

# People-Nearby Applications: How Newcomers Move Their Relationships Offline and Develop Social and Cultural Capital

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## ABSTRACT

People-nearby applications (PNAs), such as Tinder and Badoo, help millions of users to make new social connections every day. However, little is known about how PNAs support offline interactions or what application features are associated with offline encounters. Research suggests that these applications support the development of social capital, but the forms of social capital are unclear. We conducted interviews with 14 active PNA users to address these questions. Our results suggest that while existing PNA features such as filters, profile photos, and chat support online connections, most participants used non-PNA platforms to build mutual trust before meeting offline. In addition, PNA users developed two forms of social (*informal* and *formal*) and cultural capital (*incorporated* and *symbolic*). We offer insights into how PNAs and non-PNAs intersect to foster feelings of safety and trust prior to offline meetings, and we propose ways for PNAs to support the exchange of cultural and social capital.

## ACM Classification Keywords

H.5.m. Information Interfaces and Presentation: Misc.

## Author Keywords

People-Nearby Application; Social-Matching System; Trust-Building; Cultural Capital; Social Capital;

## INTRODUCTION

Online social networking sites such as Facebook have been used to strengthen ties between individuals, to expand social networks, and to create new ties [11, 12, 13]. Despite these benefits, offline interactions are still more effective at developing social relationships and at building social networks [18]. Mobile social-matching applications such as Tinder and Badoo, for example, bridge online interactions with offline ones [17, 53]. In comparison to traditional social networking sites such as Facebook, users of mobile social-matching applications typically have the intention to meet offline. These

applications, also referred to as people-nearby applications (PNAs), are social-matching systems that allow users to connect with strangers in real time and around the world based on geographical location. While these applications support individuals in creating new ties to expand their social networks [29, 38], it is unclear how PNAs support offline interactions and what application features help to facilitate offline encounters. Therefore, we started this research by asking the following questions:

- RQ1. How do PNAs support offline interactions?
  - RQ1a. What process leads PNA users to extend their interactions from online to offline?
  - RQ1b. What application features are associated with offline encounters?

To begin to answer these questions, we conducted a series of semi-structured one-on-one interviews with 14 people who had used PNAs in the last 30 days. We found that PNAs helped to expand participants' social networks and their exposure to new places, events, and information. These findings suggest that PNAs could expand a user's local social network both directly and indirectly, and could foster forms of social and cultural capital. Given these findings, we reviewed social and cultural capital theories to help clarify and understand our findings. The results of our analysis address the following question:

- RQ2. How do PNAs support the development of social and cultural capital and what types of social and cultural capital are formed?

Ultimately, humans are social creatures who look to meet people for a multitude of reasons: for companionship, to solve technical problems, for marriage, to network for jobs or find career opportunities, or simply to have good conversations [52]. Social-matching systems are designed to satisfy these human needs. Therefore, understanding the answers to these questions could help to reduce social isolation and increase feelings of social support, improve our ways of living, and even improve our mental health [48].

Because most participants were newcomers to their geographical location, their use of PNAs for socializing and forming new relationships was beneficial. These relationships enabled them to acquire resources and information to help them adapt to their new area. Our findings support prior research that

PNAs help users to expand local social networks and to develop social capital [29, 38]. We also specify the types of social resources (i.e., informational, instrumental, emotional, and social resources) provided as a result. Finally, we found that our participants developed two forms of cultural capital, a benefit that had not been previously associated with using PNAs. We discuss this and its implication in our work as well.

We make the following contributions:

- We confirm the findings of past research on how people match via PNAs and social-matching systems [37, 38, 53, 54].
- We extend this research to further understand how people move their online relationship to offline, and contribute a process model describing how our participants did so (see Figure 1).
- We identify PNA features that support the online-offline relationship process and provide design implications for PNAs to better support this process.
- We clarify the forms of social and cultural capital that can be developed by meeting new people through PNAs and how these forms of capital benefited a specific population – newcomers to an area.
- We also identify new research areas to explore, which we contribute as a set of implications for future research.

### PEOPLE-NEARBY APPLICATIONS

In this section, we distinguish between online social network sites and applications, social-matching systems, and people-nearby applications. In social networking applications such as Facebook, people share their existing social networks and are not necessarily looking to meet new people; for a large part, they are communicating with individuals who are part of their existing and extended social network [9]. While some social networking sites recommend new connections based on users' common social networks, they do not aim to bring people together offline.

On the contrary, social-matching systems bring people together in both online and physical spaces [52]. Unlike systems that recommend items to people, social-matching systems recommend people to people [38, 52], and people-nearby applications are one example of a social-matching system. PNAs facilitate social matching among users based on their physical location [54]. Because physical location data assume mobility, these applications are typically designed for mobile devices and are not web-based systems, as are many social networking sites. Another distinguishing factor between social-matching systems like PNAs and online social networking sites like Facebook is that on social networking sites (or even traditional web-based dating sites), the prospect of physical interaction is a “distant, or anticipated possibility” [54, p. 620]; while this is not an explicit reason for use, PNA users have an inherent motivation to meet offline.

From the standpoint of application features, most PNAs require users to create a personal profile where they specify interests, age, and gender and can provide a photo. PNAs also enable users to search via geographical radius to find other PNA users, and show how far or near, within miles, other users

are. Most PNAs allow users to set filters based on gender, age, and distance; to connect through the application via built-in instant messengers; and to block contact from others.

We make these distinctions because while social network research has grown considerably, PNA research is still relatively new. Understanding how people use these systems to meet offline given the inherent safety concerns of these applications is an open question.

### RELATED WORK

Researchers have explored the motivations of the use of PNAs [53, 54]. While PNAs and other social-matching applications are often attributed as being used for romantic purposes, dating is not always the sole motivation for using these applications [52]. Nevertheless, meeting individuals offline poses issues around safety, and research has investigated factors such as privacy [53] and self-disclosure [54]. Blackwell et al. [7] and Birnholtz et al. [6] also investigated self-presentation on these platforms. While existing research looks at the formation of online relationships [24] and ways to foster offline interactions [4, 10, 42], limited research explores the actual process taken and decisions made for individuals to move their social interactions from online to offline. A better understanding of this process and its potential benefits is important because it would enable researchers and practitioners to improve the design of PNAs. Further, it is unclear what PNA design features contribute or lead to offline interactions.

### Motivations

Some of the most well-known PNAs are dating applications, such as OKCupid and Grindr. However, these applications also support a wider set of needs such as making new friends, and social and professional networking [38, 54]. In fact, PNAs can be beneficial for individuals who are new to a workplace or university [25, 41] and for people who may be actively looking to meet other people [37]. Even within the context of PNAs that are explicitly advertised as dating applications, such as Grindr, individuals may have other intentions. For example, Van De Wiele and Tong [54] found in a survey of Grindr users that in addition to using the application for sex and dating, some users used the application for socializing, entertainment, to reduce feelings of social exclusion, and to find accepting communities. Despite the varied motivations people have for using PNAs, meeting offline poses safety issues. In fact, out of those individuals who participate in online dating, 45% believe that finding dates online is more dangerous than other ways of meeting people [49]. Understanding how users decide to meet offline and how users build enough trust to alleviate their safety concerns is an important yet underexplored area.

