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Distance, Availability, and Friends:

System-Managed Cues and Impression Formation

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Abstract

People today increasingly first meet others in mediated spaces, undergoing impression formation processes where they view information, gain impressions, and make decisions about others. Previous research examines profile information (e.g. name, photo, about me) that people provide about themselves within this process, and argues that people try to craft profiles for positive impressions. New location-based social applications (LBSAs), however, supplement profiles with additional pieces of information that the profile owner has no direct control over, such as whether or not they are online, how far away they are, and how many mutual friends they have with the profile viewer. People who use LBSAs make decisions about whether or not to connect with someone based on not only information that someone has provided about him or herself, but also with this new information managed by the system. The evaluation of the self-generated and system-managed information as a whole is especially crucial in the context of LBSAs as people use these apps to pursue dates or casual sexual encounters.

This project examines the role of four cues in the impression formation process in the context of LBSAs: a *photo*, a self-generated cue, and *distance*, *availability*, and *number of mutual friends*, three common system-managed cues. The study analyses cues within the impression formation process through two controlled experimental tasks. In the first task, people assess 24 profiles to test if the cues present on a profile affects the probability of someone being interested in that profile. In the second task, people evaluate three additional profiles to test the relationships among cues, dimensions of impression, and action people take on profiles. While previous research from social psychology and human-computer interaction suggests potential

effects from all of the system-generated cues, in fact the only salient predictor of expressing interest in a profile is the self-generated cue, physical attractiveness of the profile photo. The results of the two tasks are discussed in terms of practical and theoretical implications, focusing on reconsidering impression formation as an iterative process and questioning cue stability across contexts.

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List of Abbreviations

CMC – computer mediated communication

FtF – face to face

LBSA – location based social application

POVT – predicted outcome value theory

URT – uncertainty reduction theory

SIDE – social identity model of deindividuation effects

SIP – social information processing theory

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1 Introduction

Impression formation is a deeply human process: when two people meet they interact and form impressions of one another. These impressions in turn inform the decisions they each make about further interaction (Berger, 1986; e.g. Berger & Calabrese, 1975; Sunnafrank, 1986). This process unfolds in a variety of contexts face to face, from social gatherings, to job interviews, to striking up conversations at a coffee shop. People anticipate and respond to others through self-presentation in order to help shape impression formation (Goffman, 1959). They do this through body language and choosing what to wear, what to say, how to say it, and how to respond to each of those things the other does. Even in early mediated communication spaces, this process, though mediated, was still driven by the individuals engaging with and responding to each other (e.g. Ramirez & Burgoon, 2004; Ramirez Jr, Walther, Burgoon, & Sunnafrank, 2002; Walther, 1993, 1996; Walther & Parks, 2002). In chatrooms, people could decide what information to share and when; on profiles, people could curate and edit what they wanted to tell about themselves.

In the past five years, applications that support mediated first encounters have become more actively involved as a third party in this process. Using new reciprocity-based interaction design, systems now partition off interaction, i.e. chat features, from users by making each first decide whether or not they would want to chat based on information available in profiles. Additionally, systems supplement profiles with pieces of information that they gather about users or the relationship between two users, that individuals cannot directly edit or delete. This information commonly includes how far away the person is, whether or not they are online, and how many

mutual friends you have with the person. Consequently, the decision about further interaction is no longer based on how the person presents him or herself but rather the combination of that presentation along with what the system contributes about him or her.

This intervention of systems on the impression formation process raises questions about its effects. Does this information increase the likelihood of people connecting? Does it provide useful information that makes people more appropriately selective in their encounters? Even the type of information these systems provide (distance, availability, and mutual friends, for example), are not immutable and are subject to contextual sensitivity. For example, systems add how far away a person is to their profile and this information could affect the impression of a viewer of that profile has, for better or worse (which, under reasonable assumptions, would be closer and farther away respectively). Of course, this distance will change as the two people move about in the world. Should the system then surface this information as it is subject to change? Should the system surface this information if it is subject to change and the system designers know that it has effects in the impression formation?

Over the past fifteen years, people in the US have increasingly turned towards the Internet as a tool for connecting with others (Rosenfeld & Thomas, 2012). As internet technologies become more mobile and widespread, systems enabling those connections become more robust. Popular today are location-based social apps (LBSAs) that use mobile devices' location to connect people to nearby others. Tinder, one such app, boasts 26 million connections a day (Tinder, 2016); Grindr, another LBSA for men who have sex with men (MSM), reports over 2 million daily active users across 196 countries (Grindr LLC, 2015). Once connected on these apps, people chat

and pursue a range of relational goals, including dates, serious relationships, or no-strings-attached casual encounters (Van De Wiele & Tong, 2014). It's not uncommon for people to move from viewing profiles, to chat, to meeting in person quickly (Licoppe, Riviere, & Morel, 2015), making messaging systems from dating websites that unfold over days seem slow (Fiore, Taylor, Zhong, Mendelsohn, & Cheshire, 2010).

LBSAs are, at a high level, similar to each other in their overall structure if not in their feature set. People create brief profiles of themselves, which include fields such as (user)name, about me, age, interests, and photo(s). Then, when logged onto the app, people view other profiles and decide whether or not to pursue a connection. It is here where the apps most diverge: reciprocity-based apps like Tinder use a swipe-one-at-a-time design for viewing profiles; apps like Grindr show people a tile screen of profiles of people nearby all at once (see Figure 1-1).

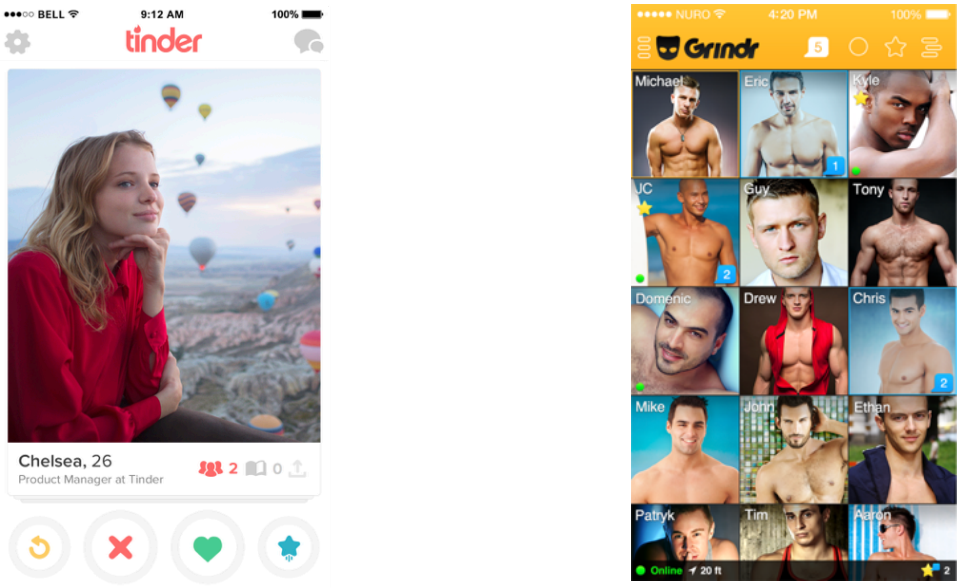

Figure 1-1 An example of a Tinder card (Tinder, 2016) **and the Grindr tiled home screen** (Grindr LLC, 2015)**.**

On dating sites and LBSAs, people must construct profiles for a general audience of users present there. In a non-reciprocity based system, users are then free to message others one-on-one, perhaps with a tailored first message specific to each other. As this process unfolds, the turn-taking provides opportunity for interactively responding to each other in an effort to explore interest and fit. Effectively, these spaces provide individuals opportunity for asymmetrical expression of interest (i.e. an initial chat).

This process is in stark contrast to the process found on reciprocity-based LBSAs, which do not support this type of turn taking. On these apps, people still construct profiles that are viewed by the broad user base of the apps but no longer can people initiate a one-on-one chat right away. These apps break this process down even further by isolating the decision to interact and ensuring that both are interested before enabling the chat and making the mutual interest visible through animations and notifications to each individual in the matched dyad. Instead of designing for one-on-one interaction between users so that they may determine if they are interested in each other, users must express interest in future interaction with others by swiping right on them. If both users swipe right on each other, then the apps notify each and enable chat features. In this way, these apps have reconfigured the process so as to necessitate action before interaction.

It is this reconfiguration that raises the questions central to this project. In non-reciprocity based systems someone would receive a message from another person and they would be able consider that other person's profile, the fact that they sent a message, and the message content itself in making a determination in how to proceed. These new systems do not permit this type of

consideration and instead force people to make initial decisions about others based on the limited information available inside of brief profiles. Given this, the significance of the information available in profiles becomes even more influential in potentiating interaction between people.

Scholars have examined mediated connection in terms of the opportunities and challenges it presents for self-presentation and impression formation (e.g. Ellison, Heino, & Gibbs, 2006; Lea & Spears, 1991; Walther, 1992). The current app landscape, which supports a range of relational goals beyond just "dating", adds renewed interest and nuance to the processes that profile owners and viewers employ to resolve presentations and impressions towards action. Contemporary systems' sensitivity to context, such as a users' location, availability, and mutual friends, and a users' current goals may play a role in this process that warrants examination. This is to say, as systems use algorithms to filter potential matches and supplement profiles with various pieces of information, how might this affect impression formation?

From a theoretical standpoint, examining information available on profiles has implications for theories on impression formation. A majority of the work around cues in computer mediated communication (CMC) has focused on self-generated cues and, to a lesser extent, other-generated cues. As Tong and colleagues (Tong, Van Der Heide, Langwell, & Walther, 2008) point out, however, new types of system-managed cues are not beyond the logic of the theoretical frameworks put forth, synthesized, and expanded over the years (e.g. Brunswik, 1956; Gosling, Ko, Mannarelli, & Morris, 2002; Hancock & Dunham, 2001; Utz, 2010; Walther & Parks, 2002; Walther & Tidwell, 1995). Initial work on system-managed cues has looked at impression formation in a context with presumably a singular relational goal, (be)friending

(Tong et al., 2008; Utz, 2010). There is some evidence to suggest, however, that these types of cues operate differently under different relational conditions (Fitzpatrick, Birnholtz, & Gergle, 2016). These cues are also employed in applications where people engage in a wide and sometimes contested array of relational goals, from short term casual sexual encounters to serious relationships. As such, it is possible that cues operate differently across users' goals on LBSAs. By understanding the relationships among types of cues, dimensions of impression, and action taken, this work contributes to building a more robust theoretical model of how cues operate contextually as well as argues for considering systems as active in impression formation.

