time, when more interaction cannot increase intimate relationships, the negative effects of nFTF will show up significantly and people will judge the activity as less valuable.

A previous study[49] found that the frequency of FTF communication and telephone use are negatively related in daily life and they exhibit a displacement relationship. This means that when FTF is available and frequent, people tend to decrease the usage of nFTF with others. Hence, we propose:

Hypothesis 2 (H2): in the condition that the frequency of FTF is low, more nFTF will increase older adults' life satisfaction; in the condition that the frequency of FTF is high, more nFTF will not increase older adults' life satisfaction;

METHODOLOGY
Data
We use data of China Health and Retirement Longitudinal Study (CHARLS)[50] to testify our hypothesis. CHARLS received critical support from Peking University, the National Natural Science Foundation of China, the Behavioral and Social Research Division of the National Institute on Aging and the World Bank. CHARLS aims to collect a high quality nationally representative sample of Chinese residents ages 45 and older. The data can be used to serve the needs of scientific research on the elderly. The baseline national wave of CHARLS was fielded in 2011 and includes about 10,000 households and 17,500 individuals in 150 counties or districts and 450 villages or resident committees.

Measures
There are eight parts in CHARLS' data: demographic backgrounds; family; health status and functioning; health care and insurance; work, retirement and pension; income, expenditures and assets; housing characteristics; interviewer observation. We use two questions in the fam-

ily part of CHARLS' questionnaire: (i) How often do you see your child? (Question number is CD003); (ii) How often do you contact with your child either by phone, text-message, mail, or email, when you do not live with him or her? (Question number is CD004). In our research, CD003 denotes the frequency of FTF communication, and CD004 denotes the frequency of nFTF communication. In the questionnaire, FTF/nFTF values include:
(1) Almost never (=1, we denote it to 1 in our data analysis);
(2) Once a year (=2);
(3) Once every six months (=3);
(4) Once every three months (=4);
(5) Once a month (=5);
(6) Once every two weeks (=6);
(7) Once a week (=7);
(8) 2-3 times a week (=8);
(9) Almost every day (=9);
(10) Others (=10).
In addition, we use the question "Please think about your life as a whole, then how satisfied are you with it? Are you completely satisfied (=5), very satisfied (=4), somewhat satisfied (=3), not very satisfied (=2), or not at all satisfied (=1)?" (Question number is DC028), in the health status and functioning part to measure life satisfaction. Shen and Yeatts[1] have used the CHARLS data in 2008 to analyze the relationship between social support and older adults' life satisfaction.

We also use some control variables in the analysis. Most of them have often proven to be relevant to older adults' life satisfaction in previous studies[3,26,27]. In order to analyze the relationship among FTF, nFTF and life satisfaction, we selected four control variables as follows: (i) health status (ADL and self-reported health status)[26,27]; (ii) distance between parents and children's residence; (iii) social activities condition (numbers of social activities and frequency of participation)[3]; (iv) relative income[27].

Sample
We chose cases from CHARLS's data that met the following criteria:
(i) FTF is less than 6. In the procedure of data collecting of the CHARLS project, when FTF is more than 6 (7, 8, or 9), nFTF is always skipped. In order to compare the different effect of FTF and nFTF, we only select the cases that have both FTF and nFTF data.
(ii) Not containing 'Others' in FTF and nFTF. It is because '(10) Others (=10)' means nothing in the present study. Therefore, we do not include the data with 'Others' in our analysis.
(iii) No non-co-resident children to communicate with. In the current paper, we focus on the relationship between communication with

non-co-resident children and older adults' life satisfaction. In the questionnaire, if respondents do not have non-co-resident children, they will skip these questions, which means they are null. Therefore, we do not include these data in the following analysis.

In total we obtained 3,455 cases from CHARLS data in 2013 from the total number in the sample of 18,628 cases.

