Parents' Mobile Relational Maintenance in Resource-Constrained Contexts: Barriers and Facilitating Access Conditions

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Abstract

Mobile phones have become central to family members' daily communication. This study investigates the material and skills access barriers that parents of adolescents in resource-constrained contexts face for mobile relational maintenance. Following an exploratory sequential mixed-methods design, interviews with parents in Bogotá, Colombia explored how they managed to keep in touch with their children despite facing access barriers and how these barriers still affected their parent-child mobile interactions. A survey was conducted in the quantitative phase to confirm the relationship patterns suggested by qualitative findings. Financial, cognitive, and environmental resources constituted access barriers. Despite gaining material access through alternative social and environmental resources, the barriers they faced still influenced the nature and frequency of their parent-child mobile interactions. Findings also showed that cognitive barriers, observed as parents' low levels of perceived capability to learn how to use mobile phones, affected parents' text messaging through their acquisition of skills.

Keywords:

Mobile relational maintenance, access barriers, resource-constrained contexts, digital divide, skills, mobiles, efficacy

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Mobile phones have become central to family members' daily communication routines. They facilitate parents' parent-child communication goals, including monitoring (Barron, 2014), coordination (Crosswhite et al., 2014), and affection and support (Devitt and Roker, 2009). However, this is based not only on the assumption that parents own a mobile phone, but also that they possess the skills to operate it. What happens when these assumptions cannot be taken for granted?

Mobile phone use has surpassed that of computers (ITU, 2014). However, access to and use of mobile phones is limited in resource-constrained contexts (Gonzales, 2014). A resource-constrained context is one in which people regularly face scarcity of the means needed to pursue their livelihood. Three of every ten adults in the U.S. who make less than $30,000 a year do not own a smartphone (Anderson, 2017). Smartphone subscriptions are much lower in developing countries than in developed countries (ITU, 2014).

This study conceptualizes access to mobile phones as a multidimensional construct, influenced by material availability, motivation and skills (van Dijk, 2005). Skills refers to the knowledge necessary to operate the hardware and software, evaluate the information people encounter (van Dijk, 2005: 72), and interact with others through information technologies. The skills someone possesses affect the activities they engage in online, what they do with the information, and how they communicate with others (Helsper and Eynon, 2013; van Deursen et al., 2014).

This study assumes that parents of adolescent children are highly motivated to be in touch with their children while away from home. I focus on the question: how do parents, in situations

of limited resources for material access and skills, still communicate with their adolescent children in their daily life using mobile phones?

A human ecological approach (Blumer, 1986; Sampson, 2012) enables the observation of interplay between the environment and human behavior, revealing how the environment and individual attributes can shape human choices. Such an approach emphasizes the importance of human agency and how and what choices people make in order to achieve their self-determined goals (Katz and Gonzalez, 2016).

The context of this study is Bogotá, Colombia. Like in the rest of the world, mobile phone subscriptions in Colombia have been growing steadily. Currently, mobile phone penetration exceeds 100% of the population, but only around 35% own a smartphone (MinTIC, 2015).

Research on parent-child mobile maintenance has focused mostly on samples from North America and Europe (Mascheroni and Ólafsson, 2015; Rudi et al., 2015; Schon, 2014). The study of mobile maintenance in emerging economies can contribute to our understanding of mobile media and communication (Pearce, 2013) by providing a broader picture of mobile communication as a global phenomenon and of the novel ways people gain access to mobile phones. In sum, this study brings questions of material and skills access to the forefront in parent-child mobile maintenance research. It focuses on parents' communication choices and behaviors given their barriers and available alternative resources.

This study followed an exploratory sequential mixed methods design (Creswell, 2014: 219). In the qualitative phase, I explored how parents experienced access barriers, how they navigated their particular circumstances to communicate with their children, and how those barriers affected their mobile phone use and communication behaviors. Data for the first phase was collected using semi-structured interviews with parents of adolescents. The quantitative phase

built on the results from the interviews. I surveyed parents of adolescents to confirm the relationships suggested by findings in the qualitative phase.

The context

Households in Bogotá are classified into one of six social strata as a proxy for socio-economic status, based on the internal and external characteristics of the dwelling and its surroundings (DANE, n.d.). It is estimated that around 9.5% of the population live in very low social strata neighborhoods, 39.3% in low, 35.7% in mid-low, 9.45% in middle, 2.6% in mid-high, and 1.7% in high (Secretaría Distrital de Planeación de Bogotá, 2015) (SDPB).