From a practical standpoint, the effects of system-managed cues within the impression formation process have a range of implications. Should these cues increase or decrease the likelihood of a connection, it becomes an open question as to if and how to design for them. For example, if increased distance decreases the likelihood of a connection, should distance be displayed at all? Should it be displayed when the user is at a place s/he seldom goes to? Second, and related, these cues have potential to raise questions around applications' design rationale, either affording as many connections as possible through fewer cues (e.g. Norton, Frost, & Ariely, 2007) or potentially more nuanced connections using cues that may suffer from context collapse. For example, when systems show users mutual friends, the assumption is that each of the individuals is friends with the mutual friends, but the validity of that is called into question when pulling from large social network data. People could interpret the cue at face-value and gain false impressions of profiles owners: where and how the applications pull this data, and how applicable and appropriate it is in the moment, become central questions of contextual integrity (Nissenbaum, 2009) in a process already known to exhibit social processing and group identities

(Lea & Spears, 1991; Walther, 1992). By studying the effects of computationally derived and contextually displayed cues we may question the role of algorithms in how people connect, all while more people turn towards systems to connect them.

To begin, I turn to research on impression formation in order to ground this project in a framework and vocabulary. I then trace scholars' application of these theories through work on mediated communication focused on dating contexts (and, more recently, contexts with a range of relational goals). Finally, I turn to the current study, an experiment with two tasks that examine effects of different types of common system-managed cues on expressing interest in future interaction.

2 Theoretical Perspectives

Impression formation describes the ways in which people make determinations about another person upon meeting them, online or off. These determinations can be understood, in their most general terms, as either positive or negative. In the broadest sense, research shows that as cues (information) about or attributable to a target (a person) are revealed, the viewer integrates the cues into their impression (e.g. Brunswik, 1956; Gosling et al., 2002; Walther, 1992; Walther, Van Der Heide, Hamel, & Shulman, 2009). The language for talking about this, the context under which it is studied, and the implications of the findings all differ in nuanced ways across scholars and disciplines. Central to all, however, is the set of cues given for first encounters, the way this set shapes impression formation, and how this set may drive particular action.

2.1 Impression formation as a process

I focus this project on mediated first encounters of a Person-Other (PO) dyad, where the Person is the viewer of a profile and the Other is the owner of that profile. Upon encountering a profile, a Person begins *impression formation* of the Other, a process that unfolds through time wherein the Person integrates information available about the Other until he or she maintains a consistent and persistent attitude of him or her as an individual (see Walther (1992) for a discussion of interpersonal epistemology). This process includes *cues*, *impressions*, and *action*.

Cues are *self-* or *other*[1]*-generated* or *system-managed* observable pieces of information (e.g. an About Me, a friend's comment, an system-aggregated count of mutual friends, respectively)

[1]N.B.: The *other* in *other-generated cues* refers to a third person and is not the same other as the Other in a PO dyad. In a PO dyad of Person A (P) and Person B (O), an *other-generated cue*

that are attributable to an Other. Brunswik's lens model and its later extension argues that an individual may form impressions of a stranger through "lenses" formed of cues, observable elements in the environment that are linked to the stranger (Brunswik, 1956). Gosling et al. extend this theory by articulating two distinct types of cues: *identity claims*, or symbolic statements made about the stranger, and *residue*, or physical traces of the stranger within space (Gosling et al., 2002). Later work focused on extending this framework to consider cue-source within CMC, differentiating between self-, other-, and ultimately system-managed[2] cues (Tong et al., 2008; Utz, 2010; Walther et al., 2009). It is through perceiving and interpreting the given assemblage of cues that someone forms an impression of another.

Online profiles have been historically laden with *self-* and *other-generated cues*: self-generated cues are things such as biographic content and photos that someone provides and maintains about him or herself; other-generated cues are cues about someone that other people provide, such as a friend leaving a comment on someone's Facebook wall about that person's behavior (e.g. Walther et al., 2009). Whereas self- and other-generated cues are directly created by people, *system-managed cues* are pieces of information determined, maintained, and/or

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would come from another, Person C, who generates a cue about Person B that Person A may integrate into impressions and action. The vocabulary of PO dyads and cues stem from two different disciplines, social psychology and communication studies respectively. As this project is not concerned directly with *other-generated cues* and is directly concerned with PO dyads, the terms are used as is without adopting additional specialized vocabulary for this project.

[2] Previous research (e.g. Tong et al., 2008; Utz, 2010; Walther et al., 2009) has labeled what I call system-managed cues as system-*generated*. I use *managed* instead as it is more precise, calling attention to the fact that cue generation is a result of action taken by a person (logging on or off, moving about in the world, articulating ties on social networks, etc.); it is the display and management of such information that is offloaded from the individual to the system.

articulated by the system about or attributable to an individual (Tong et al., 2008; Utz, 2010). System-managed cues are typically derived from a given user's past actions, or residue. They are subject to contextual formation and display (and as such cannot be directly edited by profile owners). For example, in contrast to an "about me" section of a profile written by the profile owner for a particular imagined audience (Ellison et al., 2006), systems now add cues the profile owner may never see and which are dependent on who is viewing the profile, such as number of mutual friends. In this way, these cues represent a new type of information for audiences to consider. Many of today's LBSA profiles are laden with system-managed cues, commonly including distance between people, time last seen online, and mutual friends.

As a Person gathers *cues* about an Other within an impression formation process, s/he will gain (an) impression(s) of the Other and make decisions about him/her. An *impression* itself is a multi-faceted attitude/opinion towards the Other, which includes things like perceived similarity, trustworthiness, physical attractiveness, et cetera (e.g. Berscheid, 1985; Kleck & Rubenstein, 1975; N. D. Tidwell, Eastwick, & Finkel, 2013). Finally, a Person makes an *action* when they make a decision concerning their relationship with the Other, such as agreeing to go out on a date after striking up a conversation at a bar. (Of note, these actions are related to literature on initiation of relationship (e.g. Finkel, Eastwick, & Matthews, 2007) and predicted outcome values theory (POVT) (e.g. Sunnafrank, 1986).)

Cues, impressions, and actions appear in various configurations in numerous theories because of their ubiquity in interpersonal interaction, in both social psychology and CMC studies. The field of social psychology has focused historically on attraction and relationship

initiation. Research in this area, following Graziano and Bruce (2008), can be clustered into three different groups, each with a different focus: classical realist (e.g. Crandall, 1994; Hatfield & Sprecher, 1986; D. Kenrick, 1994), constructivist (e.g. Berscheid, Brothen, & Graziano, 1976; Graziano, Bruce, Sheese, & Tobin, 2007; Kelley et al., 2003; Lemay, Clark, & Feeney, 2007), and emergent (e.g. Aron & Aron, 1986; Aron, Steele, Kashdan, & Perez, 2006; M. Clark & Pataki, 1995; M. S. Clark & Mills, 1991). These groups map to different points of the PO dyad: the classical realist emphasizes the attributes and qualities of the Other (physical attractiveness, perceived stereotyped personality traits, etc); the constructivist, the Person him or herself (motivations, comparison levels, personality); and the emergent, interaction between the Person and the Other.

Dominant theories of interpersonal perception and interaction online (e.g. social information processing (SIP), social identity model of deindividuation effects (SIDE), the hyperpersonal model, warranting theory) are related to social psychology's emergent perspective, as they examine impressions through time. At the time of their development, the focus of research was to explore emergent online interaction practices (e.g. Deandrea, 2014; Reicher, Spears, & Postmes, 1995; Walther, 1992; Walther & Parks, 2002), and to a certain extent, compare those to offline experiences (e.g. L. C. Tidwell & Walther, 2002). Consequently, empirical studies of these theories emphasize dimensions of impression such as social and task attractiveness, and credibility (Walther, Van Der Heide, Kim, Westerman, & Tong, 2008) or physical and social attractiveness and extraversion (Tong et al., 2008), and the data for analysis comes from partners interacting with each other.

LBSA interactions now operate within a different set of norms, necessitating a reconfiguration of theoretical work that was developed under earlier paradigms. During the development of SIP, it was assumed that People accrued cues of Others through mediated interaction over time using various strategies (Ramirez Jr et al., 2002), with an eventual implied action based upon the impression arrived via turn taking and cues gathered through interaction. Nowadays people must take actions on others without interacting, as systems partition off interaction and require action from a limited set of initial cues. This shift warrants an exploration of the role of the initial set of cues.

2.2 The Importance of Initial Cues

New reciprocity-based systems have disrupted the ways in which impression formation unfolds. By isolating the initiation to reciprocity, understandings of uncertainty reduction, predicted outcome values, social penetration, and social information processing shift. Instead of conceptualizing impression formation as a process through time and through turn taking, it is now the case that actions must be decided with an initial set of cues. This initial set of cues itself is made for a general audience and partially controlled and maintained not by the individual but by the system. The actions taken by each person on the initial set of cues enables or disables interaction and turn taking of impression formation as described in previous theories. Initial cues therefore become paramount in enabling future interaction, all while including system-managed cues, whose effects are unknown.

The role of initial cues in impression formation cannot be overstated. Ellison and colleagues found that profiles are a way of creating or foreclosing different relational opportunities (Ellison

et al., 2006). The ways in which people interacted through the content in their profile alone seemed to help shape the later interaction in the messaging systems available to users. Participants reported that they found meaning in small cues, such as when messages were being sent, which supported SIP's framework of how an assemblage of cues work online. The scholars also found that users were circumventing the system in strategic ways, such as rounding their age to be included in anticipated searches of others (i.e. if I'm 37, I would round my age down to 35 so someone would find me if they searched 30-35 year olds).

It is not, then, just the profile as a whole, but also individual cues within the profile that affects impression formation. For example, Fiore et al. found that perceived attractiveness is not only dependent on photos but also on free text descriptions individuals give of themselves (notably, no significance was found in fixed profile fields such as appearance, home life, and personality) (2008). Toma and Hancock found that the longer the text provided in the description field of the profile, the greater the uncertainty reduction, and the more trustworthy viewers perceived the individual (2012). The amount of information disclosure in initial interactions can be delicate, however, as Rosen et al. has found that low levels of self-disclosure are preferred (though these varied a bit across gender and age) (Rosen, Cheever, Cummings, & Felt, 2008). These findings are similar to those of Norton and colleagues, who found that providing less information and maintaining ambiguity leads to liking (Norton et al., 2007). As Whitty argues, similar to Ellison et al. (2006), online dating profiles provide information upfront and can jump start conversations to clarify relational opportunities (2008a). How, then, are system-managed cues implicated in action, especially when they are provided at the start of the process?