RESULTS

From *Table 2*, we can see that half of our sample is only FTF communicating with their children less than once every six months (Median: 3.00). Half of the sample is nFTF communicating with their children more than once every two weeks (Median: 6.00), which means half of the older adults will have phone, message, video chat or other nFTF communication with their children every two weeks. When we take all FTF data into calculation (including the deleted cases that violate the first criteria in the 'Sample' description above), the mean value is 3.44 and the median value is 3.00, which is similar to results in our dataset. It demonstrates the severity of the empty nest phenomenon: on average, young

people only come back to visit their parent twice every year. And on average, the frequency of nFTF (Median: 6.00) is more than that of FTF (Median: 3.00 in our dataset and in all FTF data). It shows that nFTF has been a more widely and frequently-used way for older adults to communicate with their children. The mean value of satisfaction is 3.07, which means on average older adults in China feel somewhat satisfied.

In the sample, older adults believe that they have a relatively higher income than their relatives and friends (mean value 4.13), lower health condition (ADL's mean value 1.26; self-reported health status' mean value 3.02). On average everyone only participates in 0.96 types of social activities; however, they have a high frequency of participation. Almost half of the sample does not live in the same city or village as their children (median value of distance 4.67).

We apply Ordinary Least Squares Regression (OLS) to testify hypothesis 1[23]. Results are shown in *Table 3*.

In Model 1 of the OLS, we just put all control variables into the equation. The value of R^2 is 0.083. In Model 2 of the OLS, we add FTF and nFTF into the equation. The value of R^2 increases to 0.085. ΔR^2 is 0.002, which is significant at $p<0.05$.

In Model 3 of the OLS, we add another variable FTF*nFTF into the equation. The value of R^2 is 0.086. ΔR^2 is 0.001 (comparing to Model 2), which is significant at $p<0.05$.

Table 3 shows that in all three models, self-reported health status, ADL, number of social activities, frequency of social activity and relative income all have significant impact on older adults' life satisfaction, while distance has not.

In Model 2, FTF has significant influence on older adults' life satisfaction. However, the

Table 2. Description of data on life satisfaction of older adults communicating with their non-co-resident children (n=3455); FTF=Face-to-Face communication evaluation; nFTF=non Face-to-Face communication evaluation; ADL=Activities of Daily Living; SD=Standard Deviation

Parameter	Range	Median	Mean	SD
FTF	1-6	3.00	3.42	1.32
nFTF	1-9	6.00	5.91	2.07
Life satisfaction	1-5	3.00	3.07	0.74
Relative income	1-7	4.08	4.13	0.82
ADL	1.00-3.85	1.16	1.26	0.36
Self-reported health status	1-7	3.00	3.02	0.97
Number of social activities	0-9	1.00	0.96	1.10
Frequency of social activities	0-4	3.00	2.94	1.17
Parent-child distance, km	0-7	4.67	4.51	1.33

Table 3. Regression analysis of life satisfaction of older adults communicating with their non-co-resident children; Model 1, 2 and 3 include an increasing number of variables; FTF=Face-to-Face communication with non-co-resident children; nFTF=non Face-to-Face communication; SE=Standard Error; ADL=Activities of Daily Living; *=p<0.05; **=p<0.01; ***=p<0.001

Parameter	Beta coefficient of the models ± SE		
	1	2	3
Self-reported health status	0.172±0.014***	0.170±0.014***	0.169±0.014***
ADL	0.052±0.039**	0.050±0.039**	0.050±0.039**
Parent-child distance, km	0.027±0.011	0.033±0.011	0.031±0.011
Number of social activities	-0.068±0.015**	-0.071±0.015**	-0.070±0.015**
Frequency of social activities	0.079±0.014***	0.078±0.014***	0.077±0.014***
Relative income	0.167±0.016***	0.163±0.016***	0.162±0.016***
FTF		0.039±0.010*	0.111±0.022**
nFTF		0.013±0.003	0.076±0.013*
Beta difference, FTF-nFTF		0.026***	0.035***
FTF*nFTF			-0.113±0.003*
R^2	0.083	0.085	0.086
ΔR^2		0.002*	0.001*

effect of nFTF is not significant. In Model 3, both FTF and nFTF have significant effect on life satisfaction. Further, there is a profound negative moderating effect of FTF and nFTF, which can explain why in Model 2 the effect of nFTF is not significant. Only in some contexts of FTF, nFTF can affect older adults' life satisfaction. Both in Model 2 and Model 3 it is shown that the effect of FTF on life satisfaction is larger than that of nFTF.