### Social Matching: How Users Decide to Meet offline

Research suggests that users of social-matching systems meet based on their similarities, and even their differences. One critical aspect of deciding to meet offline relies on building trust, though the ways PNAs facilitate trust-building are unclear. Based on prior literature, the trust-building process extends beyond PNAs, which raises the question of the role PNAs play in facilitating the process of offline interactions.

### *Similarities and Differences*

Researchers have developed sophisticated matching algorithms to make “good matches” in social matching systems, e.g., in finding event partners [50] and locating experts in enterprises [29]. For example, many social-matching systems match users based on their similarities and leverage the similarity-attraction effect [40], which assumes that people want to meet someone similar. In a series of 58 semi-structured interviews to understand when students were interested in meeting others, Mayer et al. found that students were interested when they shared commonalities with others [38]. In fact, this was one of the most mentioned reasons people connected to others. Indeed, meeting different people has its benefits; for example, it can be beneficial for accessing resources such as job opportunities [28].

Co-location also impacts social interactions between strangers. In a study exploring engagement around energy consumption, Dillahunt and Mankoff suggested that common spaces, e.g., the elevator, fitness centers, support social interaction and engagement around a community-based application [23]. This may be associated with *the mere-exposure effect*, which suggests that people’s preference for one object is positively correlated with the frequency with which they are exposed to that object [56]. This psychological effect causes the concept of familiar strangers, or strangers frequently exposed to each other because of their co-location. Prior work has found that because of the shared experience of co-location, people were more willing to meet familiar strangers than perfect strangers [42]. Our proposed research will contribute an understanding of whether the familiar stranger effect plays out in PNA users’ processes for determining who to meet offline.

On the other hand, recent research investigating how people choose to meet via social-matching systems has found that environmental context strongly impacts the kinds of people users want to meet [37, 38]. Mayer et al. [38] found that people may actually want to meet dissimilar people because of environmental context. For example, two dissimilar people are likely to connect with each other when they share nothing in common with general crowds in their environment, which is called *contextual oddity* [38]. Thus, while many social-matching systems match based on similarities, relying on the similarity of profiles may be insufficient.

This past work is limited because it only evaluated which recommendations to other people these respondents are likely to select; it is unclear whether the respondents would actually meet their recommended matches offline. In addition, this work did not investigate individuals’ process for determining who and whether to meet offline, nor how they determined who they could trust to meet offline.

### *Trust-building*

The process of building trust is challenging – it involves uncertainty reduction, i.e., seeking information about the person [5], and warranting strategies, i.e., searching evidence to judge whether the information is trustworthy [55]. Prior work indicates that online social-matching users follow this process. Gibbs et al. [27] conducted a survey study to explore the uncertainty reduction and warranting strategies of users

of online-dating websites. The strategies to ensure trustworthiness included comparing photos and profile descriptions, storing conversation history, and using search engines to find related information.

In the context of PNA users, Toch and Levi [53] identified a similar pattern of trust establishment. PNA users took advantage of location, profile, chat, and blocking features to reduce uncertainty. They also moved to other platforms such as Facebook or Instagram for information. This served as a warranting strategy to gauge trustworthiness. However, in [53], all of the participants who had met someone offline exchanged other contact information, e.g., phone numbers, Skype, or Facebook, before meeting offline. How does this lead to offline interactions, and are there other means of developing trust? Ultimately, our study aims to address these questions.

### **PNA Features Associated with Offline Interaction**

Gibbs et al. [27] identified social-matching features that help to establish trust. These features include profile descriptions and photos; conversation history, which is available via chat history; and factual profile information that can be validated or confirmed with a search engine. Toch and Levi [53] confirmed the use of profile information and chat to establish trust but in a specific PNA context. They also included the use of location and blocking features to reduce uncertainty. Finally, while Mayer et al. [37, 38] suggest that people choose to meet based on factors such as environmental context, this implies the use of the location feature to meet offline. Similarly, the location feature and the availability of profile photos would be needed to support the mere-exposure effect and familiar strangers. Our research provides insight into how these features are used as a means to build trust or reduce uncertainty, or as a way to engage with familiar strangers.

In summary, our research examines how PNAs support offline interactions, the application features associated with these offline interactions, and the conversation topics that lead to new offline social connections among PNA users.

### **METHOD**

To address our research questions, we conducted semi-structured interviews with PNA users. Our goal was to recruit participants who used a variety of PNA applications, who were not using these applications solely for dating purposes, and who had actually met someone offline through a PNA.

We conducted one-on-one interviews to understand current PNA usage and the outcomes of this usage. In the interviews, we asked participants to share their experiences using PNAs, which included motivations for using PNAs, interactions with other PNA users, and how participants decided to meet other users face-to-face.

### **Recruitment**

We recruited participants from March 2016 to May 2016. We sought to recruit individuals who used these applications for more than dating purposes. To increase the likelihood of finding individuals who used PNAs for other reasons such as general socialization, we followed the direction of Mayer et al. [37] and emailed approximately 600 university students,

choosing this population because of their life stage and potentially high level of sociability. In addition, students are known to closely monitor their smartphones [34]. We also sought participants using PNAs that did not advertise solely as dating applications.

To ensure participant diversity, we recruited online via Craigslist, Meetup.com, and Facebook; via PNAs such as Tinder, Bumble, and Badoo; and offline by posting flyers to churches, gyms, and school bulletin boards. We also conducted snowball sampling [3] so participants could refer people they met via PNAs.

Finally, to address our research questions, we screened our participants based on the following criteria:

- Participants needed to be 18 years or older.
- Participants had to have used a PNA within the last 30 days.
- Participants had to have made at least one new connection using one or more PNA applications.

### Procedure

We began our interviews by first obtaining consent from our participants per institutional review board requirements. The consent form provided an overview of the study and the study procedure. Participants completed a short demographic survey after signing the consent form and provided information such as ethnicity, education, and occupation. We then conducted interviews.

The three main topics covered in our interviews included online and offline interactions with matched partners, motivations for using PNAs, and user-interface and system issues when using PNAs. If a participant used multiple PNAs, we further asked him or her to compare the differences between the PNAs (e.g., interface features and types of people they met on various platforms).

We began interviews by asking participants to describe their most memorable experience meeting individuals on PNAs, and how this relationship developed. We followed up with these questions: “*Could you describe the first conversation between you and that person?*”, “*How did you decide to meet him or her offline?*” and “*What places have you been since you two met offline?*” When participants mentioned specific application features, we asked them to open the application and show us how they interacted with others via the application. During this process, they described specific features they used. We used this technique to help participants recall their experiences and the application features they used.