Bogotá has a high level of inequality compared to other South American cities. The Gini coefficient for Bogotá in 2014 was 0.503 (DANE, 2015), higher than other Latin American cities such as Caracas, Quito, and Lima. (UN-Habitat-United Nations Human Settlements Programme, 2011).15.8% of the population are still considered poor and 4% are considered extremely poor (SDPB, 2015).

Around 40% of the population in Bogotá have access to the Internet (SDPB, 2015). However, only 38% of households in low strata (i.e. very low, low and mid-low social strata), compared to 90% in higher strata (i.e. mid, mid-high and high), have broadband or mobile Internet access.

People spend more time commuting for work in Bogotá than in any other city in Latin America (INRIX, 2016). Commuting times on public transportation are above two hours per day. People who live in lower social strata neighborhoods use public transportation twice as much as those who live in higher socio-economic strata neighborhoods (Secretaria Distrital de Movilidad, 2016). This makes mobile phones the most efficient communication alternative for families and

emphasizes the importance of understanding what are the barriers and facilitating conditions that allow parents to keep in touch with their children during the day.

Types of Access, Barriers, and Facilitating Conditions

Although several authors have proposed different digital divide models (DiMaggio et al., 2004; Helsper, 2012; Selwyn, 2004), we adopt van Dijk's (2005) as an interpretative framework. Van Dijk (Dijk, 2005: 22) divides the concept of access into four successive kinds of access: motivational access, material access, skills access, and usage access. As this study assumes parents are motivated to use mobile phones for daily interactions with their children, we explore how the lack of certain resources create material and skills access barriers and how parents gain material and skills access through alternative resources.

Coined by some researchers as second-level digital divide (Hargittai and Hinnant, 2008), Internet skills have become a focus in digital divide research (see Litt, 2013 for a review). Skills play an influential role in digital inequalities, as they affect how individuals use the Internet (Hargittai, 2010; Helsper and Eynon, 2013) and the outcomes they get from this use (van Deursen et al., 2014; van Deursen and Helsper, 2015, 2017).

However, digital divide has not particularly focused on mobile skills and how they might affect use. Although conceptualized as a dimension of Internet skills (Deursen et al., 2016), the construct of mobile skills requires further development and consideration. As mobile Internet has become more common, mobile skills are expected to shape Internet and mobile technology use and outcomes. The paucity of research on mobile skills have found it is related with frequency of use (Park, 2015). Therefore, while the concept of skills has become central to the study of digital inequalities, more research is needed on mobile skills. As this study focuses on the different

barriers parents face for mobile interaction with their children, we expect mobile skills to potentially emerge as one of the barriers.

In van Dijk's model, each type of access is facilitated by a set of available resources. Resource is defined as the "available means that are used as a source of supply to support in accomplishing particular aims" (van Dijk, 2005: 36). The framework identifies five different categories of resources: (1) temporal—the time to engage in online activities, (2) material—the ownership of goods that enable access, (3) mental—the knowledge and cognitive and emotional predispositions to use the technology, (4) social—the social contacts who serve as sources of knowledge and advice, and (5) cultural—the norms, lifestyles, hobbies, and status within a social group that influence adoption decisions. Barriers for each access type are generated by a lack of resources.

Digital Divide and Parent-Child Mobile Maintenance

The transition from childhood to adulthood marks important changes as adolescents detach emotionally from parents and seek more autonomy (Steinberg, 2001). These changes make parents more invested in routinely contacting their children. Inter-personal communication motives suppose that people have certain goals and intentions when they interact with others. In family contexts, the most common communication motives are affection, pleasure, and inclusion (Barbato et al., 2003).

Previous research in parent-child mobile communication has illustrated the importance of mobile phones for family communication rituals in places such as Norway (Ling, 2006). Other studies showed how families in the U.K. (Devitt and Roker, 2009) and in Israel (Ribak, 2009) find mobile phones useful in situations of emergency. Research has noted the importance of mobile technologies to enable permanent contact between family members in places such as the U.S.

(Crosswhite et al., 2014), Taiwan (Wei and Lo, 2006), Australia (Wajcman et al., 2008), and Denmark (Christensen, 2009).

When mobile parent-child communication is studied in resource-constrained contexts, other factors that intervene in families' communication practices are forefront. Ureta (2008) found that, among low-income families in Chile, mobile phone use was restricted to urgent matters only. Other studies emphasize how environmental factors affect adoption and modes of use. Katz and Gonzalez (2016), in a qualitative study that examined how different macro- and meso-level factors influenced technology adoption decisions and how families viewed and used technology, illustrate how factors such as immigration law enforcement, safety concerns, and cultural norms at school affected families' decisions about how to engage with those technologies.