Then we compare the path coefficient of FTF and nFTF on Life Satisfaction. To achieve this, we follow the algorithm used by Low et al.[51]:

$$t = \frac{PC_1 - PC_2}{\sqrt{(SE_1^2 + SE_2^2)/n}} \quad [1]$$

In this equation, t refers to the t-value; n refers to the sample size; SE1 and SE2 refer to the standard error of each path; finally, PC1 and PC2 refer to the two path coefficients under comparison.

In Model 2, the Δβ is 0.026 (t=125.2); in Model 3, the Δβ is 0.035 (t=80.5). The two Δβ values are significant at the p<0.05 level.

In the regression model, the beta coefficient means how the unit change of independent value affects the dependent value. In real daily life, most of the interaction between older adults and children involves FTF and nFTF at the same period, but the respective communication frequency is different. Therefore, in order to further analyze the different effect of nFTF and FTF on older adults' life satisfaction, we will use the median value of FTF and nFTF to classify communication pattern into FTF-oriented and nFTF-oriented. In the FTF-oriented group, the FTF frequency is higher than its median value, while the nFTF frequency is lower than its median value. In the nFTF-oriented group, the FTF frequency is lower, while the nFTF frequency is higher.

Specifically speaking, we divide FTF and nFTF into two parts respectively by median values. We name the group wherein FTF or nFTF is higher than median values as High group, the other one as Low group. Then we combine them into four groups (*Table 4*): Group 0 means that both FTF and nFTF are low; Group 1 means that FTF is high but nFTF is low; Group 2 means that nFTF is high but FTF is low; and Group 3 refers to a group for which both FTF and nFTF are high. Group 1 refers to the FTF-oriented Group; Group 2 refers to the nFTF-oriented Group.

Table 4. Group classification matrix and group numbering of life satisfaction of older adults communicating with their non-co-resident children; FTF=Face-to-Face communication; nFTF=non-Face-to-Face communication; high=frequency>median; low=frequency<median

	FTF high	FTF low
nFTF high	3	2 (nFTF-oriented)
nFTF low	1 (FTF-oriented)	0

By controlling all control variables from *Table 5*, we find that life satisfaction in Group 0 is lower than in the other three groups. Its mean value is less than other mean values in Group 1, 2, 3 (Mean difference is less than 0). Group 1 has the highest life satisfaction among all three groups. Particularly, its life satisfaction is significantly higher than that in Group 2 (α=0.1), which means that a high nFTF cannot reach the same level of life satisfaction as a high FTF.

Figure 1 shows the difference of life satisfactions between the four groups. From *Table 5* and *Figure 1*, it can be seen that FTF-oriented communication can lead to higher life satisfaction than nFTF-oriented communication. Even though nFTF in nFTF-oriented communication is more frequent than FTF in FTF-oriented communication (in Group 1 FTF=4.37, nFTF=3.60; in Group 2, FTF=2.44, nFTF=7.06), life satisfaction in the FTF-oriented group is higher than that in the nFTF-oriented group. The result means that FTF has a significantly better effect on older adults' life satisfaction than nFTF. Then, according to the analysis of beta coefficient in *Table 3* and the analysis of classification of *Figure 1*, we can conclude that *Hypothesis 1* is supported.

Table 3 shows that there is a negative moderating effect between FTF and nFTF. It means that the effect of nFTF on increasing life satisfaction is moderated by FTF. In order to further explore the

*Table 5. Pairwise comparisons of mean group differences (ANOVA) of life satisfaction of older adults with control variables included: relative income, ADL, self-reported health status, number of social activities, frequency of social activity, parent-child distance; SE=Standard Error; CI=Confidence Interval for the difference; +=p<0.1; *=p<0.05*