After capturing at least one concrete experience, we asked participants about their motivations for using the applications and their overall feelings about the applications. We asked participants to describe their first impression of PNAs and how and why they decided to use the applications. For example, we asked participants to “*Please describe how and why you decided to start using the application(s) and your motivation for continuing to use them.*”

Last, we asked participants to describe any interface and system issues they faced. These questions highlighted whether

any of the features was useful in making connections and interacting with others. We also asked: “*What parts of the interface do you like most?*” and “*Could you describe how you adjust the settings of the app?*” The last question allowed us to understand how people use the filter feature in PNAs.

### Analysis

We audio-recorded all interviews and had them professionally transcribed for analysis. Two independent coders coded the 14 transcripts line-by-line in multiple coding phases. We took advantage of an open-coding approach [14] in our first pass. This allowed us to identify distinct categories and concepts in our data. For example, we categorized *interactions* that occurred as a result of using PNAs and noted concepts such as the *types of outcomes*. We then developed our codebook based on the main topics of our interviews. The main themes included: motivations of using PNAs, the process taken to meet others offline or not, features used in the applications to support offline interactions, and conversation starters and content. The coders discussed the coded transcripts after each pass. Coding conflicts between the coders were discussed until an agreement was reached and the codebook was modified accordingly (e.g., they added, removed, or integrated codes).

After analyzing our results and exploring related research to support our findings, we used a framework for social and cultural capital to interpret our results. Social capital refers to the resources and benefits accumulated through social relationships [16], and Mayer et al. find that PNAs provide access to “bridging” social capital [38]. Bridging social capital refers to the resources and benefits accumulated from heterogeneous social ties, or ties that exist across lines of age, class, race, and ethnicity [44]. These ties are valuable as they provide us with access to new information. The specific types of social resources accumulated from the social capital gained via PNAs are unclear. Bridging social capital consists primarily of informal, and not formal ties [26, 43]. As a result, we coded our data based on four types of social resources, which we discuss next.

Formal social ties are connections with social groups that have an explicit structure such as bylaws or contracts. Formal social ties correspond to civic involvement and relate to resources such as childcare or medical resources, often provided by the government or other associations [45]. Informal social ties, on the other hand, are connections with family and friends, and these do not have an explicit structure. Informal social ties are highly associated with four types of social resources: informational, instrumental, emotional, and social companionship [15, 26]. Informational resources consist of advice or information that helps to address problems or needs. Instrumental resources consist of tangible forms of aid and assistance such as money, labor, or materials. Emotional resources relate to the empathy and trust one receives from his or her social connections. Finally, social companionship refers to social time with others, either online or offline.

Traditionally, cultural capital has referred to the forms of skills, education, knowledge, or advantages a person has within a given society, or culture [8]. Anheier et al. [2] divided cultural capital into two subtypes: *incorporated* and *symbolic*.

ID	Demographic	Edu.	Occupation	PNAs	Moti.	Length of Use	PNA Use Location	New-comer	Participant Location
P1	F, 20-29, Asian	B	Student	Tinder	1	1.5y	USA	Y	Midwest
P2	M, 20-29, Asian	B	Student	Tinder	1, 2	8m	India, USA	Y	Midwest
P3	M, 34, White	G	Researcher	Tinder	1, 4	2m	Persian Gulf, Europe, USA	Y	Midwest
P4	M, 20-29, White	B	Brewery scientist	MeetMe, OkC, Tinder	1, 3	1.5y	USA	Y	Midwest
P5	F, 25, Asian	G	Manager	MeowChat, Tinder	1, 2	6m	USA	N	Midwest
P6	F, 26, Asian	G	Student	Tinder	5	6m	USA	Y	Midwest
P7	M, 25, African American	C	Rental agent, Part-time student	PoF, Tinder	2, 4	3y	USA	N	Midwest
P8	M, 19, White	C	Student	Bumble, Tinder	1, 3	2m	USA	N	Midwest
P9	F, 24, Asian	G	Language teacher, Part-time student	Tinder, WeChat	1, 2	2y	USA	Y	Midwest
P10	F, 33, White	B	Producer	Bumble, Tinder	1, 3	1y	USA	N	East Coast
P11	M, 34, African	A	Musician	Badoo	1	4y	Nigeria, Ghana, USA	Y	East Coast
P12	F, 25, White	B	Actress, Bartender	Bumble, Tinder	1, 3	1y	USA	N	West Coast
P13	F, 25, Asian	G	Designer	Tinder	1, 2	8m	England, Taiwan	Y	Abroad England
P14	M, 25, White	G	Student	Grindr, Scruff, GROWLr	5, 6	2y	USA	Y	Midwest

**Table 1. Profiles of the 14 participants. The Demographic column shows: gender, age, and ethnicity/race. P1, P2, and P4 provided their age range only. In the (Edu)cation column: B=bachelor's degree; G=graduate degree; A=associate degree; C=some college. In the PNAs column: OkC=OkCupid; POF=Plenty of Fish. In the (Moti)vation column: 1=talking to new people; 2=curiosity; 3=dating; 4=making new friends; 5=research purpose; 6=finding casual sexual partners. In the Length of Use column: m=month(s); y=year(s). In the Newcomer column: Y=the person was a newcomer. In the Participant Location column: all participants except P13 were interviewed in the U.S.**

Incorporated cultural capital exists in the form of education and knowledge of a culture, e.g., languages, social norms, and skills [2]. On the other hand, symbolic cultural capital refers to the resources available for an individual to hold prestige or recognition within a given society or culture. These resources could hold cultural, artistic, or moral value [2]. For example, knowledge of classical music or familiarity with certain foods may influence a person's social status within a social group and would be a form of symbolic cultural capital.

As a result, we developed another codebook based on extant literature of social and cultural capital [2, 8, 26], and we conducted a second coding phase using provisional coding [47]. In this phase, we coded our transcripts according to two variables: 1) the four social resources associated with informal ties (i.e., informational, instrumental, emotional, and social companionship); and 2) signal type (i.e., incorporated cultural capital such as language or culture-specific knowledge versus symbolic cultural capital, such as art or music).

## RESULTS

We recruited and held semi-structured interviews with 14 participants. Interviews lasted about 30 minutes to 1 hour (average 47 minutes, range 34–69 minutes), and the total length of our interview data is 652 minutes. Our participants had diverse backgrounds; half were U.S. natives (7); the other seven were from India (3), Taiwan (2), China (1), and Nigeria (1). Further details are presented in Table 1. Nine of our participants were

newcomers to their area. In this study, we defined newcomers as people who had been living in their area for less than a year, or people who were temporarily visiting a new location.