2.3 Cues over time

Studying effects of the initial set of cues is important because they shape both impressions and action from the start of the relationship: at any given moment an impression can inform whether or not interaction should continue. There are several theories that focus on emergent impressions gained by interaction through time (e.g. social penetration theory (Altman & Taylor, 1973), uncertainty reduction theory (see Berger & Calabrese, 1975; Gibbs, Ellison, & Lai, 2010; Toma & Hancock, 2012), predicted outcome value theory (see Grandhi, 2008; Ramirez & Burgoon, 2004; Ramirez & Zhang, 2007; Sunnafrank, 1986), social identity and deindividuation (SIDE) theory (see Lea & Spears, 1991, 1995; Spears & Lea, 1994), and social information processing (SIP) theory (see Ellison et al., 2006; Walther, 1992, 1996). The first three were developed outside of CMC and argue that as conversational turn taking happens, new information is integrated into the emergent impression of an individual; the latter two point towards how shifting impression formation to contexts online affords different opportunities and creates different challenges as compared to face to face.

Considering the opportunities and challenges of impression formation in mediated contexts, studies have looked at information seeking and revelation processes online. Gibbs et al. investigated uncertainty reduction strategies in online dating profiles, finding that online daters with greater concerns about personal security, misrepresentation, and recognition engage in more uncertainty reduction strategies when communicating with potential dates online (Gibbs et al., 2010). Ramirez and Zhang have also used both uncertainty reduction theory (URT) and POVT in combination for their study of moving relationships from mediated channels to face to face (FtF) through four conditions. The authors found that shifting to FtF sooner led to higher levels of

uncertainty reduction and information seeking, whereas shifting later disturbed the impression formation and introduced more uncertainty and negative predicted values (Ramirez & Zhang, 2007).

One of the central framings of research on online dating profiles is how affordances of mediated communication are balanced against anticipated future interaction (i.e. how people navigate moving across phases). To the first point, Walther (1992, 1996) has described *selective self-presentation*, the controlled type of self-presentation made possible in mediated, reduced-cue environments. With the prospect of eventually meeting people face to face, it becomes critical that the selective self-presentation not deviate too much from what one may experience in face to face. In a study of users of four different dating websites, Toma et al. surveyed users about the accuracy and social acceptability of attributes on their own profiles (e.g. age, height, weight, habits and interests, beliefs etc) (2008); a later study focused on profile photos compared to photos taken of the person when they came into the lab, finding one in three to be inaccurate with women more deceptive than men (Hancock, Toma, & Fenner, 2008). Both studies argued that these deceptions were made as a negotiation between the affordances of selective self-presentation in mediated spaces and discovery of deception in future face to face meetings. New evidence from an LBSA setting suggests deception of this variety can be experienced as a transgression and end interaction abruptly (Fitzpatrick & Birnholtz, 2016).

2.4 Moving from Sites to Apps

The work reviewed above on impression formation in CMC spans over 20 years. CMC itself has undergone huge shifts during that time period. The development of theories in the early

1990s emerged from work on text-based chat rooms; scholars later applied these theories in online dating contexts, after the uptake of social media had shifted the web towards profile-based interaction. The current moment represents yet another shift, wherein people have taken up location-based social apps.

Previous research on connecting strangers for romantic or sexual encounters, including work on dating sites and apps, has focused on self-presentation (Blackwell, Birnholtz, & Abbott, 2014; Ellison, Hancock, & Toma, 2012; Ellison et al., 2006). This work has focused in particular on how users construct and shape impressions with dating profiles, and the nature of their interactions with other users both on and off the sites. Despite some similarities between these two contexts for connecting strangers, there are three important differences between sites and apps: the ambiguity of goals, emphasis on the *now*, and information and interaction constraints.

The first difference is the greater amount of constraints found on LBSAs compared to dating sites. These constraints are found both on the profile itself and on user action supported by the system. Profiles on mobile LBSAs are limited compared to sites on desktop browsers in part because of screen size, and consequently support far fewer profile fields. By reducing options for self-generated cues, and adding system-managed ones, the relationship between cues available and how they may be utilized changes. Action constraints typically happen in two ways: forcing choice about relational opportunities, and restricting chat features. For example, on Hinge and Tinder people may only view one profile at a time. Before being able to see the next profile, they must provide the system with a decision about whether or not they are interested in that person. Several apps have adopted a reciprocity-based model for even enabling the chat features,

wherein both individuals must express interest in each other before they can chat (Bumble, 2016; Hinge, 2016; Tinder, 2016). Some apps further manage this process by adding time-outs to chat features once enabled, giving users 24 hours to strike up a conversation before removing the feature (e.g. Bumble, 2016; Hinge, 2016), and only allowing women to send the first message (e.g. Bumble, 2016). Because of these designs, the profile, even as it is limited by constraints, has major downstream effects for relational formation.

Second, it is important to acknowledge that a range of sites, for dating and otherwise, often are targeted at particular types of connections (e.g., social network sites for friends, (Ellison & boyd, 2013)) or particular types of individuals (e.g., farmersonly.com or militarycupid.com). This makes it easier to imagine the audience for one's profile and actions (Litt, 2012), and provides some context for interpreting the profiles of others (Marwick & boyd, 2011). (This is not to say that casual encounters do not happen through connections on dating sites, so much as to suggest that sites' design, its marketing of itself, and the social norms of users on it emphasize dating and relationships.) LBSAs, however, support a range of user goals (Van De Wiele & Tong, 2014), which they themselves may obscure through ambiguous profile language (Birnholtz, Fitzpatrick, Handel, & Brubaker, 2014), potentially making it difficult for people to determine others' goals. These ranges of goals are reinforced by “looking for” profile fields, which across LBSAs are typically a multiple select option and include options such as “casual,” “dates,” and “relationship.” People still use selective disclosure within these fields, however, as research has shown that users still pursue relational goals outside of those listed on their profiles (i.e. looking for dates but has casual sexual encounters) (Fitzpatrick & Birnholtz, 2016).

Third, and not surprisingly, time moving through interaction phases differ between these platforms. While online dating research consistently finds that users create profiles to elicit positive responses and outcomes from others (Ellison et al., 2012; Hitsch, Hortaçsu, & Ariely, 2010; Mascaro, Magee, & Goggins, 2012), these profiles may contain deceptions that are constrained to slight exaggerations of traits and traits that are not easily verified given the possibility for future FtF interaction, days or weeks from the profile view (Ellison et al., 2012; Toma & Hancock, 2012; Toma et al., 2008). LBSAs, however, with their emphasis on availability and/or proximity, enable the possibility for "now" (Blackwell et al., 2014; Van De Wiele & Tong, 2014). This distinction is perhaps especially critical in contexts when a given user is horny and looking for a casual sexual encounter right away. The apps appear to reinforce this logic, with Grindr for example including travel time in minutes to other users, which includes mode of transit. It is possible, then, that these cues are involved in the impression formation process in the moment (e.g. Ariely & Loewenstein, 2006).

3 The Current Project

We know from previous work that cues play an important role in impression formation processes in online dating contexts (e.g. Ellison et al., 2006; Finkel et al., 2007; Sunnafrank, 1986; Tong et al., 2008; Utz, 2010; Walther, 1992; Walther et al., 2009). The focus now becomes the role of these new system-managed cues in this context, which itself has changed given the design of LBSAs. Previous studies have looked at system-managed cues (number of friends in aggregate) on Facebook (Tong et al., 2008; Utz, 2010); the cues used in these studies are dependent entirely on the profile owner. System-managed cues on LBSAs, however, may depend exclusively on the profile owner (whether they are online or not) or represent some type of relationship between the owner and viewer (how far away the two are or how many mutual friends the two have). These cues are overlaid on top of whatever baseline set of self-generated cues a user decides to provide, and they update based on whoever is viewing the profile. As system-managed cues contextualize profiles for viewers, and as the possibility of later stages of interaction become dependent on the profile (i.e. one can only chat with another if they both swiped right), it is important to study how these cues affect action and how they are involved in impression formation.

3.1 Theoretical Models and Research Questions

This project theoretically models impression formation as a process involving cues, impressions, and action:

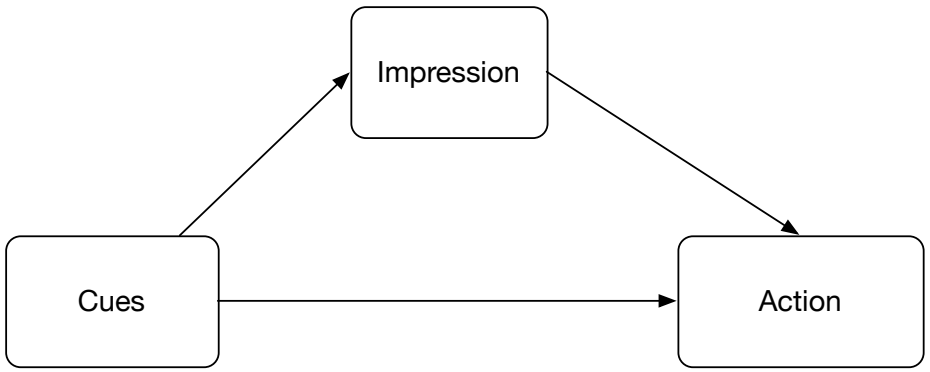


Figure 3-1 Theoretical model of relationships within impression formation.

This model (see Figure 3-1) posits relationships exist between cues and impressions, impressions and action, and cues and action. Previous research has explored the ways in which cues, self-, other-, and system-managed, affect impressions of individuals (Edwards, Spence, Gentile, Edwards, & Edwards, 2013; Tong et al., 2008; Utz, 2010; Walther et al., 2008). Research on relationship initiation has similarly investigated the relationship between dimensions of impression and initiation of relationship (see, for example, Sprecher, Wenzel, & Harvey, 2008). It is the third relationship, the one between cues and action, as well as the entire system of relationships, where there is no directly applicable known work.

Consequently, this project explores these relationships in two pairs of central theoretical models and research questions that relate to one another. The first theoretical model (see Figure 3-2) breaks out the remaining relationship from the impression formation process, relating cues to action as such:

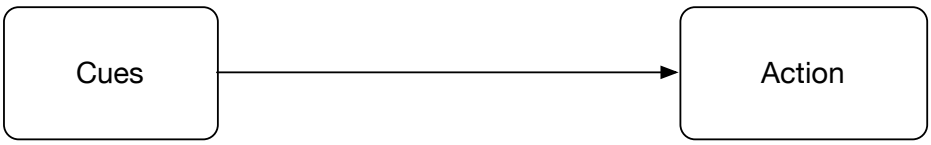


Figure 3-2 Cues predicting action

In this model, cues are predictors of action, meaning that as things such as distance increases or decreases, the likelihood of someone swiping right or left also changes. The model proposes a relationship between these two variables and asks:

RQ1. Do system-managed cues predict action?