Madianou and Miller (2011), in a study that looked at experiences of Philipino migrant mothers in the U.K. and left-behind children with communication technologies, showed how the place of access influenced individuals' experience with the technology. The differences in experience were related to access asymmetries between the U.K and the Philippines.

In sum, studies at the intersection of digital divide and parent-child communication suggest that financial, environmental, and motivational factors shape adoption, skills acquisition, and types of use. The qualitative phase of this study explored how the lack of certain resources was related to material and skills access and how, in order to achieve their parent-child communication objectives, participants tried to overcome those barriers through alternative resources.

Qualitative Phase Methods

Participant recruitment.

This study followed a sequential mixed-methods design (Creswell, 2014, p. 225). Such approach allows to explore the research problem while taking into account the diversity of perceptions, experiences, and context of participants. The quantitative phase examined whether the qualitative findings were limited to the idiosyncrasy of the sample or represented the population in Bogotá who lived in resource-constrained contexts.

Some participants were recruited by contacting parents of teenage children in two low-income public schools in Bogotá. Other participants were recruited by contacting public and private schools that served low-, mid-, and high-strata populations based on information from the Secretary of Education (Secretaría Distrital de Educación de Bogotá, 2017). A few individuals who lived in higher social strata households were included because I suspected that the barriers people faced were not limited to lack of financial resources. This phase of the study followed a purposeful criterion sampling method (Palinkas et al., 2013) to recruit participants who: (1) were parents of an adolescent, (2) spent most of the day away from home, and (3) were invested in communicating with their child on a regular basis.

A total of twenty one-hour long semi-structured interviews were conducted with parents of children between the ages of 13 and 18 years old. Interviews took place at a location chosen by the interviewee. The average age of parents was 43.5 years old. Seventeen parents were females, and three were males. Table 1 shows demographic information for interviewed parents.

Table 1. Demographics for interviewed parents

Gender	
Female	17
Male	3
Marital status	
Married	10
Divorced	3
Widow	1
Living with partner	2
Single	4
Social strata	
Low (1, 2, 3)	10
Mid (4)	7
High (5, 6)	3

Interview protocol.

Participants were asked about the different technologies they used to communicate with their children, the barriers they faced when trying to use these technologies, and how they tried to solve these barriers. Interviews were recorded and then transcribed. I iteratively coded under emerging categories (Onwuegbuzie and Leech, 2006). A codebook was developed including definitions for codes and example quotations (Guest et al., 2011: 52). Codes were interpreted and

grouped into categories, then organized into a conceptually clustered matrix (Miles and Huberman, 1999: 128). The matrix included a summary of the coded segment for each participant.

Analysis and Results

I identified three categories of resources—financial, environmental, and cognitive—that, when absent, generated barriers for material and skills access. Although parents turned to alternative available resources, the presence of these barriers ultimately affected parents' mobile interactions with their children.

Material Access.

This section describes barriers and alternative resources for material access.

***Barriers for material access*.** I identified financial and environmental material access barriers.

Financial resources. This barrier became apparent only for owning smartphones and for having data or voice plans. Some parents said it was not financially feasible for them to acquire a smartphone or to subscribe to a voice or data plan. Alba is single and lives with her sixteen-year-old son. They share a house located in a very low social stratum district with Alba's aunt, her husband, and their children. She works as the cleaning lady in a house. She leaves home before her son wakes up. The rest of Alba's family lives in another city, and sometimes her son spends long periods of time with them. Money is an important concern when she wants to say hello to her son and check if he is all right: "To be able to talk or chat, well, it depends on the budget that I have. If I do not have money to buy voice minutes or data, I have to limit my conversations." (Alba)[1,2]

Environmental resources. Environmental barriers consisted of perceptions that it was unsafe to own a mobile phone or a smartphone or to use one in the streets. 281,000 mobile and

smartphones were reported stolen in Bogotá in 2017 (Direccion de Investigacion Criminal e Interpol-Policia Nacional de Colombia, 2018). In 2016, of every four robberies reported, one was a mobile phone (Direccion de Investigacion Criminal e Interpol-Policia Nacional de Colombia, 2017).

Some of the participants perceived this issue as a barrier for having or publicly using a mobile phone. Luz lives with her partner, her two children, and her granddaughter in a house located in a very low social strata neighborhood. She likes to always be informed about the whereabouts of her sixteen-year-old son and would enjoy sending him sweet messages. However, he does not have a mobile phone because his parents are afraid he might get mugged and beaten should he use it in a public space. Carmen lives in a very low social strata house with her partner, her three daughters, and her granddaughter. Her oldest daughter is 17 years old and is the mother of a two-year-old girl. Carmen and her mother run a fast-food joint. Carmen likes to be in touch with her teenage daughter and to be informed throughout the day about her granddaughter. But, when she is in the street, she will not answer the phone: "When I am in the street I do not like to answer phone calls. I have seen how a lot of people have been robbed. I would panic." (Carmen).