Four of the participants were students who responded to our recruitment emails (P1, P2, P6, and P14); three found our information from the physical flyers we posted (P3, P4, and P5); three learned about the study from their friends and social networks (P7, P8, and P9); three of the participants found our study on Craigslist (P10, P11, and P12); and the final participant learned about the study through our public Facebook recruitment post (P13). Though we attempted to use snowball sampling by asking the 14 participants to invite their matches, we did not successfully recruit participants this way.

We conducted our interviews in the U.S. and all participants were currently in the U.S. except P13, who was living in England and was interviewed remotely.

Table 2 lists all PNAs that were used by our participants. Eleven PNAs were used across our sample. All of the applications allowed users to search via geographical radius, set filters for gender (except Grindr, GROWLr, and Scruff) and age, allowed users to block other users, and provided built-in instant messengers. Some PNAs listed in the table have interface features or mechanisms designed for specific user populations, e.g., Bumble, Grindr, and WeChat, but these applications are still open to non-targeted users. For exam-

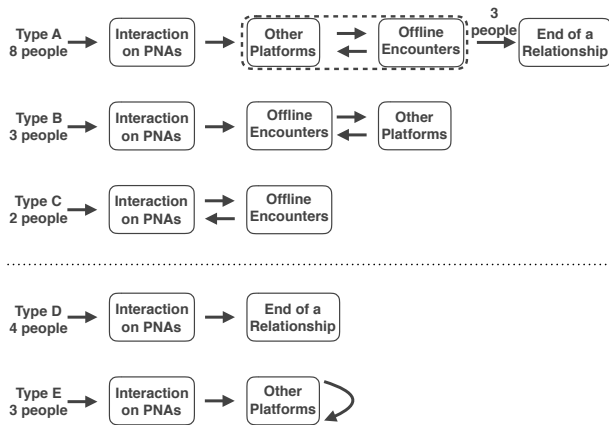


Figure 1. Five processes for developing relationships on PNAs.

ple, although WeChat was originally designed for Chinese populations, non-Chinese users can still install it and use the services.

In this section, we first report the results of our user motivations. We then discuss a process model that demonstrates how our participants moved their online relationships to offline. Next, we identify PNA features that lead to offline encounters and discuss the nature of this process in depth. These findings address our first research question and its sub-questions. To address our second research question, we describe how PNAs supported the development of specific types of social and cultural capital.

### Motivations

The analysis of our interview data resulted in six types of motivations. A majority (N=12) of our participants (P1-P5, P7-P13) used PNAs to talk to new people. Seven (P2, P4, P5, P7, P9, P10, P13) participants simply used the applications out of curiosity. Four participants (P4, P8, P10, P12) used these applications for dating; three (P3, P7, P9) were motivated to make new friends. P6 and P14 were studying the user experience of PNAs; P14 was also motivated to find casual sex partners. Note that some of our participants were motivated to use PNAs for multiple reasons – in some cases, these motivations reflected the PNAs they chose to use.

### Process for Offline Interactions

To address our first research question, we identified five processes to describe how our participants developed relationships via PNAs (see Figure 1). The first three processes led to offline interactions. Note that participants in some cases experienced more than one process.

A majority (N=8) of our participants (P4-P10 and P13) described going through the first process, Type A. In this case, participants moved to and extended their relationships to other platforms before meeting face-to-face. These platforms included Facebook, Instagram, and Snapchat. Participants also connected via the phone. In this case, participants described

taking a couple of days to a couple of months for them to move from online to offline.

P4, P8, and P10 mentioned “ending a relationship” or “stopping contact” in this process. This explicit termination occurred after a couple of offline interactions. In all three cases, relationships ended due to unmatched expectations. For example, P8 was motivated to use PNAs for dating purposes; one of his matches, however, was not motivated to use the tool in this way. Though they became Facebook friends and met offline three times, they decided to end the relationship and contact because of their unmatched expectations.

Three participants (P3, P4, P12) described going through the second process, Type B. In Type B, participants used the PNAs’ built-in messenger feature as a way to plan their future offline interactions. Participants in this case did not exchange personal contact information. After meeting offline, participants used external channels (e.g., Facebook and phone) to keep in touch. P3 and P12 met their matched partner within 1-2 days after selecting a match. For example, P3 met an Indonesian woman when he traveled to the Persian Gulf region. They met on the second day they matched on Tinder. However, P3’s match struggled in her decision because it had only been a short period since they met via the PNA. P3 described their conversation:

“She said, ‘Isn’t it a little bit too early? I want to get to know someone.’ I said, ‘That’s fine, but I’m only here for a few days, so it’s now or never.’ Then the next day, she said ‘Okay. You seem like not a murderer, so let’s hang out.’” [P3]

In this case, P3 felt that the woman was willing to meet because culturally, meeting others via PNAs may have been the only way for her to have expanded her social network. He explained that the immigrants in the Persian Gulf, particularly women, are often restricted to have such an open social life. Therefore, he felt that the woman decided to take advantage of the opportunity to meet. P3 further explained:

“For the non-local population, I think it’s easier to meet through PNA ... There’s not too many places to socialize, because it’s a very strict Muslim country ... People may have a harder time socializing than they normally would, [so] they use these PNAs.” [P3]

In P12’s case, offline encounters happened very quickly, faster than what P3 described. P12 matched and had a short conversation with a person on Bumble that was nearby. They met offline within 15 minutes after their conversation. She lived in a small town near Los Angeles, where it was easy to see the same person frequently. As P12 described:

“I felt like I had seen this person several times. We finally connected on Bumble and he was [within] 2 miles of me. We had seen each other, we had never really talked ... We were so close to each other that we met like 15 minutes later. [The area is] not like downtown LA ... so if you go out a lot you see the same people over and over again.” [P12]

P4 could not recall how long it took for him to meet one individual he met in person. The conversation he shared using the PNAs’ built-in messenger feature was about their shared

Application	Participants	Slogan	Targeted Population
Badoo	P11	<i>Meet New People, Chat, Socialize</i>	N/A
Bumble	P8, P12	<i>Meet friends, find a date, and network</i>	Female users
Grindr	P14	<i>The world's largest gay social network app</i>	Gay users
GROWLr	P14	<i>The Bear Social Network</i>	Gay users
MeetMe	P4	<i>Dating, Socializing, Networking</i>	N/A
MeowChat	P5	<i>A fun place to chat and meet new friends</i>	N/A
OKC*	P4	<i>Free Online Dating</i>	N/A
POF*	P7	<i>The Leading Free Online Dating Site for Singles</i>	N/A
Scruff	P14	<i>Gay Guys Worldwide</i>	Gay users
Tinder	All except P11 & P14	<i>Meet interesting people nearby</i>	N/A
WeChat**	P9	<i>Free messaging and calling app</i>	Chinese users

**Table 2. The eleven PNAs used by our participants. \*OKC and POF were first released as online dating websites. The PNA version of their services were released later. \*\*WeChat was designed as an instant messenger app for existing contacts in its initial release. The feature of people-nearby search in WeChat was released later.**

interests, specifically beer and other alcoholic drinks. He and his offline connection first met in a bar and after their first meeting, they exchanged their Facebook information and phone numbers, and they had been in touch since then.