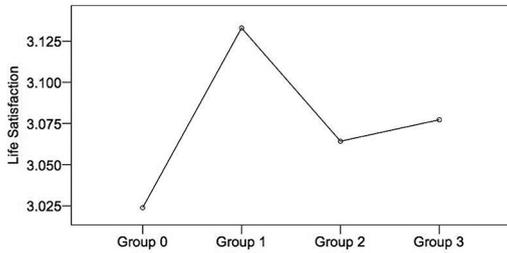| Group comparison		Mean ± SE	Sigma	95% CI
0	1	-0.109±0.041*	0.008	-0.190 - -0.028
	2	-0.040±0.034	0.233	-0.107 - 0.026
	3	-0.053±0.033	0.105	-0.118 - 0.011
1	0	0.109±0.041*	0.008	0.028 - 0.190
	2	0.069±0.041+	0.091	-0.011 - 0.149
	3	0.056±0.040	0.160	-0.022 - 0.134
2	0	0.040±0.034	0.233	-0.026 - 0.107
	1	-0.069±0.041	0.091	-0.149 - 0.011
	3	-0.013±0.031	0.673	-0.074 - 0.048
3	0	0.053±0.033	0.105	-0.011 - 0.118
	1	-0.056±0.040	0.160	-0.134 - 0.022
	2	0.013±0.031	0.673	-0.048 - 0.074

Figure 1. Comparison of life satisfaction among different groups; Group 0=low nFTF (non Face-to-Face communication) and low FTF (Face-to-Face communication); Group 1= low nFTF and high FTF; Group 2= high nFTF and low FTF; Group 3=high nFTF and high FTF. High and Low are separated with Median Value of nFTF or FTF

*Table 6. Hierarchical regression analysis of life satisfaction of older adults communicating with their non-co-resident children; FTF=Face-to-Face communication; nFTF=non-Face-to-Face communication; high=frequency>median; low=frequency<median; ADL=Activities of Daily Living; +=p<0.1; *=p<0.05; **=p<0.01; ***=p<0.001*

Parameter	FTF low	FTF high
Relative income	0.162**	0.58***
ADL	0.049***	0.038
Self-reported health	0.158***	0.178***
Number of social activities	-0.062*	-0.068*
Frequency of social activity	0.051+	0.111***
Parent-child distance, km	0.011	0.019
nFTF	0.066***	-0.046+
R^2	0.081	0.082

moderating effect, we do a hierarchical regression analysis. *Table 6* shows the result of nFTF's hierarchical regression. We can see that nFTF is significantly positively related to life satisfaction at low (b=0.066, p<0.001) but not at high (b=-0.046, p<0.10) levels of FTF. This means that in a low FTF context (lower than once in six months), increasing nFTF will result in higher life satisfaction, while in high FTF context (more than once in six months) increasing nFTF will result in lower life satisfaction. Then our *Hypothesis 2* is supported (H2: in the condition that the frequency of FTF is low, the more nFTF will increase older adults' life satisfaction; in the condition that the frequency of FTF is high, the more nFTF will not increase older adults' life satisfaction).

Discussion

Communication with children is one important way to increase older adult's life satisfaction and decrease the negative consequence of empty nest. With the advancing of ICT and the constraints of living and a busy job schedule, more and more young people are relying on nFTF technology to communicate with their parents, and confident that the nFTF is a perfect way to improve intergenerational relationship and resolve the empty nest syndrome[10]. Therefore, we are wondering whether nFTF can provide the same benefit as FTF does to increase older adults' life satisfaction. And how does nFTF cooperate with FTF to achieve the best results? In the current paper, we examine the different effects of FTF and nFTF on older adults' life satisfaction. From *Table 3*, we can find that both FTF and nFTF are positively related with life satisfaction. However, FTF's regression coefficient is significantly larger than that of nFTF, which means that FTF is more beneficial to life satisfaction than nFTF.

First, from the perspective of media characteristics and users' perception, we may use Media Richness Theory and Social Presence Theory, re-

spectively, to analyze the different ability of FTF and nFTF to provide emotional support. Based on the theory of Media Richness, we find that FTF is a better way to exchange emotion with family[38,39]. Besides, FTF has a higher social presence and then result in trust[17], has more monitor of the interaction[20] and more self-disclosure[14], which make the interaction give more 'warmth' and improves participant's relationship. Carstensen[52,53] finds older adults are more emotional-goal-oriented and will pay more attention to intimate relationship development and maintenance, especially with their family. It is possible that the feeling of being at the same place to finish one thing together is one of the most important factors in making FTF better than nFTF[14]. FTF communication does not just include talking. It allows parents and children to be involved in deeper interaction (for instance,cooking or shopping together), under the same physical circumstances. Under the same physical circumstance, there are more physical touch, olfaction effects, and other non-verbal message to improve understanding and emotional connectedness[32,36,37]. And the deeper interaction can increase attraction and positive attitude between generations better than just casual talking[53]. Therefore, we cannot only stress the role of information exchange on making FTF the better way to increase older adults' satisfaction.