Study Task 1 (see Chapter 4) investigates this model and research question, establishing whether or not cues affect action, which cues affect it, and in what direction.

After determining whether or not the relationship exists, research can go one step further to investigate how or when these relationships are affected. Moderation (*when*) and mediation (*how*) analysis are both part of a type of modeling called conditional process modelling. Conditional process modeling posits that after a relationship between variables is established (the *if* of RQ1 and Task 1), variables can be modeled in specific configurations that places them inside a process. The impression formation process that this research project is concerned with lends itself appropriately to this modeling, allowing for deeper investigation to relate cues, impressions, and impression based actions together.

In building a theoretical model (see Figure 3-3) that accounts for these new system-managed cues, one must consider the context from which they emerge. System-managed cues

are contextually added to profiles which are dominated by photographs. In study of different types of cues, such visual, verbal, and textual, various scholars have found visual primacy or prominence: visual cues such as photographs are easier and faster to process, communicate more, and have stronger and longer impact on impression formation (e.g. Argyle, Alkema, & Gilmour, 1971; Burgoon, 1994; DePaulo, Rosenthal, Eisenstat, Rogers, & Finkelstein, 1978; Posner, Nissen, & Klein, 1976; Rayner, Rotello, Stewart, Keir, & Duffy, 2001; Shepard, 1967). System-managed cues, typically text-based, therefore can be understood as information that is in addition to or supplements the self-generated cues already present in profiles. The study consequently assumes that these system-managed cues operate as moderators, that they strengthen or dampen a given effect of the self-generated photo. From a statistical perspective, this means that they are modeled as interactions that predict dimensions of impression. From a practical perspective, it would mean that a given system-managed cue would affect predictions given by physical attractiveness. Take a profile with a less attractive photo that at a baseline would predict taking no action: if that person has some mutual friends, the homophily effect of mutual friends may be strong enough to overcome the lack of physical attractiveness. Relatedly, if that same profile was relatively close and someone was looking for a quick, no-strings-attached sexual encounter, that person may take action on the profile. Alternatively, if a given profile had a highly attractive photo, but was not online, the effect of the attractive photo predicting action may be dampened by the profile owner being offline: this dampening may be further decreased if the situational context of the viewer was such that they were looking for someone for an casual encounter as soon as possible.

Put another way, one could expect a Person to respond most strongly to an Other's self-generated cues (i.e. their photo); system-managed cues such as distance would be taken into account in addition to the photo. In this way, one may take the self-generated cues as the independent variable in the model and the system-managed cues as the moderator in the model. The moderator effectively asks does the system-managed cue strengthen or dampen the relationship that the self-generated cue has to dimensions of impression. The dimensions of impression then, in turn, may mediate and explain how these relationships of cues may affect action. These relationships may be theoretically modeled as such:

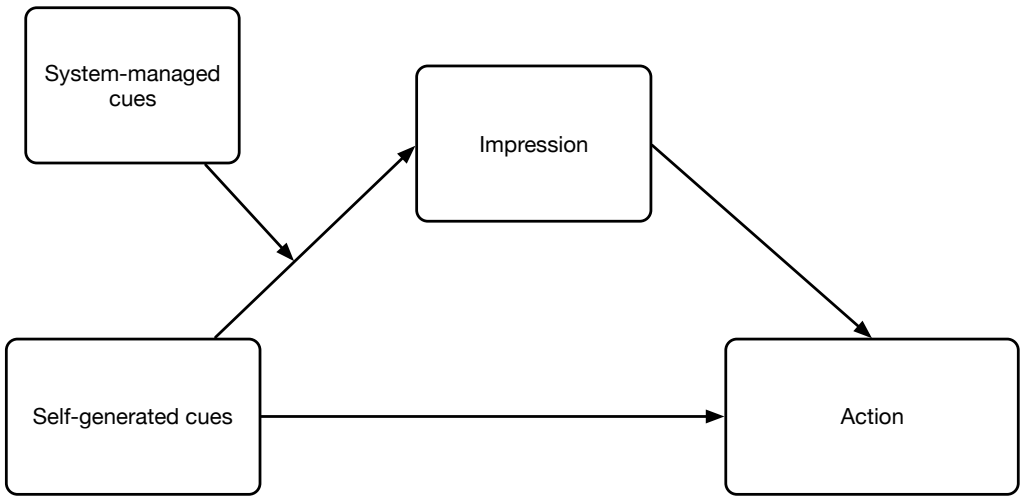


Figure 3-3 Theoretical diagram of impression formation conditional process model.

Comparing this model to the previous, one can see the role that impressions may have inside of this process: cues, self-generated or system-managed, may affect impressions, which in turn can affect actions. Formulated as a research question:

RQ2. How do self-generated and system-managed cues affect impression formation?

Previous research, the theoretical model, and basic intuition, suggests that system-managed cues, like other types of cues, affect action through their effects on impressions. For example, if a cue tells me I have friends in common with someone, I may find them more socially attractive (a dimension of impression) and decide I want to hang out with them (action). Study Task 2 (see Chapter 5) investigates this system of relationships to determine which cues affect impressions that in turn predict action.

This project examines the role of four cues in the impression formation process: a *photo*, a self-generated cue, and *distance*, *availability*, and *number of mutual friends*, three system-managed cues common in LBSAs. As above, the project first investigates whether or not a relationship exists between these cues and action (Task 1), and then teases out how and when they might affect these actions (Task 2). Of course, these system-managed cues do not exist in a vacuum, but rather within a context of individual characters of the Person and other potential covariates. Finally, to situate these cues in context of goals present on LBSAs, I study them in relation to an individual's attitudes towards relationships and sex.

3.2 Cues and action

3.2.1 Self-generated Cue: Photos

In previous work on profile-based online dating systems, photos emerged as particularly important for self-presentation and impression formation (e.g. Brown, Maycock, & Burns, 2005; Ellison et al., 2012; Fiore et al., 2008; Wang, Moon, Kwon, Evans, & Stefanone, 2010; Whitty, 2008b). The photo becomes particularly important as physical attractiveness plays a significant role in interpersonal attraction and dating behavior (Eastwick & Finkel, 2008; Langlois et al.,

2000; Walster, Aronson, & Abrahams, 1966), with people viewing physically attractive individuals more positively. This sentiment is echoed in literature on online dating, as Whitty found people try to use an attractive photo themselves in their profiles, and that they were actively looking for physically attractive others on the site (2008b). Historically, research has demonstrated gender difference in the effects of physical attractiveness and interpersonal attraction, with men placing more importance on women's physical attractiveness than women on men's (and with women placing more importance on men's earning prospects) (Feingold, 1990; Kleck & Rubenstein, 1975; Reis, Nezlek, & Wheeler, 1980); recent research, however, suggests that while more physically attractive people give more positive impressions, there is no interaction of sex (Eastwick & Finkel, 2008). Extending the logic of photos and physical attractiveness to action, I predict:

> *H1. There is a main effect of photos on action, with those photos of more physically attractive people having a greater chance of expressed interest than those of less physically attractive people.*

This main effect is commonly seen in theories of evolutionary psychology (e.g. Finkel & Baumeister, 2009; Graziano & Bruce, 2008). The underlying mechanism of physical attractiveness increasing the likelihood of expressing interest is simply that: people find attractive people attractive, and they are prompted by a biological imperative to reproduce with attractive others. Researchers have made arguments that people pursue mating with attractive individuals because they increase the chances of the offspring being successful and attractive themselves. Additional arguments have been made that the ability to secure an attractive partner

can signal success, value, and worth, especially for men who have relationships with attractive women. One can expect, then, that people will pursue more physically attractive others more often than less physically attractive others. (Of course, the opposite may be true if there are contributing effects of someone's self-confidence. If, for example, someone believed themselves to be less successful in pursuing relations with others, they may be less inclined to pursue relationships with others that they may assume would blow them off.)

The role of physical attractiveness may be further complicated in this study by the range of relational goals. There is qualitative evidence that in pursuing a broader range of goals on LBSAs, physical attractiveness is only part of the process. Fitzpatrick and Birnholtz have found that within short term relational goals enacted in next to real time, participants seemed attentive to others' availability and proximity (2016). Additionally, others have empirically found partner preferences change depending on relational goals (Li & Kenrick, 2006). Eastwick and Finkel have further tested three-way interaction of relational goals, physical attractiveness, and sex, but found the three-way interaction did not affect relation-initiation (Eastwick & Finkel, 2008). Still, the underlying issue at hand in these cases would be satisfying an in the moment need rather than establishing a relationship; to this end, the mechanisms related to physical attractiveness may not come into play within the negotiate of activity between the two individuals. In short: if you are looking to hookup with someone and a less attractive person is interested in hooking up with you, you may go for that person because the sexual urge overcomes the social. To account for these possibilities, relational goals will be modeled as covariates and higher order interaction effects will be explored.

3.2.2 System-managed Cues: Distance, Availability, and Friends

Each of the three system-managed cues proposed for study can range in values: near or far in distance, online or offline, and none to few to several mutual friends. Theories of propinquity and interpersonal attraction suggest that the closer someone is (geographically, socially, temporally), the more likely people will take interest in that person. This idea can be broken down and traced through previous research related to each of these three cues.

3.2.2.1 Distance

Theories of propinquity posit that the closer someone is physically to another person, the more likely it is that they are attracted to them (socially, et cetera). In a seminal study conducted on relationships in an MIT dorm, researchers found individuals were twice as likely to become close friends with someone who lived next door than two doors down (Festinger, Schachter, & Back, 1950). Similar findings on the effect of distance on friendship formation have been duplicated in later studies (e.g. Nahemow & Lawton, 1975; Segal, 1974). Segal argued that proximity (in this case, lining up state police trainees in alphabetical order throughout training) drove friendship formation, though Segal does not point to an underlying theoretical or relational rationale for this effect (Segal, 1974). In a recent study, Back and colleagues found that proximity effects exist even upon first meeting someone when assigning students to seats in a classroom randomly (2008). Nahemow and Lawton are more nuanced and take a perspective of hierarchy of spaces, that an individual in his or her life cultivates a daily living space and a selected activity space. The researchers found proximity and similarity interacted with regard to friendships: those who were close could be similar or dissimilar, but as distance increased, people were more likely to be friends with people who were more similar (age and race) to

themselves (Nahemow & Lawton, 1975). One can anticipate that these findings may persist even in a context with different relational goals:

> *H2a. There is a main effect of distance on action, with those closer having a greater chance of expressed interest than those further away.*

Shorter distance may imply more similarity and/or less effort on getting together, which in turn may make the Other more attractive. To the first point, distance may stand in for homophily. As distance is tied to geography, and as geography is tied to race, class, and education, the closer someone is the more likely it may be that that person is similar. This similarity may then drive the effect of distance on action, with people liking those who are more similar more than those who are less similar.