Two participants, P11 and P14, experienced the third process, Type C. In this case, users relied on built-in messengers in PNAs to keep in touch with each other even after face-to-face interactions. For example, although P11 exchanged phone numbers with someone he met, they still continued communicating via PNAs. P14 used multiple PNAs and in some cases matched with the same person across different platforms. In these cases, he preferred to remain on the PNA that saved his chat history, which was a paid membership feature. It was easier for him in this case to review old messages.

*“It depends on where the conversation is initiated, and where ... most of [the conversation] happens. I’ve had conversation[s] with [someone] on Scruff and GROWLr. But the majority of our conversations has happened on GROWLr, so I like to reference back to the old messages that I’ve sent him.” [P14]*

Four participants (P1, P3, P5 and P12) described going through the fourth process, Type D. In this process, users ended the relationships through the PNAs. In this case, no contact information was exchanged. The relationships ended right away for two reasons: participants were traveling temporarily and participants experienced discomfort when interacting with certain individuals. Both P1 and P3 interacted with social matches when traveling abroad, but these interactions terminated at the end of their trips. On the other hand, P5 and P12 ended interactions with some users and used the application’s block feature to prevent further interaction. They did so because they experienced awkward conversations or felt the people they talked to were unusual.

Three participants (P1, P2, and P13) experienced the last process, Type E, which did not lead to offline encounters. After having conversations with others on PNAs, they moved to other platforms to remain in contact. It is possible that these relationships could move offline, or end after some time. For example, P2 matched with someone who lived in a city that was a two-hour drive away. They became friends on Facebook

and had kept in touch for 6 months. Although P2 had not met her offline, he planned to do so in the near future. P2 suggested that long-term interactions online before offline encounters were necessary to build trust; he was only willing to meet her offline after he established trust with her: *“Coming from the online to the offline zone, I think it’s a big threshold and only can happen after a while and a lot of trust comes into the picture ... only then, I would want to meet them.” [P2]*

#### **PNA Features Supporting Offline Interactions**

The PNA features used to support the three processes leading to offline interactions included cross-platform integration, the built-in messenger features, and the paid chat history feature to maintain contact and to sustain the relationship. Supporting features such as user profile information, and filters for gender, proximity, and geographical location, helped users to build trust, develop their relationships, identify similarities, and take advantage of current situations, which led to offline encounters. We also explored the PNA features that facilitated offline encounters in our first research question.

##### *Cross-platform Integration*

Cross-platform integration was frequently discussed in the interviews. Some PNAs (Bumble and Tinder) supported cross-platform integration, which allowed users to link their other social media accounts to their PNA profiles. Two types of information are imported from other social media: mutual friends and photos. Participants’ responses suggest that cross-platform integration influenced their trust in other PNA users. For example, five participants (P1, P6, P7, P10, and P12) mentioned that knowing they shared mutual friends with other PNA users influenced their willingness to send likes. After meeting other PNA users who shared common friends, participants described how stories about their common friends served as a form of icebreaker.

On the other hand, four participants (P3, P4, P5, and P14) chose to avoid people with shared attributes [37]. Shared attributes included: people who were likely associated with someone in his or her social network, people with shared attributes to his or her current social networks. Some participants avoided relationships they thought would pose compli-

cations as a result of shared attributes. For example, P3, a researcher with a doctoral degree, mentioned that a lot of the people he saw via PNAs were students or academics. Because he already had many academic friends, he wanted to meet someone he would not normally encounter.

*“I think grad students at [specified university] are more boring than grad students in other universities. They’re much more serious, and they’re always working [on] stuff ... I try to, if I use a PNA, to use it to meet someone I normally wouldn’t meet.” [P3]*

Participants also leveraged the contents from other social media that were integrated into PNAs to identify shared attributes. For example, P7 was a part-time student minoring in music; he mentioned that when reading other PNA users’ profiles, he saw photos imported from Instagram. These photos helped him to understand the other person’s interests and he chose to reach out because of these shared attributes.

*“Then when I went on her Instagram ... what also interests me is that she’s a singer, so I can see that common interest. You see this picture, gospel choir.” [P7]*

#### *Built-in Instant Messenger and Chat History*

All of our participants used built-in messengers to interact with each other, and this was often their first interaction after they received a match recommendation. In particular, for participants who went through processes B and C, having conversations via built-in messengers was the major way to exchange information before their offline encounters. Conversations usually started from shared interests or life attributes, such as alcoholic drinks (P4), school life (P8), or local events (P3, P13, P14), and common friends (P1, P2, P6, P7, P12).

One participant (P14), kept his interaction within a specific PNA because of the chat history feature. While none of the other participants mentioned this feature, P14 appreciated the feature because it helped him to recall his conversations with his matches.

#### *Profiles*

All of our participants used profiles to seek information about a person they saw on PNAs. However, the information they sought and the ways they judged its validity varied significantly among participants. For example, the education status influenced P1’s and P3’s decision in different ways. P1 tended to send matches to those who had some level of intellectual capability, e.g., who reported good schooling or majors in their profiles. According to P1, a master’s student, “If this guy is from a good school ... I can have meaningful conversations with him ... it’s not just like flirting and stuff” [P1]. However, as mentioned, P3 held a doctorate but avoided graduate students because he already had a lot of friends in academia.

Profile images also play an important role in users’ matching decisions. Six participants explicitly mentioned using photos to judge whether a profile is trustworthy or represents a fake account (P1, P2, P3, P4, P6, P8). Furthermore, though P12 did not explicitly mention she used photos to judge PNA users, she recognized a familiar stranger from the profile photo and as a result met the stranger offline 15 minutes after.

#### *Filters: Age, Gender and Geographical Location*

One person (P2) mentioned that he modified the age filter to the maximum and the minimum settings – no other participants mentioned adjusting this filter. For P2, he thought that meeting people from different ages provided exposure to “*different perspectives, different people, and different reasons [for using the app]*” [P2].

All of the PNAs except those for gay communities (Grindr, GROWLr, and Scruff) allow users to filter based on gender. Nine of our participants had no issues matching with people of the same gender and set their filters to match with any gender. However, these participants noted that as a result of setting their filters to match with any gender, they had been approached by gay users for dating. Therefore, all participants except P11 and P14 reverted to the default gender setting, which assumed heterosexuality. P11 matched with both genders on Badoo and some of these relationships developed into offline friendships. P14 only used PNAs designed for gay communities.

Some participants used filters for geographical location. Five participants (P1, P4, P8, P12, P14) set distances to which they could possibly meet their match in person, though the actual distance varied among individuals. On the other hand, two people (P2 and P7) turned it to the maximum distance to enlarge the pool of people they could connect to. Other participants kept distance filters on the default value.