It is possible that the involvement with each other to finish a relatively complex task (deeper interaction) under the same circumstances is an important element to make FTF better. For example, Nguyen et al.[54] found that compared with only chatting-FTF, playing games with the elderly (deeper interaction to fulfill the same goal) is better to improve intergenerational perception. It is suggested that, in the future, the nFTF tool should be designed not only to simulate the FTF to create circumstances similar to the physical world, but also involve people in deeper interaction to fulfill the same goal than just casual chatting.

Secondly, we extend FTF and nFTF from just communication channels to interpersonal interaction ways through analyzing the different ability of FTF and nFTF to provide instrumental support. Most previous studies just regard FTF and nFTF as an information communication channel by analyzing their characteristics from the function of information exchange[43]. But, FTF and nFTF are not constrained to information exchange activities[20]. Especially for FTF, it also results in interpersonal interaction for supporting each other physically or psychologically, such as for daily chores and sick care[1,29]. It is obvious that parents do not just want to chat with children, or exchange some trivial daily life information. They want to get support from their children.

Emotional and instrumental family support both are important facets in affecting older adults' life satisfaction[1,27,29]. However, parents cannot get all kinds of support just via nFTF communication (for instance, Instant Message or Video Chat), especially for instrumental support. When parents get older and weaker, they are afraid that no one will take care of them[27]. Frequent FTF interactions maybe allow them to feel more secure. It is possible that frequent nFTF communication could stress the fact that children are far away from them. As the older Chinese saying goes, "Better good neighbors near than relations far away". Compared to children with just frequent nFTF communication, it is obvious that those with frequent FTF communication can provide more instrumental support to their parents. Therefore, parents can get more support, especially tangible instrumental support, and then feel more secure[1,29]. In conclusion, FTF is believed to be the best way to develop and maintain intimate relationship with children.

In real daily life, most of the interaction between older adults and children involve FTF and nFTF at the same period, but the respective communication frequency is different. In order to deeply investigate the different effect of nFTF and FTF on life satisfaction, we examine the context in which two communicative channels are both used. Finally, we find that in the nFTF-oriented communication group (where nFTF is higher than the median value of nFTF; FTF is lower than the median value of FTF), older adults' life satisfaction is lower than of those in the FTF-oriented group (where FTF is higher than the median value of FTF; nFTF is lower than the median value of nFTF). It means that as for parent-child communication, nFTF cannot recover FTF's loss just by increasing the frequency of nFTF. The difference is almost significant (p=0.10). The low significance could be a result from the measure-

ment of life satisfaction. In the present study, we just use one item to measure older adults' life satisfaction, which cannot cover all important facets of that construct[54]. From *Table 2*, we can find the SD of life satisfaction is just 0.740, which means that the measurement extracts only a small portion of life satisfaction. In addition, in China older adults are used to response with 'somewhat satisfied', when they are asked if they are satisfied with their current life. This may be another reason why the SD is so small.

Further, we examine how nFTF cooperating with FTF can achieve the best results. Ultimately we find that only in the context where the frequency of FTF is low, increasing nFTF with parents improves their life satisfaction. We employ ANOVA test to further explore the cooperation between nFTF and FTF (*Figure 2*). In our sample dataset, if the FTF is almost unavailable, more nFTF communication will significantly increase older adults' life satisfaction. And with availability of FTF increasing, nFTF's effectiveness is decreasing. Specifically speaking, when the frequency of FTF is once a month or more frequent, more nFTF (more than once every two weeks) will result in lower life satisfaction than less nFTF (less than once every two weeks). Along with FTF becoming harder, nFTF's function of increasing life satisfaction is stronger; along with FTF becoming easier and more available, nFTF will not possess the capability of improving older adults' life satisfaction.