This fear of using or carrying a mobile phone in public spaces contrasts with what has been observed in developed contexts, where some people have developed high levels of mobile phone dependency (Konok et al., 2016; Lopez-Fernandez et al., 2013), even bringing negative consequences to their relationships (Hall and Baym, 2012; Seo et al., 2016).

These findings show that parents faced financial and environmental barriers, and those affected not only the quantity but also the qualities of their parent-child communication. This is the case for Luz, who could not reach her communication goals because her son did not have a

mobile phone due to their environment. Parents who faced these barriers were less likely to own a smartphone or a plan and limited the number and nature of their interactions throughout the day.

Alternative resources for material access. Parents, however, navigated around these barriers to gain material access using alternative resources.

Social resources. Those participants whose children did not have mobile phones could still reach their children by calling their children's friends. However, those interactions were mostly limited to learning about the adolescent's whereabouts, affecting the fulfillment of parents' affection motivations. Luz calls either his child's girlfriend or his best friend: "I have the contact information of Tatiana and of 'El Pollo.' I call them and talk to Antonio and tell him not to take too long" (Luz). Lucero lives with her husband and their two children in a mid-low social strata apartment. She monitors her seventeen-year-old daughter. She works as an office assistant, so she does not see her child again until she gets back home in the evening. Since her daughter's mobile phone was stolen, she contacts her through her best friend: "Now that they stole her mobile phone I text her best friend and ask her about my daughter to see if she is with her" (Lucero).

Patricia lives together with her husband and their four children in a mid-low social position district. She likes to always know where they are and what they are doing. Usually, they use their social resources as an alternative when her children do not have voice minutes: "When Diana does not have any minutes on her mobile, she asks a friend that has minutes, calls me, and hangs up, and then I know it is her and I return the call." (Patricia).

Environmental resources. We found that the local context offered facilitating conditions for material access. Although services at cybercafés–a type of public access computing (PAC) venue—have a cost, they represent a useful alternative for those who face financial constraints. PAC venues are locations that serve the information and communication needs of underserved

populations (Baron-Porras and Gomez, 2012). They offer, among other services, access to computers, the Internet, and landline and mobile phone booths (Baron and Gomez, 2013).

Cybercafés allow parents to control how much money their children spend on minutes and also enable children to contact their parents when they need to talk to them. Cristina is a domestic worker who lives with her three children in an apartment located in a low social strata district. When her seventeen-year-old daughter does not come home from school, Cristina wants to know where she is and how she is doing: "Yes, I give her some spare change so she can call me when she's out. When she doesn't call, I get mad at her, because that's when I start imagining something terrible has happened" (Cristina).

These findings illustrate the strategies parents use to navigate the financial and environmental barriers they encounter. Parents who face environmental barriers tend to use their mobile phones less frequently. Those who face financial barriers are still capable of contacting their children using PAC venues and calling a friend's mobile phone. However, in several occasions their communication motivations are limited to monitoring.

Skills Access.

Possession of skills has been proven to affect how digital technologies are used (van Dijk and van Deursen, 2014). Some participants who did not have skills to use their devices received help from their children but, others felt incapable of acquiring those skills. Their lack of skills affected their use, as they only made phone calls and never text messaged their children.

Based on Social Cognitive Theory (SCT) (Bandura 1997), we called learning efficacy individuals' perceptions of learning capability. Efficacy is defined as an individual's belief in their capability to follow a course of action in order to attain a type of performance (Bandura, 1997).

Efficacy influences learning processes (e.g. Honicke and Broadbent, 2016). Below we characterize the proposed concept of learning efficacy and its relationship with skills barriers.

Skills barriers. Some participants felt that operating a touchscreen smartphone was very challenging. Many times, they could not do what they intended. Laura is a mother of three and lives in a very low social stratum apartment with her husband. She likes to contact her children on their mobile phones to tell them how much she loves them, but she does not have the skills to text them: "I can't with the touchscreen phone. I have tried in every way. Even every single time I need to answer a call, I end up hanging up (chuckles). That touchscreen is a horrible thing" (Laura).

For others, the touchscreen presented a challenge, but their children or other family members taught them to use it. Mariana lives with her husband and their two children in a mid-social stratum apartment. She works as a PR representative. She explains how she experienced the change from a mobile phone to a smartphone: "It has been tough for my kids, because my husband got me a new mobile and it killed me. . . . You always need your fingers to do anything with that; it jiggers and makes sounds by itself. . . . Finally I learned how to use it." (Mariana).