Another example associated with location came from P5. She mentioned that she did not open PNAs in the city she worked.

*“Because I work in [a Midwestern city] but I don’t want to meet people in [the city] ... Mostly they are gangster, homeless people. I feel people in and near [the town she lived] are simpler. They are either students or engineers.” [P5]*

In addition to open-ended self-introductions, some PNAs (e.g., POF and OKC) have predefined cells for users to enter a detailed profile, such as religion, language, or number of kids. Users can thus use filters to seek people with specific characteristics. In one case, P7, a single father of two girls, was motivated to seek other PNA users within his area who were also single parents. His intention was to exchange life experiences as a single parent. We asked P7 to walk us through how he used the application to seek this type of support and as he searched through the profiles, he identified one individual:

*“[This person] has kids, that right there shows me that we have an interest, we’re both parents ... This gives me just enough to see if we have something in common, so there’s something that we can talk about when I actually send her a message.” [P7]*

#### **PNAs and Developing Social and Cultural Capital**

As discussed in our analysis, we conducted a secondary and more focused analysis of our data to understand the types of social and cultural capital formed via PNAs. We reanalyzed *all* participant data, not just that of newcomers, though most participants were newcomers to their area.



### *Social Capital: Four Types of Social Resources*

All of the participants developed informal social ties as a result of their PNA usage. We found that our participants met their PNA matches offline and described benefiting from these connections. We categorized these benefits into the four social resources described in the analysis: *informational, instrumental, emotional resources, and social companionship.*

Informational resources were the most common type of resource our participants acquired from their PNA matches. Informational resources consist of advice used to address problems or needs. All of the participants described receiving informational resources from their interactions with other PNA users. For example, the participants received information about local events and facilities, and recommendations for restaurants and spots with nice views. In many cases, the participants were new to an area and received information from locals. Oftentimes, locals suggested their personal preferences.

*“At that time, I was new to [a Midwestern college town] and the guy was a native [to the town], so he gave me a lot of tips about what to do in and around [the town]... I told him I like burgers, so he recommended some places for burgers.”* [P1]

In some cases, locals provided new information that may not have been easily accessible through other channels. P13, a designer, wanted to learn programming. She learned about a local programming event through someone she met online via Tinder:

*“He told me that he will be one of the tutor[s] [for the] Ruby on Rails for Girls event [this] weekend and he invited me to come ... though I tend to use Meetup or other applications but I didn’t know this information and he told me that.”* [P13]

We found that newcomers and travelers to new areas were not the only users seeking and benefiting from new information. For example, P10, a Bumble and Tinder user who had lived in the same area for 13 years, shared her experience exploring two local restaurants recommended by a person she met on Tinder. Though she had lived in the city for a while, she had not known about these restaurants.

*“We went to a little restaurant, and we went to another Mexican place ... Both of them were new to me ... I actually have a friend who lives not too far from there.”* [P10]

Instrumental resources, on the other hand, consisted of tangible aid and assistance. For example, participants described receiving instrumental resources that included free transportation (P5, P11), free stay (P11), and help with a gym membership application and with workout routines (P12). P11, a Badoo user from Nigeria, attended a 1-week training program in Ghana. He matched with someone on Badoo who lived in Ghana and who provided him with a free stay and with free rides during his visit.

*“He was actually very helpful ... He took me to different places I needed to go to because I didn’t know the place. Some of the places don’t really have directions, so you need somebody who is local to take you around. He was able to do that.”* [P11]

P12 received help with a gym membership application and new workout routines.

*“He was just helping me on my form and really giving confidence on how to be able to lift weights, especially because I was so new, I was a beginner.”* [P12]

As mentioned earlier, emotional resources relate to the empathy and trust one receives from his or her social connections. In our interviews, these resources were the least identified type of resources. We observed one instance in the case of P7, a single father, who used the “number of kids” filter to find single parents. While P7’s motivation was to make new friends, he stated in the interview that he wanted to share his feelings, i.e., empathy, and experiences as a single parent with other single parents. However, he had not yet found a match.

All participants were able to receive social companionship via online communication, because all of them spent time interacting with each other on PNAs. All except two participants (P1 and P2) received social companionship offline.

In addition to the aforementioned resources, we saw that PNAs supported introductions to larger social networks. For example, those matched to our three participants (P5, P9, P11) introduced them to their friends and sometimes families. These results suggest that meeting people on PNAs could lead to new local social networks, and therefore informal social capital including emotional support and social companionship; however, it was unclear what types of networks these were and whether these second-layer social networks also provided these resources.

### *Social Capital: Formal Ties*

We also observed that participants indirectly built ties with local volunteer associations, business teams, and sports clubs, which created formal social ties. Two participants (P2 and P8) learned information about local associations. P2 learned about an Indian student association at a nearby college; P8 learned about a meditation club and its events in his neighborhood. However, neither of them joined or participated in events organized by these associations.

On the other hand, P9 and P12 formed formal ties indirectly from people they met on PNAs. After meeting the gym coach, P12 became a member of the gym that was a 20-minute drive from her house. Because of the distance, she decided to join a gym that was closer to her house after a couple of weeks. As a result, she discontinued her connection to the gym association and could no longer benefit from that formal tie.

P9, who is Chinese, ended up participating in events organized by local associations and being a part of a local association as a result of connections made through a PNA as a newcomer. After moving to a U.S. city 2 years ago, P9 met a Chinese man by using the people-nearby feature in WeChat. The man introduced her to local Chinese associations. Since then, P9 has participated in events led by one association and has continued to be involved in one of the associations’ online groups.

*“[The person] introduced some Chinese events. One event was organized by a Chinese organization. They invited Chinese people who live in [this area] to attend that event. From*

that event, I really know many people, [it provides] a social network.” [P9]

#### *Incorporated Cultural Capital – Social Norms, Language*

From our participants’ interactions with local people, we identified two signals of incorporated cultural capital: *social norms* and *language*. Social norms are rules followed by members within a social group [35], and one of our participants (P3) mentioned learning the social norms of a specific community. As we mentioned, P3 had a conversation with an Indonesian woman he met on Tinder in the Persian Gulf. This woman had worked at a local hotel in the Gulf region for 2 years. Through P3’s interaction with her, he acquired knowledge of local social norms in the region. P3 was curious about the local culture, though he did not intend to join the local culture.

“*[The Persian Gulf region is] somewhat of a strict Muslim country ... They have curfews and stuff, and if you’re a woman, [life] is hard ... She said that she has this curfew where you have to be home by 1 a.m.*” [P3]

Language is the other type of incorporated cultural signal we identified in our studies. Two participants (P5 and P13) mentioned language exchange in their interactions with other PNA users. For example, when P13, whose mother tongue was Mandarin Chinese, was in London, she used Tinder to meet local people and practice her English by speaking and by conversing with others online (via typing).