To the second point, distance may operate as a signal for effort involved in getting together. For a pair of individuals to meet up face to face across distance, either one or both must put forth the effort to cover the distance between them. Distance can therefore be attractive or unattractive in terms of the amount of effort that it suggests. For example, if you were interested in pursuing a serious relationship, evaluating the distance of another person may be critical as you or the other person would have to travel that distance with some regularity. (Of note, distance operates differently in terms of effort as related to geographic locale: 10 miles in Chicago can represent upwards of an two hours of travel time, whereas in the suburbs or the country it could be a consistent fifteen minutes.)

Of course, the opposite, however, may be true. Ebbesen and colleagues (1976) found that not only do friends live closer, but also those that someone dislikes. (In this vein, Blackwell et al. (2014) found that in the space of LBSAs there may be such a thing as "too close"; a participant reported blocking all individuals close enough to be presumed as living in his dorm. This extreme level of proximity is beyond the scope of this proposed work.) Akin to photos, higher order interaction effects with distance will be explored in accordance with this background literature.

3.2.2.2 Availability

Time-related cues (chronemics) in CMC have been shown to affect perceptions of others in a range of ways. For example, changes in inter-post pause has been tied to personality and trust (Kalman, Scissors, Gill, & Gergle, 2013), and time stamps have been shown to affect intimacy and dominance (Walther & Tidwell, 1995). In a study on online dating, participants reported on the significance of small cues, including chronemics: one participant who sent a message late at night received a surprised response back because of the timing; another argued that he would not bother contacting someone who has not been on the site actively (Ellison et al., 2006). What's interesting in these two cases is that time has potential to communicate very different things: in the first case, the participant said that he believe the late messages communicated about his 'night owl' lifestyle, which is not attractive to women; in the second case, being offline for a while may suggest a lack of engagement or openness to engage. Fiore and colleagues took a perspective of responsiveness as signaling interest: too quick a response may signal overeagerness, too slow may signal being uninterested. They found the probability of a initiator responding to a potential dates reply to an his or her first message decreased as a function of time

between the initial message and the potential dates reply, but there was no danger (decreased probability of a response to a reply) in a potential date replying right away to the initial message (Fiore et al., 2010). Following this, I hypothesize:

> *H2b. There is a main effect of availability on action, with available people having a greater chance of expressed interest than unavailable people.*

Research into NSA interactions on LBSAs apps suggests that people move quickly from online to off for casual encounters (Licoppe et al., 2015); being seen as online now may help facilitate these types of interactions and being offline may preclude the possibility. In contrast, those who are pursuing dating relationships may not experience effects of time as much given their long-term goals may be indifferent to in-the-moment availability. (There may be, of course, a cutoff point where the chronemic cue is large enough to suggest the person is no longer a user of the system, (e.g. Ellison et al., 2006), though, again like distance, that extreme is not within the scope of this study.) As above, relational goals will be modeled as covariates and interaction effects of availability will be explored.

In short, availability may operate on multiple levels during initial encounters. Being available now could signal opportunity for in the moment coordination and active engagement with the app and users. Additionally, depending on time of day, being available now could imply certain types of behavior, such as being an early bird or night owl, shirking work responsibilities, etc. Being offline communicates a certain level of ambiguity and low level of attention to interactions on the app. And, as above, being offline for a long time could represent abandoning the application altogether.

3.2.2.3 Number of Mutual Friends

The knowledge of having mutual friends with a stranger has the potential to communicate a lot of information through the homophily principle, or the idea that similarity creates connection (Mcpherson, Smith-Lovin, & Cook, 2001). One can imagine that mutual friends may suggest attitudinal similarity, demographic similarity, and/or personality similarity, all of which have been found to increase attraction (Gonzaga, Campos, & Bradbury, 2007; Griffitt & Veitch, 1974; Mcpherson et al., 2001; Watson et al., 2004). Further, insofar as mutual friends may signal potential approval, Sprecher and Felmlee have shown that people experience greater attraction towards individuals approved by members in their social network (1992).

The research above supports the notion that mutual friends may have a positive impact on attraction. Similar to geographic distance, however, there may be a threshold at which too many mutual friends could dampen the attraction. In a study on effects of the total number of friends (not mutual), Tong and colleagues found a curvilinear relationship between number of friends and social attractiveness, with profile owners being most socially attracted at 302 friends (Tong et al., 2008). Though not the same value per se, the idea may translate to mutual friends in this context. Given this, I predict:

> *H2c. There is a curvilinear relationship between number of mutual friends and action, with expressed interest occurring most frequently with few mutual friends (as compared to no mutual friends and several mutual friends).*

In the dating context, this effect has been found to be complicated by a gender difference, with women experiencing positive effects on impressions as social network approval of the

target increases (Graziano, Jensen-Campbell, Shebilske, & Lundgren, 1993; Leslie, Huston, & Johnson, 1986; Sprecher & Felmlee, 1992). Though previously untested, it's reasonable to assume this could differ by relational goals in particular directions. For example, when pursuing a serious relationship, having a few mutual friends may be seen as a good grounding; none, void and/or wanting of signal, and many, perhaps too close for comfort (especially should things not work out). On the other hand, when pursuing casual encounters, having no mutual friends may be liberating and several perhaps prohibitive. Having a casual sexual encounter with someone who shares several mutual friends with you has the possibility for perturbing the broader social network should/if/when anyone finds out: as such, people inclined towards casual encounters may be more drawn to take action on/with strangers, decreasing the risk of gossip. Higher order interaction effects of mutual friends will be explored in this vein.

Overall, the number of mutual friends can communicate a level of pre-established closeness or perhaps even approval between a pair of individuals. The greater number of mutual friends, the greater the signal that the pair may be a match. Homophily suggests that it is the underlying similarity implied by mutual friends that would drive this attraction and connection.

3.2.3 Relational Goals

Previous work on online dating sites reviewed above tend to frame their research within a context of long-term relational goals (dates and committed relationships); more recent work on LBSAs have begun to explore the broad range of relational goals (short and long term) that people pursue on contemporary apps (e.g. Blackwell et al., 2014; Van De Wiele & Tong, 2014). Because goals may fluctuate for a number of situational reasons, and that the systems themselves

allow for users to pursue a range of goals at the same time, it is important to account for this in some way in the current work.

Sociosexual orientation and relational goals have all been shown to impact impressions and action. Sociosexuality is defined as an individual's willingness to engage in short-term sexual relations without closeness, commitment, or other emotional bonding. In a study on attentiveness and sexual arousal, Maner and colleagues found an interaction effect between sexual arousal (that they manipulated) and sociosexuality, wherein sexually aroused participants with high sociosexuality attended more greatly to physically attractive targets (Maner, Gailliot, Rouby, & Miller, 2007). Previous work has further demonstrated there are differences in the ways in which men and women consider prospects for short and long term relations (D. T. Kenrick, Groth, Trost, & Sadalla, 1993; Li & Kenrick, 2006). Sociosexuality and relational goals are specific to the Person and will therefore be included as covariates in the model to account for their role in predicting action.

3.3 Cues and Impression Formation

In addition to seeing if these relationships between the cues and action exists, we can build and explore a model that relates cues, impressions, and action to see *how* they operate. For example, it could be that with some mutual friends, the likelihood of swiping right on someone increases. But why? Or how is this likelihood increased? One way of teasing this apart is using conditional process modeling, which tests relationships among variable in a process. In this context, that would be the profile card itself (the stimuli/manipulations), the emergent impression

of that person (a multidimensional construct), and the action (swiping right or left to express interest in future interaction).

This study breaks down the multidimensional construct of impressions into four contributing underlying constructs: perceived likeability, background homophily, attitude homophily, and perceived physical attractiveness (Jones, Pelham, Carvallo, & Mirenberg, 2004; L. McCroskey, McCroskey, & Richmond, 2006). Each of these dimensions have been demonstrated to have relationships with either cues or with action. In an evaluative conditioning study, participants who were shown photos of a person wearing a jersey that had either an arbitrary number or a number that had been positively associated with the participants own name. Those shown the photo of the person wearing a jersey with a number positively associated with their own name rated the photos higher on perceived likeability (Jones et al., 2004); perceived likeability is included in task 2, as it has been shown to be affected by cues (Liebman & Gergle, 2016). The measures of homophily, background and attitude, and interpersonal physical attractiveness, have also been used in studies around impression and initial encounters as both dependent (e.g. Burgoon, Coker, & Coker, 1986; Burgoon & Hale, 1988; Gudykunst, 1985; Richmond, 1978; Rocca & McCroskey, 1999; Walther, Slovacek, & Tidwell, 2001; Walther et al., 2009; Walther & Tidwell, 1995; Wright, 2004) and independent or covariate variables (e.g. Allen & Post, 2004; Andersen & Kibler, 1978; Garrison, Pate, & Sullivan, 1981; Garrison, Sullivan, & Pate, 1976; Gudykunst, Yang, & Nishida, 1985; Turner, 1993; Wang et al., 2010). Using all four as mediators in the process model will allow exploration of paths from cues to action.

In mapping out the relationship between profile, impression, and action, as well as isolating particular dimensions of impression, we can test more robust theories of how this process unfolds. In the above example, with a higher likelihood of swiping right given a few mutual friends, it could be that that person appears more socially likeable (one dimension of impression) or that they are perceived to have more similar attitudes given mutual friends (another dimension of impression).

4 Task 1 – Do System-managed Cues Predict Action?

4.1 Overview

Task 1 investigates the potential relationship between system-managed cues and action. While previous research has explored the ways in which cues, self-, other-, and system-managed, affect impressions of individuals, it has not made a direct connection to interpersonal affinity or relationship initiation (Edwards et al., 2013; Tong et al., 2008; Utz, 2010; Walther et al., 2008). It stands to reason, for example, that while having a certain number of friends makes you more socially attractive, it would not necessarily predict that someone would want to be friends with you.

Given this gap in research, Task 1 undertakes exploring possible connections between system-managed and self-generated cues and action. This connection must be established first, in order to place cues, impressions, and action into a process model for Task 2. By conducting both Task 1 and Task 2, and relating them together, one can see a broader picture of the role cues may play in the impression formation process.