CONCLUSIONS AND IMPLICATIONS
From the results, we can make the following two conclusions:
(i) In order to increase older adults' life satisfaction, if FTF is available, FTF has the priority over nFTF, since FTF is more beneficial to older adults'
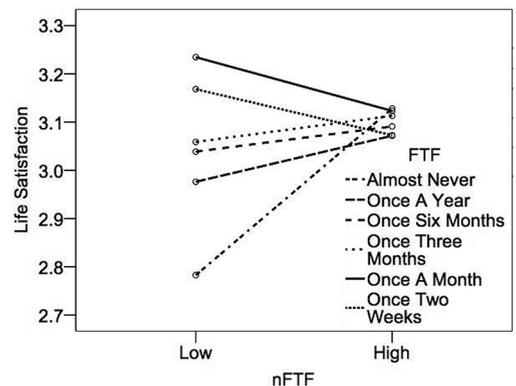

Figure 2. ANOVA of life satisfaction of older adults communicating with their non-co-resident children both in non-Face-to-Face mode (nFTF) and in various forms of Face-to-Face (FTF) communication

life satisfaction than nFTF;
(ii) Only when FTF is not available or hard to get, nFTF can recover FTF's loss in some way, but it cannot reach the same level as FTF does.

Our results are consistent with previous studies. Previous studies find benefits of nFTF on family are reflected on its ability to communicate with remote family members or friends[10,23,31]. nFTF communication can strengthen people's social relationship because it allows people to communicate with family members in distant places and without time constraints[11]. In addition to that, our results extend previous studies by answering the question how nFTF cooperating with FTF can achieve best results.

According to our conclusions, we suggest that children should go home and FTF communicate with their parents more frequently and cannot just rely on nFTF to communicate. Although nFTF can recover some loss of unavailable FTF, it cannot help older adults to reach the same level of life satisfaction as FTF does. Besides, teaching parents using Internet or ICT is useful. But the use of these technologies to communicate with their children does not always benefit them.

These findings suggest to young people how to choose their usage pattern of nFTF with their parents wisely. If they are studying or working in another city and cannot come to visit their parents once every six months (from the perspective of mean value, it is once every six months; specifically speaking, based on the sample's specific features, the split point is between once every three months and once a month, see *Figure 2*), they should arrange more nFTF communication with their parents, at least once every two weeks. The less frequent FTF communication is, the more nFTF should be used to improve older adults' life satisfaction. But if they live in the same city or can come to visit their parents once a month or more frequently, they had better have nFTF communication less than once every two weeks, because in this context more nFTF will decrease their parents' life satisfaction. They should choose the appropriate usage pattern of nFTF based on the frequency of FTF with their parents. Bearing in mind, nFTF is only used to strengthen but not to replace family solidarity by physical togetherness and FTF communication[8].

LIMITATIONS AND FUTURE WORK

Our study still has several limitations. First, we only use one question to measure older adults' life satisfaction and it cannot measure every part of the construct[25]. In China, older adults are used to response 'somewhat satisfied', when they are asked if they are satisfied to their current life. From *Table 1*, it can be seen that mean value and median value are almost the same (3.07 and 3.00) and the SD is only 0.740, which means that most subjects in the sample choose the same items. Therefore, in the future we should use a comprehensive scale and an exquisite method to measure older adults' life satisfaction.

Secondly, we only analyze the relationship of FTF and nFTF with life satisfaction quantitatively. But we miss the importance of interaction content and pattern. Although the frequency of nFTF is higher than that of FTF generally the duration of FTF at every time of communication is longer than that of nFTF. Then maybe the shorter duration of nFTF makes nFTF have less depth of interpersonal interaction.

Thirdly, the just mentioned difference makes nFTF less beneficial than FTF to increase older adults' life satisfaction. In the future we should focus on the different pattern of FTF- and nFTF-interpersonal interaction, in order to further explore the difference of FTF and nFTF.

Fourthly, in our dataset cases with higher interaction frequency than 6 are deleted because of CHARLS's design. But this design may result in missing a part of reality and of other possibly interesting findings. Therefore, in the future we will find another dataset to test our theory.

Finally, cases with non-co-resident children are not included in our analysis. However, living alone is an important factor in affecting older adults' life satisfaction. It is of interest to differentiate between those with non-co-resident children and those with co-resident children.

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