“*Actually I didn’t have too much time to meet people in London even in bars because I [was] always with my friends [who were international students] ... I also want to practice my English conversation, especially in typing ... It’s only [when] I started to use Tinder, I started to know about London.*” [P13]

On the other hand, we found that participants who did not speak local languages also introduced their native languages to local PNA users. One of the study participants mentioned teaching her first language to local residents. P5 matched with a Korean man on Tinder, and she taught him simple Mandarin Chinese. Although Mandarin was not the main language used in that city, learning Mandarin enriched the Korean man’s cultural capital for entering Chinese social groups.

“*Sometimes I teach him Mandarin. Whenever he saw something, for example, a chair, he [would] ask ‘what is the Mandarin of chair?’ [And] he always asks me how to say ‘what time is it?’ in Chinese.*” [P5]

#### *Symbolic Cultural Capital: Music and Food*

The other major cultural capital is symbolic, e.g., music, food, and art. For newcomers, learning about these cultural elements can help to introduce them to the values, standards, and styles of a culture [2]. This is important when moving to, or being introduced to, new places. For example, P3 was a newcomer to the Persian Gulf region, as mentioned. He learned about the local culture of the Persian Gulf through an Indonesian woman. The Indonesian woman also introduced him to Indonesian pop songs.

“*We talked a little about music ... I asked her about Indonesian music, so she was playing me the big Indonesian pop stars. If*

*you ask me who they were, I would find that I wouldn’t be able to [recall].*” [P3]

Learning about and experiencing music and food, elements of symbolic cultural capital, was also common among some of the other participants. P11 was introduced to and experienced new food when traveling in Ghana. He matched with another Badoo user who introduced P11 to “kenkey.” P11 described feeling closer to the other Badoo user by sharing the food.

“*We tried to compare entrees and see what we have in common and what we have different there too. They have one food they call ‘kenkey.’ It’s made from cassava. We have something similar in Nigeria, so it’s like we live close, connected.*” [P11]

#### **Limitations**

The first limitation of our study is the number of participants, especially given that they represented a diverse group of individuals living in the U.S. It is possible that our findings are limited to newcomers, specifically newcomers to the U.S. living in or near a large university town.

Perhaps the use of these applications varies across, cities, countries and cultures. A larger-scale study would be needed to fully understand the extent to which our findings generalize. Nevertheless, our study is exploratory and leads to a better understanding of how offline interactions occur and the types of social and cultural capital formed in these relationships.

We did not focus on individuals who used PNAs solely for dating purposes. It is unclear whether these users are a limited representation of all PNA users. Nevertheless, research suggests that the motivations of PNA users are multifaceted, which we confirmed in our results.

A final limitation of our work is that we only know one side of the relationships described. That is, we only know how the participants perceived the interactions and relationships they had with others. While we requested participants to invite the people they met on PNAs to our study, this did not lead to additional participants. We suspect that this might have put our participants in an uncomfortable situation.

#### **DISCUSSION**

In this section, we confirm prior findings for using PNAs and uncover how PNAs fulfill implicit needs that our participants articulated in interviews. We also discuss in detail the conditions that led to offline interactions and contribute design implications that could further support and foster the online-offline relationship process via PNAs. We conclude our discussion with an analysis of the types of social and cultural capital acquired, primarily by participants who were newcomers to their area. This extends past research suggesting that PNAs help to foster social capital. We first provide insights into the types of social capital that were formed, which has not been discussed in PNA research.

#### **Factors and Features Leading to Offline interactions**

Ultimately, what led our participants to offline interactions confirms and complements past research [27, 37, 38, 53]. The majority of our participants met offline after developing trust with their PNA matches. Several participants took advantage

of meeting individuals with shared interests, as suggested by Mayer et al. [38]. In a couple cases, participants met offline with nearby users who they recognized as *familiar strangers* [42]. PNA features facilitated uncertainty reduction, trust-building, and opportunistic social matching [37] based on shared *social context*.

Our results did not confirm prior findings suggesting that offline interactions result from *personal* or *relational context* [38]. While personal context includes contextual engagement, *relational context* includes contextual rarity, or meeting others with whom one shares something rare (e.g., nationality, ethnic minority, religion, or extraordinary hobbies); contextual oddities; or contextual activity partnering. Future research should investigate the unique conditions in which offline interactions are based on these factors.

Our participants built trust by using the filtering features to reduce uncertainty. Participants reported filtering by age, gender, distance and geographical area, and number of kids (P7 the single father). We did not find that our participants filtered by race, ethnicity, or religion, although the capability to filter in these ways varies across platforms. However, when users choose certain applications such as WeChat, they may be filtering by race and ethnicity indirectly because these platforms are designed for specific demographics, in this case Chinese users. Many participants used Tinder, which only provides age, location, and gender filters. OkC and POF provide more comprehensive filters.

Two participants blocked users (P5 and P12), consistent with the results of Toch and Levi [53], who found that blocking was used to reduce uncertainty. The presence of geographical location in PNAs along with profile pictures was used to support the *mere-exposure effect* [56] and the identification of familiar strangers [42]. This helped to reduce uncertainty as well. In this case, participants took no additional action to establish trust, which we find interesting. The two features helped to reduce uncertainty, to make the choice to meet offline relatively simple. This supports Mayer et al.'s [37, 38] suggestion that people may choose to meet based on factors such as environmental context. This finding also supports the investment in future PNA design to facilitate connections between familiar strangers.

Interestingly, some PNAs provided unique features, such as chat history, to help to reduce uncertainty and to establish trust. Our participants also used warranting strategies as suggested by Gibbs et al. [27] to build trust. For example, participants moved to other platforms such as Facebook, Instagram, Snapchat, SMS, and the phone as warranting strategies to establish mutual trust prior to meeting offline. In fact, participants leveraged the cross-platform integration features offered by Tinder and Bumble to establish trust. These PNAs allowed for integration with Facebook and Instagram, respectively. In this case, participants used contents from other social media that were integrated into PNAs to identify shared attributes. For example, P7 mentioned that when reading other PNA users' profiles, he saw photos imported from Instagram. These photos helped him to understand the other person's interests and he chose to reach out because of shared attributes [37].

We found that some participants sought to meet other PNA users based on shared context and shared attributes. However, some participants actively avoided meeting others who were similar; this varies slightly from past research suggesting that people are interested in meeting individuals who share "rare" attributes (e.g., attributes distinct from the general population) [37, 38]. This distinction could be further investigated in future research.

Finally, none of the participants mentioned the use of search engines to confirm the validity of profile information; however, this is not surprising because searching to confirm the validity of user information was the least used approach for trust-building, according to Gibbs et al. [27].