4.2 Hypotheses

Previous research on physical attractiveness and on each of the three system-managed cues explored here has been conducted in various contexts. We expect from previous work the following set of hypotheses (motivated in detail in Section 3.2) as to how these cues may operate in the context of an LBSA:

Table 4-1 Hypotheses of main effects of cues and action.

H1	There is a main effect of photos on action, with more physically attractive photos having a greater chance of expressed interest than less physically attractive photos.
H2a.	There is a main effect of distance on action, with those closer having a greater chance of expressed interest than those further.
H2b.	There is a main effect of availability on action, with available people having a greater chance of expressed interest than unavailable people.
H2c.	There is a curvilinear relationship between number of mutual friends and action, with expressed interest occurring most frequently with few mutual friends (as compared to no mutual friends and several mutual friends).

4.3 Method

To see if system-managed cues predict action, I ran a 2 (*photo attractiveness*: moderate, high) × 2 (*availability*: online, offline) × 2 (*geographic distance*: near, far) × 3 (*number of mutual friends*: none, few, several) controlled experiment with repeated assessments. Each participant assessed a stack of swipeable cards, similar to popular LBSAs, using a custom built iPad application (see Appendix A – Building a swipe-gesture LBSA). Each card contains a photo and each of the three system-managed cues, completely counter-balanced in a Latin Square so each participant assessed every combination in a particular order, for a total of 24 (2 *attractiveness* × 2 *distance* × 2 *availability* × 3 *friends*) cards assessed per participant. Each order configuration in the square was seen by two participants. Data for this task is within subjects, as each participant made multiple assessments and saw all conditions.

4.3.1 Participants

Ninety-six participants were needed for counterbalancing the conditions of both part one and two of the experimental tasks; participants were over-recruited (a total of 110 participants were enrolled in this study), until a balanced set of 96 participants (48 women) was reached with each participant passing manipulation checks and the app and survey capturing each response (see Section 4.3.6 and Section 4.3.7).

Each participant was a self-reported single/not in a relationship, heterosexual, current Northwestern University undergraduate student and Facebook user, between 18-25 years old (mean = 19.97, SD = 1.46). A majority of participants were Caucasian/white (n = 42), but participants did come from a variety of racial groups: Asian, n = 31; Bi- or multi-racial, n = 5; Black, n = 11; Native American/Alaska Native/Inuit, n = 1; and Other, n = 4, comprising of Indian, East Indian, South Asian, Mexican/Latina; 2 participants preferred not to respond. Nine participants were of Hispanic/Latino/a ethnicity, with 83 non-Hispanic/Latino/a participants, and 4 who preferred not to respond. Participants most often had lived in the Evanston/Chicagoland area between 1-2 years (n = 24), with 20 between 2-3 years, 14 between 3-4 years, 17 for 4 years or more, and 21 less than a year. About half of the participants reported never having used any location based social apps (n = 42); of the 54 participants who had (26 male, 28 female), only 15 reported being active users.

Participants were recruited through on campus flyering, listservs, social media posting, the Department of Psychology paid participant registry, and in-person intercepts. The first 52

participants were paid $8 for the time; the remaining participants were paid $10[3]. Participants on average had close to a thousand Facebook friends (mean = 993.49, SD = 466.61).

Participants were asked about the importance of cues commonly present on LBSAs: name, photo, age, distance, availability, and number of mutual friends. They responded to a single-item measure for each using a five-point unipolar scale, from "not at all important" to "extremely important." Participants emphasized the importance of photo, age, and distance in their responses (see Table 4-2 Perceived importance of cues present on LBSAs).

Table 4-2 Perceived importance of cues present on LBSAs

Importance of Cues				
Cue	Min	Max	M	SD
Name	1	5	1.93	1.00
Photo	3	5	4.64	0.58
Age	2	5	3.70	0.80
Distance	1	5	3.04	0.91
Availability	1	4	1.81	0.90
Mutual Friends	1	5	2.8	1.09

4.3.2 Procedure

The procedure for the whole study unfolds in three parts (see Appendix B – Study Design and Sample Stimuli Sets): (1) experimental Task 1 (Tinder-style cards) and (2) Task 2 (profiles

[3] The compensation was increased in an effort to reinvigorate enrollment.

on desktop, see Task 2 – The "How" of Cues and Action), and (3) a post-tasks survey. Overall, this borrows the same experimental paradigm as Fitzpatrick et al. (Fitzpatrick et al., 2016). Participants came to either the lab or were recruited through onsite intercepts at the University Library. They were brought to the private study room where a researcher explained the study to them, received their consent for participation, and read through the priming script for the study.

During the priming script (see Appendix C – Task 1 Priming Script), the researcher talked through the custom built app with the participant, having them login through Facebook and approve or deny permissions for the app to access their Facebook profile. After completing the script and answering any questions participants had about how the app worked, the researcher excused him or herself from the room and the participant swiped through the stack of cards. Once the stack was completed the researcher came back and launched Task 2 for the participant (a desktop survey), and excused him or herself again. Upon completing both Task 1 and 2 and the post-task survey questions that immediately follow Task 2, participants were debriefed, compensated, and excused from the study room.

4.3.3 Stimuli and Experimental Manipulations

Each assessment, a "card" on the app, has a combination of the four stimuli, photo, time last seen online, geographic distance, and number of mutual friends, plus a pseudonym. Pseudonyms were taken from the Social Security Administrations list of most popular names for 1996, to make them familiar and of the same cohort as participants themselves (Social Security Administration, 2016).

Photo physical attractiveness was operationalized using a photo set of profile photos collected and normalized for physical attractiveness before the study. The study uses 30 male and 30 female photos across both tasks taken from an overall photo set of 200 photos (100 female). Photos of one white-presenting individual whose face was clearly visible were collected from a location based social app set for 18-22 years old (to keep age of population of stimuli the same as participants) and geo-spoofed into another location (to reduce the likelihood of participants recognizing individuals).

While I do not have express permission from the copyright holders for using these photos, I argue that their display in this study operates under fair use, as discussed with the Office of General Council at Northwestern University. Fair use has four main factors: the purpose and character of the user, the nature of the copyrighted work, the amount used, and the effect on the market for the work. In my circumstances, I am using the work for educational research, accessing the work publicly, using the work in its entirety (common for photos), and anticipating no market effects from using the work (i.e. these are not professional photographs). Furthermore, I am displaying the work to a limited set of individuals, who will not have access to the images after the study is completed. Finally, with regard to privacy, privacy scholars have emphasized on the role of context with regard to privacy (Nissenbaum, 2009). The LBSA context is one where photos are shown to strangers in order to pursue connections: the study is about how photos are involved in that very process. As I am showing the photos to strangers, I am keeping as close to original context as possible, albeit using them inside a study.

Photos were evaluated for recognizability and physical attractiveness by eight individuals from the study's sample population (i.e. current undergrads) (J. C. McCroskey & McCain, 1974; L. McCroskey et al., 2006). Only two of the 1,600 evaluations (16 coders of 100 photos each) of recognizability came back positive, from two different coders on two different photos; all photos were kept for later use. The scale items for physical attractiveness had strong reliability ($\alpha = .95$), so the sum across the items and coders was taken to score each photo. The photos were then ranked by score and the top (high attractiveness) and middle (moderate attractiveness) quintile of 20 photos each were taken. (The bottom two quintiles were dropped under the assumption that they would have too strong of an effect for other manipulations; the second to the top quintile was dropped to increase differentiation between *high* and *moderate* physical attractiveness.) The four sets of twenty photos (20 male high and 20 medium attractiveness, 20 female high and 20 medium attractiveness) were further pruned to reduce stimuli variance, including but not limited to removing photos with dogs, men with long beards, women with low plunging blouses, and people in formal clothing. Of the remaining photos for each set, 12 were randomly selected for use in the card swiping application and another 3 were selected for the survey.

Availability was shown as a combination of text and icon on the card, underneath the pseudonym and picture. Under the “online” condition, a green dot with “online now” will be displayed; under the “offline” condition, a grayed out watch icon with the text “offline” will be displayed.

Distance was displayed as text underneath the picture. The "close" condition was between one half mile and one mile, represented as a randomly chosen integer value between 2370 and 5280, with "feet away"; the farther condition was a randomly chosen integer value between 2 and 5 "miles away". The near condition represents on campus and the surrounding area, and the far condition places the Other outside downtown Evanston, possibly in Skokie or Rogers Park area.

Number of mutual friends was manipulated at three levels: none, few, and several. While the abstract concept of few and several mutual friends would depend on the total number of Facebook friends a participant has, it stands to reason that notions of few and several operate independently of Facebook. In other words, it would be reasonable to assume that a Facebook user with ~300 friends and one with ~3,000 friends would both perceive a target with 3 mutual friends as having a "few" and 15 mutual friends as "several." Therefore, the three levels of number of mutual friends was, instead of percentages of the individual participant's total number of Facebook friends, an integer within a range: 0 for "no mutual friends"; 2-5 for "a few mutual friends"; and 13-17 for "several mutual friends". The text displayed will either be "no mutual friends" or "X mutual friends", where X is the randomly assigned value inside the range of the condition level.

4.3.4 Covariates

4.3.4.1 Big 5 – Agreeableness

John and Srivastava (1999), in a constructivist study, found that people who were more agreeable rated others that they met more positively. Applicable here is the possibility that more

agreeable individuals may be generally more inclined to express interest in others at a higher rate. In considering how the composition of the PO dyad may affect expressing interest in future interactions, participants were given a 9-item inventory for Agreeableness of the Big Five personality traits. Participants were asked to respond to how much they agree with statements about themselves such as "tends to find fault with others" and "has a forgiving nature." Participants ranged in agreeableness, from 3.11 to 6.22 ($M = 4.8$, $SD = .75$ $\alpha = .70$).

4.3.4.2 Self-Perceived Mating Success

When encountering the profile of another individual and making decisions on whether or not to express interest in that person, one may pause and reflect on one's own sense of worthiness. If, for example, the profile owner is highly attractive, someone with lower self-confidence with regard to dating may be less inclined to express interest; if, however, that person believes they are highly valued as a potential mate, they may be more inclined to express interest in highly attractive profiles (and perhaps less inclined to express interest in less desirable profiles). To capture participant's sense of how successful he or she is with regard to mating opportunities, I administered a 10-item inventory. Landolt, Lalumière, and Quinsey's (1995) 8-item self-perceived mating success inventory was combined with another two measures from Eastwick and Finkel (2008). Participants rated their level of agreement to the ten items on a seven-point Likert scale; items were comprised of statements such as "Members of the opposite sex notice me," and "I am a desirable dating partner". The self-perceived mating success of participants ranged from 1 to 7 ($M = 4.3$, $SD = 1$, $\alpha = .9$).