For some participants, it was difficult at the beginning, but circumstances forced them to learn how to use a smartphone:

> One must adapt to the new circumstances. Earlier I didn't even know how to answer a phone call on that gizmo. My kids explained me over and over and I couldn't. . . . Later on, and little by little, I saw it as necessary, and I even learned how to text when they [her children] explained me how to do it. (Patricia)

Learning efficacy barriers. We identified that some of these participants felt incapable of learning to use a smartphone. Parents who perceived they could not learn also tended to use their mobile phones differently, compared to those who already had the skills. Angela, a widow who

lives with her sixteen-year-old son in a mid-social strata district, is convinced she cannot learn: "I find it very difficult. David [her son] tells me, 'Come on! Learn!' But no, I just can't". (Angela). As a result, she only uses voice calls when trying to communicate with her son, despite recognizing that "he [David] wishes that his mother could send him a text through WhatsApp" (Angela).

When asked about trying to learn how to send a text message, Angela said: "I find it very difficult. I just make phone calls", and added:

> "If we are not together, from mobile to mobile; if I can find a land line where to call him, I just do that. No messages with WhatsApp. . . I always tell him, 'Dear son, you know your mom only knows how to answer the mobile phone.' " (Angela)

Cristina shared the same view. When asked about how she used her smartphone, she answered: "No. All those devices, just to answer and make phone calls. . . . All those other things. Never. I can't learn" (Cristina).

Previous studies show how children help their parents learn to use communication technologies (Correa, 2014). Findings in this study point at learning efficacy as a cognitive resource that influences mobile phone use. A lack of this cognitive resource can become a barrier, as it hinders skills acquisition. According to these results, parents who feel less capable of learning how to use a mobile phone either do not ask for help or believe they cannot learn. Therefore, they do not get the skills to use their mobile phones for tasks beyond making phone calls.

Quantitative Phase

Following qualitative findings, we expect that both environmental and financial barriers will negatively affect smartphone ownership, and that those facing environmental and financial

barriers will tend to talk less frequently with their children through their own mobile phones. We thus propose the following hypotheses, which we test using survey data:

H1: A negative relationship exists between smartphone ownership and a) financial and b) environmental barriers.

H2: A negative relationship exists between frequency of communication using parent's own mobile phone and a) financial barriers and b) environmental barriers.

Qualitative findings suggested that parents who faced financial and environmental constraints tended to contact their children through others' mobile phones and PAC venues more frequently. Therefore, we hypothesize that:

H3: A positive relationship exists between communication frequency through social connections and a) financial barriers and b) environmental barriers.

H4: A positive relationship exists between PAC venues use and a) financial and b) environmental barriers.

Our results also pointed at the existence of a cognitive resource that, when lacking, affected a specific type of mobile use: text messaging. In contrast to parents who sought help and thought they could actually learn the skills, those parents who did not feel capable of learning restricted their mobile phone use to just phone calls. Therefore, we test the following mediation model (Figure 1):

[FIGURE 1 AROUND HERE]

Sample and data collection.

Eighteen schools were contacted through RedPapaz, an existing national network of schools. Based on information from the Secretary of Education (Secretaría Distrital de Educación de Bogotá, 2017), we selected schools following the social strata of the student population they

serve and making sure we kept representative quotas of teenage children from each social stratum. A total of five school principals expressed their interest in the study. Three of the schools were public and served very low, low, and mid-low social strata, and two were private, and served mid, mid-high, and high social strata students. In exchange for their participation, each school added questions to the survey and received a report of the findings. No incentives were offered to parents. Children of the parents who participated in the study were between 14 and 19 years-old. The average age of the children was 16 years old (*S.D.*=1.16).

Data collection.

One section per grade, from 8th to 11th. [3] was randomly selected. In one school, data was collected during parents-teacher conferences. For the other schools, invitations and consent letters were sent with the students in closed envelopes, together with the questionnaire and a return envelope. Children returned the signed consent letter and the questionnaire answered. Invitation letters were constructed following the Tailored Design Method (Dillman, 2007).

Sample.

Of the 622 surveys that were sent, 298 surveys were completed. The response rate was 47.9%. Table 2 includes descriptive information for social strata and education. Respondents' mean age was 43.66 (S.D.=7.64). 24.5% identified as male and 70.8% as female. 95% said they had a mobile phone. Because this study focused on resource-constrained contexts, the hypotheses were tested using those participants who lived in households located in very low, low, and middle-low social strata districts. Eight observations had to be excluded from this set because of inconsistent or inattentive responses. The new sample size was *n*=216.

Analysis and results

Dependent variables.