### **PNAs Fulfill Explicit Motivations and Implicit Needs**

Our findings confirm prior PNA research results suggesting that individual motivations extend to more than dating on social-matching platforms [52, 53, 54]. Besides dating, our participants' motivations spanned five distinct motivations, including having conversations with new people, curiosity, making new friends, holding a personal interest in studying PNAs, and finding casual sex partners. PNAs fulfilled these explicit motivations and our findings support and complement prior findings that suggest conditions in which users of social-matching applications are matched with others [37, 38, 39, 54]. Participants in our study, however, also used PNAs to fulfill their implicit, or unconscious, needs. For example, while P7's explicit motivation for using PNAs was to make new friends, he had an implicit need to find other single parents. P9, a Chinese woman had recently arrived to the U.S., used PNAs to make local friends, but she had an implicit need to meet someone who shared her culture.

### **System Design Implications**

We addressed our first goal to understand how PNAs support offline interactions, by contributing a process showing that before meeting offline, our participants: 1) engaged in trust-building activities with the use of other platforms, either via the PNA (cross-platform integration) or outside the PNA; and 2) found "*familiar strangers*." In this section, we raise questions about whether the design of future PNAs should provide better support for facilitating connections between familiar strangers, or better support for reducing uncertainty to build trust. We also provide design implications for PNAs to better support the implicit needs of PNA users.

#### *Support for Offline Interactions*

Humans are inherently social and look to connect to others for companionship, to solve technical problems, for marriage, to network for jobs [52], and for positive health [32]. PNAs could actually encourage their users to move directly offline (e.g., Types B and C, Figure 1). While offline connections often led to users connecting via other platforms, this did not imply discontinued use of PNAs. Therefore, encouraging users to move offline should not contradict with corporate values of keeping users on PNAs. Our results suggest that PNAs could leverage technical advances in context awareness [37, 38, 39] to encourage the interaction and engagement of familiar strangers, which led to immediate offline encounters (e.g., this

did not require elements of trust-building such as chatting via messengers, or using other platforms). Similarly, some PNAs included built-in chat features that supported trust-building (Type C), which led to offline interactions. Finally, PNAs such as Tinder and Bumble allow for cross-platform integration of social media platforms (e.g., Facebook, Instagram). These PNAs support users in reducing uncertainty and warranting trust (e.g., Type A). The PNAs not supporting these features could better support offline encounters by adding support for these features.

#### *Support for Implicit Needs*

The PNAs helped users to meet their implicit needs as well as explicit goals. The newcomers benefited from learning and experiencing local cultures, and even learning new workout routines. While our participants did not all express their needs explicitly, PNAs could facilitate connections among individuals based on stated interests or perhaps common locations visited. For example, if the system knew that P12 visited the gym a couple of times and that her match frequented the gym, perhaps the system could match based on this information to encourage serendipitous connections [39].

#### **Implications for Future Research**

We previously discussed how PNAs could better support offline interactions; however, we did not discuss how PNAs could support the formation of different types of social and cultural capital. We discuss these opportunities next.

#### *Support for Social and Cultural Capital*

What is interesting about the results of our analysis is the common theme around newcomers who benefited from the ties they met both online and offline. These results are similar to findings by Mayer et al. [38], who found that their participants were more motivated to meet people when they were alone than when they were with friends. This was influenced by their being in a new and unknown place, though most were newcomers to areas while traveling. Nevertheless, PNAs can benefit people other than newcomers. Prior CSCW and CHI researchers discuss the benefits of social capital among underserved and often isolated groups [19, 20, 21, 22, 33] and PNAs could support the formation of social capital.

However, based on P5's comments, discrimination on these platforms might occur because of negative stereotypes such that underserved populations may not benefit from PNAs. Rudder, OKCupid's co-founder, observed racism and political biases across multiple PNAs and dating websites [46]. These issues might prevent people of a specific race or who live in a specific area from making new connections and benefiting from PNAs. Other location-based social media have been modified to solve these issues. For example, Nextdoor, a social media platform designed for neighborhoods, underwent user interface changes to prompt users to think twice about reporting suspicious activities in their neighborhoods perhaps because of negative stereotypes. According to [30], the interface change reduced racist posts by 75%. Future research should address how to mitigate issues of stereotyping and discrimination on PNAs to increase users' opportunities to meet people and develop social and cultural capital.

We found that non-newcomers benefited from the ties they met online and offline. In terms of the types of the social resources provided via social capital, PNAs supported informational and instrumental social resources. We did not, however, find that PNAs supported emotional social resources. For example, P7's implicit goal was to meet single mothers to share his experience and feelings of being a single parent and to understand how others experienced single parenthood. Emotional social resources relate to empathy and trust one receives from his or her social connections. A question to be addressed in future research is what role PNAs might play in supporting emotional resources among their users. Is it possible to integrate emotion-detection [1] into PNAs?

Living or interacting in new places often leads to the acquisition of cultural capital. We found that our users, primarily our newcomers, obtained incorporated and symbolic cultural capital from using PNAs. For example, P13, a Chinese-speaking woman, practiced her English with area locals, which equipped her for adapting to English culture. P3 learned Indonesian pop music while visiting the Persian Gulf. Since P3 was there temporarily, learning about this music was something he could bring back to the U.S. that would distinguish him from his peers. In short, he could be considered more cultured or artistically aware.

There are temporal aspects of being a newcomer. One example is people who are temporarily traveling, considered to be tourists or short-term visitors. Other newcomers may have the intention of staying in a place for a longer period of time (e.g., students, immigrants, refugees). For these newcomers, acquiring cultural (and social) capital can lead to economic benefits and social mobility. Besides research in ICTD [36], very little research explores the development of cultural capital in the context of ICTs.

We believe that it is too preliminary to propose design implications for cultural capital support via PNAs; however, one could imagine PNAs supporting a setting that enabled newcomers to specify their length of stay and interest in meeting locals.

In theory, PNAs could help newcomers connect to communities and increase heterogeneity in communities [31, 51]. Going forward, we would like to provide empirical evidence to support this hypothesis. We would also like to understand more broadly whether and how the acquisition of cultural capital varies across countries.

#### **CONCLUSION**

We conducted an exploratory study of 14 active PNA users to understand how PNAs support offline interactions (i.e., What process leads to offline interactions and what application features help to facilitate these interactions?). Based on our initial findings, we extended our analysis to understand how PNAs support the development of social and cultural capital. While prior research found that PNAs supported *bridging social capital* [38], we found that the social resources provided by social capital included informational, instrumental, and social companionship. Further, we found the types of cultural capital formed via PNAs, a finding not mentioned in prior research. In summary, we make the following contributions:

- We confirm past research on how people may match via PNAs and social-matching systems [37, 38, 53, 54].
- We extend this research to further understand how people move their online relationships offline, and contribute a process model describing how our participants did so.
- We identify PNA features that support the online-offline relationship process and provide design implications for PNAs to better support this process.
- We discover the forms of social and cultural capital that can be developed by meeting new people through PNAs and how these forms of capital benefited a specific population – newcomers to an area.
- We identify new research areas to explore, which we contribute as a set of implications for future research.

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