4.3.4.3 Openness to Sex

Participants may be more inclined to express interest in others depending on their relationship to sex in their everyday life. Participants who are very open and/or have active sex lives may be more inclined to try new things and more open to casual encounters or the range of possibilities afforded by LBSAs: participants who are less open about sex may be more reserve in their use of the experimental app and in expressing interest in profiles that they are shown. I measured participant's openness to sex using Sociosexual Orientation Inventory (Eastwick & Finkel, 2008; Simpson & Gangestad, 1991, 1992). Participants completed four of the five indices from the inventory: (a) number of sexual partners in the past year; (b) number of different sex partners foreseen in the next five years; (c) number of times having engaged in sex with someone on one and only one occasion; and (d) a three-item inventory tapping attitude towards sex (ex. "Sex without love is ok"). The fifth index related to pursuing sex outside of participants' current relationships and given that all participants were not in a relationship, this item was removed. Participants attitude towards sex, from the three-item measure, ranged from 1 to 7 ($M = 4.08$, $SD = 1.73$, $\alpha = .85$).

4.3.4.4 Seeking Relationship

Encountering profiles in a mindset for pursuing a relationship may have particular effects on how cues are utilized. For example, for someone looking for a serious relationship, it may be significant that others have several mutual friends already before they would be considered a potential match. Additionally, it could be that those looking for a serious relationship would prefer to consider the individuals who are close by first, in terms of both convenience, but also in the case that nearness may also suggest that the person is also a student. To assess participants inclination towards pursuing serious relationships, I used a three-item inventory expanded from a

one-item measure from Eastwink and Finkel (2008). Participants were asked to respond to the following three statements on a 7-point bi-polar scale (strongly disagree to strongly agree): "I would like to have a serious relationship"; "I am looking for more than casual sex"; and "I am open to dating people". A post-hoc Scree test was performed and confirmed that the three items in fact tapped a single underlying dimension, as the three items (Cattell, 1966). Participants ranged in relationship seeking, from 2.67 to 7 ($M = 5.7$, $SD = 1.09$, $\alpha = .79$).

4.3.4.5 Seeking Casual Encounters

In a similar vein as serious relationships, individuals seeking casual encounters may attend to cues in different ways compared to those who are not. For example, if someone is seeking a casual, one-time encounter, they may be keen on finding someone who is nearby and online now, and perhaps somewhat less pre-occupied with how attractive that person is. In complement seeking relationship as described above, a new three-item inventory was developed to tap into participants' interest in pursuing casual encounters. Participants were asked to respond to three statements on a 7-point bi-polar scale (strongly disagree to strongly agree): "I am open to casual encounters with people"; "I am not looking for anything serious right now"; and "I would like to have casual encounters with others". As above, a post-hoc Scree test suggested that the dimensionality could be reduced to one underlying construct, interest in casual encounters (Cattell, 1966). Participants ranged in this interest from 1 to 6.67 ($M = 4.4$, $SD = 1.29$, $\alpha = .79$).

4.3.5 Measures

For this task, the outcome measure was a binary of expressed interest in future interaction. In Task 1, this was captured through swiping each assessment card either left or right. This binary

outcome was chosen in part to reflect broadly positive and negative impressions as well as binary actions within LBSAs systems and social media more broadly (e.g. blocking or not blocking someone, friending or not friending someone, and, in the contexts of LBSAs, swiping left or right). Furthermore, in comparing single- to multiple-item measures, single-item measures have been demonstrated as effective in certain contexts (Gardner, Cummings, Dunham, & Pierce, 1998; Wanous, Reichers, & Hudy, 1997). Out of the total 2,304 cards, participants swiped right on 803 of them (left on 1501).

Time spent on card during the first task was also tracked as the experimental paradigm lends itself to quick, successive assessments. The decision for rapid assessment was made for two reasons: (1) previous literature has shown that impressions can be form quickly and that they are relatively stable over time (Ambady, 2010; Ambady, Hallahan, & Rosenthal, 1995; Ambady & Rosenthal, 1997); and (2), similar to binary outcomes, it simulates *in situ* experiences of LBSA app use. Participants spent an average of 2.85 seconds per card (SD = 1.04).

4.3.6 Manipulation Checks

Manipulation checks were conducted after the completion of the third and final profile in experimental task two. Participants completed a brief survey of ten questions, two for each of the system-managed cue manipulations, and four related to the photos. The questions included true/false items such as: “I saw people who were online right now”; “I saw at least one person more than once”; “I was shown people more than a mile away”. Analysis of manipulation checks were run regularly after participants completed the study; if they did not perform better than chance on the manipulation checks, their participant conditions were put back for a new random

assignment with a new participant. This enrollment continued until a balanced set of 96 participants performed better than chance on this manipulation check.

4.3.7 Stimuli Checks

4.3.7.1 PO dyads were strangers

To ensure and confirm that all profiles viewed and assessed were of strangers, the survey asked participants if they knew any of the people in the profiles they showed; participants that recognized, knew, or had met any of person in the study were removed and, as above with the manipulation checks, their condition was reassigned to a new participant. This process was repeated until all participants passed both the manipulation check aboves and this stimuli check.

4.3.7.2 Testing values within a manipulation level

Three of the four experimental manipulations, photos, distance, and number of mutual friends, had randomly assigned values within a given level. For example, some cards assigned the "few" level of mutual friends displayed 3, while others 5. Similarly, cards with the high attractiveness condition were randomly assigned photos without replacement from the set of twelve high attractive photos, medium attractiveness, photos from the medium attractive set. As the different levels of the factors represent potential ranges (a specific number of mutual friends within "few" or "several", a specific distance within "near" or "far"), it is possible that a given individual value is significant in predicting outcomes; similarly, it is possible that a given individual photo, even if already normalized, could be significant.

This study is concerned chiefly with whether or not there is a difference between levels (near vs far, zero vs few vs several, and medium vs high attractiveness), however given the variabilities within a level, testing how well the level operates as a "group" is worth exploring. (The availability manipulation did not have different values within its two levels, "online now" and "offline", so it does not need to be tested in this way.) I ran the following three post-hoc tests to see if any specific values within a level were significantly predictive of action.

Two of the manipulations, distance and friends, are represented as continuous variables within their levels. I took a subset of the data for each level and then ran simple logistic regressions of each subset, modeling the specific values of the level of the given manipulation. The two models run for each level of distance as a categorical manipulation, near and far, show that no given distance within a level was significant in predicting the outcome. In other words, as distance increases from 2370-5280 feet or from 2-5 miles, the likelihood of swiping right on someone does not change. A similar procedure was followed to test the values shown in the "few" and "several" mutual friends. Again, the models show that number of mutual friends as a continuous variable was not significant in predicting the outcome, as friends increased from 2-5 or from 13-17. (Because for the "none" condition there was only one value, 0, it could not be tested.) For both, then, in the models for analysis, I keep the factors at their categorical levels ("near" and "far", "few" and "several") rather than their specific values.

The remaining manipulation, photo physical attractiveness, had 12 unique values, or in this case photos, for the two levels of manipulation, medium and high attractiveness. It is possible that certain photos could predict the outcome (i.e. someone is so attractive or so unattractive that

the photo could have a significant effect on the direction of the swipe). As above, four subsets of the data were taken to test cohesiveness of a given level: (1) male moderate attractive; (2) male high attractive; (3) female moderate attractive; and (4) female high attractive. Within each subset, simple logistic regressions were run with the photo as a categorical variable with 12 levels. This categorical variable was recoded using deviation encoding so that the regression would compare each photo to the grand mean of the twelve photos in the subset, rather than compare eleven of the photos to a single reference photo selected from the set. Two photos were significant for both female subsets and for the high attractiveness male subset models; the effect sizes were relatively small and could be attributable to the co-occurrence in random assignment to other things (ex. Photo A of high attractiveness appears more commonly with few mutual friends than with low or high mutual friends). Because the photo stimuli were normalized before the study, the effects are small, and the manipulation is focused on the difference between the two levels, these few photos will not be specifically accounted for within the models below.

4.3.8 Analysis

I modeled the data using mixed effects logistic regressions (see Table 4-3). The experimental manipulations, physical attractiveness, time last seen, geographic distance, and number of mutual friends, were all modeled as independent variables. The participants were modeled as random effects as each participant saw multiple assessments. I modeled the data using a forward approach, beginning with the fewest factors and adding factors from there. With each addition, I first ran a likelihood ratio test to see if the addition of the given set of factors is significant; I then compare model fit to the previous model, using AIC and BIC, to see if the additional parameter improved overall fit (Agresti, 2013). As the previous work suggests physical attractiveness to be

most important in social psychology and mate preferences, the first model includes participant gender and physical attractiveness, as well as the three system-managed cues. Effects of factors were consistent building out to model 2 (adding higher level interaction effects) and model 3 (adding covariates from the survey inventories). I therefore focus my reporting on model 3.

Table 4-3 Mixed effects logistic regression models of swiping left or right on stimuli cards

	Model 1 - Cues			Model 2 - Cues and 3-way interaction			Model 3 - Cues, 3-way, and Demographic		
	Odds Ratio		SE	Odds Ratio		SE	Odds Ratio		SE
Gender (male)	3.049	***	0.223	4.030	***	0.277	3.358	***	0.293
Distance (far)	0.843		0.105	0.843		0.105	0.843		0.105
Availability (offline)	0.911		0.105	0.910		0.105	0.910		0.105
Mutual Friends (L)	1.159		0.091	1.123		0.287	1.123		0.287
Mutual Friends (Q)	0.848		0.090	0.709		0.260	0.709		0.260
Photo Phys Att (high)	8.576	***	0.118	11.053	***	0.188	10.989	***	0.188
Gender × Phys Att				0.668		0.239	0.674		0.238
Gender × Friends.L				1.180		0.340	1.180		0.340
Gender × Friends.Q				1.441		0.318	1.440		0.318
Phys Att × Friends.L				0.802		0.327	0.802		0.327
Phys Att × Friends.Q				1.499		0.304	1.498		0.304
Gender × Phys Att × Friends.L				1.287		0.408	1.288		0.408
Gender × Phys Att × Friends.Q				0.395	*	0.393	0.395	*	0.393
Used LBSA (true)							1.621	*	0.230
SOI Attitude							1.136		0.079
Seek Relationship							1.023		0.108
Seek Casual							1.037		0.110
Self-Perceived Mate Value							0.833		0.105
Intraracial Dyad (true)							1.014		0.223
Intercept	0.090	***	0.195	0.075	***	0.227	0.060	**	1.018
Log Likelihood	-1176.8			-1169.4			-1163.0		
Deviance	2140.9			2126.4			2129.5		
AIC	2369.6			2368.7			2368.1		
BIC	2415.5			2454.8			2488.7		
N	2304			2304			2304		

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

4.4 Results

Model 3 confirms H1, the hypothesis around main effects for physical attractiveness: the probably of swiping right on a profile increases by almost factor of 11 as one moves between a profile with a photo of moderate attractiveness to a profile with a photo of high attractiveness. Calculating predicted probabilities of this difference, controlling for other manipulations, profiles with a moderately attractive photo had a 16.9% chance of being swiped right, while photos with a high attractive photo had a 53.4% chance of being swiped right.