Ownership of a smartphone with a corresponding data plan was determined by asking respondents whether they owned a smartphone with a data or voice plan. 48.1% reported they had one.

Communication frequency using parent's own mobile phone (M=4.36, S.D.=0.96) was determined by asking participants how frequently (1: never, 5: always) they contacted their child using their own mobile phone.

Table 2.

Percentages for social strata[4] and education

Social strata		Education	
Very low	6.4%	Some elementary	2.3%
Low	49.3%	Elementary	7.7%
Mid-low	19.5%	Some high school	13.1%
Mid	13.1%	High school	25.5%
Mid-high	6.7%	Some college	16.4%
High	0.7%	College	19.8%
		Graduate	9.4%

Mobile communication through social connections (M=2.60, S.D.=1.32) was gauged asking participants how frequently (1: never, 5: always) they contacted their child through someone else's phone.

Mobile communication through PAC venues (M=2.77, S.D.=1.49) was measured asking participants how frequently (1: never, 5: always) they contacted their children using a cybercafé, public library or tele-center.

Mobile texting (M=3.13, S.D.=1.59) was determined by asking participants how frequently (1: never, 5: always) they contacted their child through WhatsApp texts.

Independent variables.

Each perceived barrier was gauged using the average score of two items. The preface was: "We would like to know how much you agree with the following statements. (1: Totally disagree, 5: Totally agree)."

The items for financial barriers (M=2.98, S.D.=1.00, α=.41) were: "I don't have the money to pay for a smartphone data plan," and, "Minutes to talk over mobiles are expensive."

Environmental barriers (M=4.02, S.D. =.99, α=.83) was operationalized using the items: "It is not safe to use smart or mobile phones in the streets of my neighborhood," and, "It is not safe to use smart or mobile phones in the streets of the city".

Learning efficacy (M=8.49, S.D. =1.66, α=.94) was measured using the average score of six items. The preface asked respondents how capable they believed they were of learning how to do a set of activities on mobile phones and smartphones (10: Vary capable, 1: Not capable at all). Items included: "Learn how to use an app on a smartphone," "Learn how to use a smartphone," and "Learn from the explanations of someone about how to connect to a video conference through the smartphone." The items were developed based on the skills interviewees identified as feeling incapable of learning.

Skills (M=4.03, S.D. =.81, α=.93) was measured averaging the score of 14 items. Participants were asked to express how much they agreed with each statement (1: Totally disagree, 5: Totally agree). The preface read, "I know…" Some of the items were: "How to connect a smartphone to a Wi-Fi network," "How to send different kinds of files on a smartphone," and

"How to configure the ringtones on a mobile phone." The items were developed based on interviewees' accounts of tasks they learned, wanted to learn, or could not learn.

Analysis

Assumptions for regression analysis were examined. The new sample size was n=191[5] after identifying influential outliers using DFBETAS (Andersen, 2008: 41). Results of OLS regressions are reported using standardized beta coefficients.

Ownership of smartphone with data plan.

Hypotheses 1a and 1b examined the influence of financial barriers and environmental barriers on ownership of a smartphone with a corresponding data plan. After controlling for age, gender, and education, results of a logistic regression (Table 3) showed the perception of financial barriers reduced the likelihood of having a smartphone by 30.9%, confirming hypothesis 1a. However, the coefficient for perceived environmental barriers was not statistically significant. Hypothesis 1b was not supported.

Financial, Environmental Barriers and frequency of communication using parent's own mobile phone.

Hypothesis 2a and 2b examined how financial and environmental barriers negatively affected parents' frequency of mobile communication with their children using their own device (Table 4). Only those participants who reported owning a mobile phone were included in these analyses. Control variables included age, gender, and education level. Results of an OLS show how financial barriers and frequency of communication using parent's own mobile phone are negatively related (β=–.180, p=.035), supporting hypothesis 2a. Hypothesis 2b was not supported. The relationship between environmental barriers and frequency of communication using parent's own mobile phone was not statistically significant (β=.69, p=.41).

Financial and Environmental Barriers and Communication through Others and through PAC venues.

Results did not support hypotheses 3a and 3b (Table 5). The relationship between financial barriers (β=.127, *p*=.12) and environmental barriers (β=.002, *p*=.97) and communication through others, although positive, was not statistically significant.

Hypothesis 4 was partially supported. As individuals faced more financial barriers, they also reported using PAC venues more frequently to contact their children while away (β=.136, *p*=.049), after controlling for age, gender, and education (Table 5). The relationship between environmental barriers and PAC venues use was positive but not statistically significant (β=.014, *p*=.83).

Table 3.
Logistic Regression Analysis of Smartphone with Data Plan Ownership

	B	Odds ratio
Age	-.052*	.95
Gender	1.070**	2.91
Education	.433***	1.54
Financial barrier	-.369**	.691
Environmental barrier	-.043	1.04
(Intercept)	.876	2.57
Goodness-of-fit	χ^2=33.138, p<.001	
Log likelihood	209.412	
Cox & Snell R Square	.173	

N=175. Dependent variable smartphone ownership (yes=1).
*p<.05, **p<.01, ***p<.001.

Table 4.
OLS regression analyses predicting frequency of communication using parent's own mobile phone.

	β
Age	.032
Gender (Male)	-.145*
Education	.011
Financial Barriers	-.180*
Environmental Barriers	.069
F(*df*)	1.470(5,162)
R^2	.043

*p<.05, **p<.01, ***p<.001. *N* = 167.

Table 5.
OLS regression analyses predicting mobile phones access through PAC venues use and social connections by financial and environmental barriers.

	Access through social connections	PAC venues use
	β	β
Age	-.027	–.143∗
Gender (Male)	–.191*	–.148∗
Education	–.178∗	–.328**
Financial barriers	.127	.136*
Environmental barriers	.002	.014
F(*df*)	3.459(5,161)	7.995(5,169)
R^2	.097	.192
N = 166.		*N* = 174.

*p<.05, **p<.01, ***p<.001.

Mobile use learning efficacy and skills.

Process Macro (Hayes, 2013) for SPSS was used to test the mediation model. Gender, age, and education were included as covariates. Only those users who reported having a mobile phone were considered in the analysis (n=172). Results indicated that learning efficacy was a significant predictor of skills, $\beta = .23$, SE = .035, $p < .001$, and that skills was a significant predictor of mobile messaging, $\beta = 1.02$, SE = .165, $p < .001$. These results support the mediation hypothesis (Figure 2). Learning efficacy was no longer a significant predictor of mobile messaging after controlling for skills, $\beta = .022$, SE = .086, p=.79. Approximately 31% of the variance in mobile messaging was accounted for by the predictors ($R^2 = .313$). The indirect effect was tested using a bootstrap estimation approach with 5000 samples. The unstandardized indirect coefficient was significant, $\beta = .243$, SE = .0549, 95% CI = .1476, .3628.

[FIGURE 2 AROUND HERE]

Discussion

As digital divide studies using micro-level approaches focus on individuals' attributes, they do not capture resources present in the environment (Hampton, 2010). A human ecological approach to the observation of parents' mobile relational maintenance allowed us to uncover meso-level resources and how they jointly influence access together with micro-level resource variables. Thus, this study complements van Dijk's (2005) framework by identifying environmental resources that the framework did not initially include and how these resources were related to material access.

The environment in which individuals are placed can influence access and use of mobile phones. In the present study, findings suggested that concerns of getting their mobile phone stolen influenced parents' decisions of ownership (especially for their children) and use of mobile phones in public spaces. However, quantitative results did not confirm the relationship between safety

concerns and smartphone ownership, frequency of communication using parents' own mobile phone, contact through social connections, or use of PAC venues. The lack of support for these hypotheses can be explained in three possible ways. First, smart and mobile phone robberies in Bogotá have been mostly present in very specific and limited areas of the city. Participants in the qualitative phase and the quantitative phase lived in different areas of the city. Future studies using a representative sample of the city population might lead to more definite results. Another potential explanation is that these concerns affected only ownership of mobile phones for children, a variable that was not included in this study.

Velghe (2012), in a study that examined mobile phone use of middle-aged women from Wesbank, South Africa, found that while mobile phones theft was relatively common, being connected and available seemed to override the risk of carrying a mobile. Therefore, people developed a set of strategies that dictated when and where to use and show their mobile phones, which influenced how they used their devices in public places. It might be that, as Velghe (2012) found, theft concerns affected parents' strategies for how and when they used their mobile phones in public spaces but did not restrict their overall interaction with their children or actual ownership of a device. The benefits of owning and carrying a mobile phone in public may have overridden the costs. More qualitative studies are needed that delve into parents' mobile phone use strategies in public spaces and how they compensate for those environmental restrictions.

Other studies have identified other environmental factors that affect access. Correa and Pavez (2016) found that the geographical location of certain towns in rural Chile affected access, as people in those areas were more isolated, infrastructure was more scarce, and people were less aware of different access possibilities compared to those in big metropolitan areas. De Souza e Silva, et al., (2011) found the environmental circumstances of people living in favelas in Rio de

Janeiro, Brazil influenced how they appropriated and cannibalized mobile phones, challenging law enforcement. In sum, our findings contribute to the existing idea that circumstances created by individual and environmental conditions give shape to different access choices, building an access ecology that integrates peoples' access limitations and enablers, ultimately influencing how they use technologies. Individuals' attributes should be considered concurrently with environmental factors, as they act jointly to influence access and usage decisions.

As active agents, parents sought alternative ways to achieve their communication objectives, but they were often still unable to meet them. Parents who faced financial constraints interacted less frequently with their children during the day, and, although driven by affection motivations, their interactions reflected monitoring motivations. This is an important communication and relational outcome. Children tend to evaluate interactions that reflect these motivations under a negative light (Hessel et al., 2016).

Our findings also demonstrate how skills influenced how people used their devices. Furthermore, we uncovered learning efficacy as a cognitive resource that facilitates skills acquisition. While studies suggest that seeking help and support from others, especially children, influence skill accruement (Correa, 2014; van Deursen et al., 2014), our findings showed that learning efficacy acted as a necessary cognitive resource for skills learning. This cognitive resource, and not necessarily the skills, might be the barrier affecting some parents.

The notion of efficacy has been used before in digital divide research (Eastin and LaRose, 2000). However, that construct was propounded to explain knowledge barriers to adoption, comfort, and satisfaction using the Internet. Consequently, it has been interchangeably used with Internet skills (Litt, 2013) and they have been found to be highly correlated, leading to model

misspecifications (Blank and Lutz, 2018). In contrast, we found that more than Internet efficacy, it is perceived learning capability that actually leads to skills.

Our conceptualization of efficacy as a cognitive resource that precedes skills is congruent with the human ecological approach. This approach enables the observation of how people follow certain actions in order to reach their self-determined goals. The efficacy construct is a key factor in SCT for explaining human agency, as people who believe they do not have the capacity to produce the results they desire will not attempt to make them happen (Bandura, 1997: 3).

In sum, this study found that as parents faced material access barriers, they sought ways to circumvent those barriers in order to achieve their parent-child communication goals. Although most times they were able to keep in touch with their children, the nature of their interactions was still affected, most likely not reaching their communication goals. Their material access barriers, despite the alternative resources used, affected the frequency and nature of their contact. Cognitive barriers affected the acquisition of skills. However, contrary to other studies, cognitive barriers were less related to the social support individuals received when trying to gain skills and more to learning efficacy beliefs, a cognitive resource that affected their skills learning processes and, ultimately, their mobile phone use.

Limitations and Future Studies

Not accounting for differences in parents' motivation levels and how motivations influenced the different ways in which parents sought to overcome access barriers and connect with their children can be construed as a limitation of the present study. Parents guided by monitoring motivations might be more invested in finding ways to gain material access, as their communication objective presents a sense of urgency. This is not necessarily the case for parents driven by affection motivations. Qualitative studies that delve into the motivations of parents and how those translate

into actual communication behaviors will shed light onto the meaning parents give to their parent-child interactions. Quantitative studies should then examine how the strength of various motivations influence the circumvention of access barriers or the use of mobile phones.

The qualitative phase of the study did not detail enough the different strategies parents employ when using their mobile phone in public spaces. More studies should look at how environmental barriers, such as safety concerns, affect parents' decisions to get their children mobile phones, their strategies to still connect with their children, and their communication objectives.

Also, other mediation models could be tested using parent-child communication frequency as an outcome variable. It might be the case that frequency of social connection and PAC venue uses mediate the relationship between financial barriers and communication frequency.

The relationship found between financial barriers and parents' mobile interaction with their children does not exclude the possibility this might be a spurious relationship. It might be that the type of job that parents have affects both the amount of financial resources and the frequency of communication, as low skills jobs allow for less interruptions and are paid less. A replication of this study could include categories of jobs as controls to account for this potential confounding factor.

The measurement of financial barriers variables showed a low reliability score, as we combined perceptions of costs for mobile phones minutes and for smartphones data plans. A more robust operationalization should be developed.

The question about how the barriers uncovered in this study affect the communication and relationship between parents and children remains unanswered. This study took a step forward in

this direction by identifying how parents circumvent access barriers, but the interactions with their children are still affected by these barriers.

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[1] The names are fictional.
[2] Original quotes were translated from Spanish.
[3] In Colombia, high-school goes from 6th. to 11th. grade.
[4] Social stratum was determined by asking participants in what strata was their household located.
[5] No data imputation to missing data was performed. Some participants did not provide an answer for some items in the learning efficacy, skills, environmental and financial barriers or on the frequency of mobile text messaging, PAC venue use and parent's own mobile communication frequency. Missing data was handled using pairwise deletion method.

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