Model 3 also shows that there is a main effect of gender of the participant on the outcome: when male participants were swiping, the odds of swiping right on a profile increased by a factor of 3.358 as compared to women. This finding is consistent across all three models. Again, looking closely at predicted probabilities, we can compare the percent likelihood that a right swipe would occur under particular conditions. Holding other variables constant, a male participant assessing a profile with a moderately attractive photo will swipe right 22.6% of the time, a profile with a high attractive photo 62.3% of the time; a female participant assessing a profile with a medium attractive photo will swipe right 8.9% of the time, a profile with a high attractive photo 45% of the time.

Models 1-3 all demonstrate that there is no detected main effect of any of the three system-managed cues on swiping direction (H2a-c unconfirmed). It is possible, however, that these effects could exist in interactions, which would not necessarily show up as significant for main effect. Graphing the data to explore possible interaction showed potential for both two- and three-way interaction between physical attractiveness, participant gender, and each system-

managed cues. Additional models, not reported here, were run to test for two- and three-way higher order interaction effects. Distance and availability were not significant in either two- or three-way interactions; those factors were removed from the models reported to keep the models parsimonious.

Number of mutual friends, however, was significant in a three-way interaction with participant gender and physical attractiveness. The factor shows a significant curvilinear relationship, specifically under the conditions of male participants assessing female profiles with high physical attractiveness. Moving across the three levels of number of mutual friends under these conditions, the predicted probabilities of swiping right "curve": 53.5% chance of swiping right given zero mutual friends; 70.5% chance some mutual friends; and 62.8% chance several mutual friends.

4.5 Discussion

The above findings offer three points for discussion around modeling action, system-managed cues, and open questions about impression formation as a process.

4.5.1 Self-generated cues and covariates predict action

Task 1 was designed to explore the possible relationship between cues and action. The analysis shows that in fact self-generated cues (a photo), as well as gender and LBSA use covariates, predict action. These parameters have different points of origin: the Person for gender and LBSA use, and the Other for the self-generated cue. This distinction implies that action stems from characteristics, qualities, and experiences of both individuals involved mediated first encounters. This expands the notions set forth by classical realist, constructivist, and emergent

theories of impressions. Each take a different site in the dyad for analysis and intervention, the Other for classical realist, the Person for constructivist, and interaction for emergent. Here, the analysis shows a synthesis of classical realist and constructivist, accounting for aspects of both the person and the other. (Given that there is no interaction between the Person and Other, emergent could not be considered.)

4.5.2 System-managed cues do not predict action

Previous work on concepts represented by system-managed cues (distance, availability, and mutual friends) all set expectations to see some sort of effect from each in this study. Unfortunately, I was unable to detect any direct effects of any of the cues, and only found one higher order three-way interaction effect with gender, photo and number of mutual friends. This is despite the fact that, for distance in particular, participants thought that the system-managed cues were "moderately important." This suggests that while the system-managed cues add information to the profile, there may be an overwhelming strength of the effects of self-generated cues and characteristics of the individual in play.

Action in this task was operationalized as swiping left or right to express interest in future interaction. It may be that distance, availability, or mutual friends matter, but not in these first, rapid moments of response action. For example, if a Person connected and then started chatting with an Other, they may have a conversation about their mutual friends and use that interaction to inform later decisions. Relatedly, if the Person is only concerned about coordinating a date for later in the week, he or she could interpret the availability and/or the distance of the Other as easily overcome as context changes (i.e. given the opportunity to coordinate, neither of these

things become prohibitive in their interaction). In this way, these cues may have effects that the Person "puts aside" until after the chat is enabled.

The fact that LBSA use is a significant predictor of action speaks to this issue directly. The probability of swiping right on a profile, controlling for everything else, increased by a factor of 1.621 when moving from people who had never used LBSAs before to those who had. This suggests that there is something inherent in the process of LBSA use that shapes the ways in which people read these profiles and respond to them. Because this first action is one of several that need to align in order for an in-person encounter to occur, it could be that LBSA users "cast a wider net," knowing that not all Others will also swipe right on them, and that not all mutual right swipes will result in a "match."

4.5.3 Open questions

While this task finds a relationship between cues and action, this relationship may still be mediated by dimensions of impression. In other words, action may be "cue-based," "impression-based," or a mix of the two. As stated above, previous research provided opportunity to explore a theoretical model relating cues, impressions, and action together. This task isolated the relationship between cues and action, but running another task relating all three together could demonstrate that cues do not have a direct effect on action but rather an indirect effect. For example, people who are physically attractive and have more mutual friends may be considered more likeable, which would in turn result in action. Study task 2 takes up this line of thinking directly.

5 Task 2 – The "How" of Cues and Action

5.1 Overview

Whereas Task 1 tested whether or not cues predict action, Task 2 examines these cues and action as part of process that includes dimensions of impressions. These dimensions of impression may mediate the relationship between cues and action, so that cues' effects on action is indirect, through impression. Task 2 therefore assumes a potential system of relationships among these three variables. Whereas previous research has attended to relating cues and dimensions of impression, as well as cues and relationship initiation (see Chapter 3). Task 2 synthesizes this work by putting it in conversation with each other and examining the potential of impression formation as a *process*. The overarching question guiding this task in the study then is:

RQ2. How do cues, self- and system-managed, affect impression formation?

5.2 Method

To explore the role of cues in impression formation, a second task of complementary between subject studies was designed, one for each of the cues: 2 (*distance*: near, far) × 2 (*physical attractiveness*: moderate, high); 2 (*availability*: online now, online recently) × 2 (*physical attractiveness*: moderate, high); and 2 (*mutual friends*[4]: none, some) × 2 (*physical*

[4] For the second task, the levels of mutual friends were reduced from three to two. This decision was made for two reasons: (1) because it was more important in part two to determine how the presence of any mutual friends may affect impressions and action than to see if this changes across different levels; and (2) to keep the studies balance for the same amount of participants in each cell across the set of three for standard counterbalancing.

attractiveness: moderate, high). Each profile displayed only one system-managed cue (and, obviously, one level of physical attractiveness), in order to isolate the different levels and conditions (notably, the photo physical attractiveness condition was between participants so each participant saw the level of photo physical attractiveness across the three profiles).

With 96 total participants (48 female), each cell of each of the 2 × 2 (distance, availability, and friends × physical attractiveness) profile studies has 12 participants (12 participants * 4 conditions * 2 genders = 96). The ordering of the profile assessments was again completely counter-balanced in a Latin Square to control for ordering effects, with again two participants seeing each order. Data for this part is between subjects, as each participant only saw one condition for each type of profile.

5.2.1 Participants

The participants for Task 2 were the same as those in Task 1.

5.2.2 Procedure

Participants, after completing Task 1, were directed to a survey on the desktop inside the study room. Participants were instructed to enter information from the card they randomly selected at the beginning of the study, their participant ID and survey group number, as well as their gender. The survey then loaded the corresponding configuration of the Latin Square for Task 2 and the participant continued through the survey. The first three pages of the survey make up what is referred to was Task 2, with each page containing a profile. Participants viewed the three additional profiles and completed four survey inventories, perceived likeability,

background homophily, attitude homophily, and interpersonal physical attraction, and the outcome measure for each (Jones et al., 2004; L. McCroskey et al., 2006).

After completing Task 2, the participants continue on to complete manipulation checks, a few additional personal survey inventories (used as covariates in analyses), and some demographic questions.

5.2.3 Mediators

For each of the three profiles in the Task 2, participants were asked to complete four dimensions of impression, or what will become the mediators in analysis: three interpersonal attraction inventories, (1) background and (2) attitude homophily and (3) physical attractiveness (L. McCroskey et al., 2006), and perceived likeability (Jones et al., 2004).

5.2.3.1 Background Homophily

To capture perceived background homophily between the Person and Other, McCroskey and colleagues' (2006) 10-item background homophily measure was administered (see Table 5-1). Participants responded to statements about similarities and differences between the profile owner, such as "This person's background is similar to mine," and "This person's life as a child was similar to mine," using a 7-point bi-polar scale (1 "strongly disagree" to 7 "strongly agree"). The 10-items were reliable across each profile, so the ten items were collapsed to a single average. This means there were three background homophily measures, one for each profile shown.

Table 5-1 Descriptive statistics and reliability of background homophily by cue.

Background Homophily					
Cue	Min	Max	M	SD	α
Distance	1	6	3.58	1	.90
Availability	1	6	3.86	.97	.89
Friends	1	6.3	3.78	.99	.90

5.2.3.2 Attitude Homophily

Whereas background puts emphasis on the conditions and environment being similar, attitude homophily focuses on behaviors, perspectives, and attitudes (L. McCroskey et al., 2006). Participants answered the 15-item attitude homophily measure (see Table 5-2), responding as above using a 7-point bi-polar scale in responses to statements such as: "This person treats people like I do"; and "This person expresses attitudes that are different than mine". The items for the measure had strong reliability and so an average of the 15 items was taken of each administration, one for each profile.

Table 5-2 Descriptive statistics and reliability of attitude homophily by cue.

Attitude Homophily					
Cue	Min	Max	M	SD	α
Distance	1.8	5.27	3.46	.77	.94
Availability	1.0	6.0	3.76	.9	.96
Friends	1.8	6.0	3.52	.85	.95

5.2.3.3 Physical Attractiveness

Rounding out the attraction measures, and directly related to evaluating the self-generated cue of the photo, participants were tasked with answering the 12-item interpersonal physical attraction measure (see Table 5-3) (L. McCroskey et al., 2006). Participants responded to statements such as, "He/She is not physically attractive", "He/She is sexy looking", and marked their agreement/disagreement using the same bi-polar 7-point scale. As above, given the strong reliabilities, an average of the items was taken for each of the three profiles.

Table 5-3 Descriptive statistics and reliability of physical attractiveness by cue.

Physical Attractiveness					
Cue	Min	Max	M	SD	α
Distance	1.5	7	4.61	1.28	.97
Availability	1	7	4.66	1.32	.97
Friends	1.92	6.92	4.67	1.29	.97

5.2.3.4 Perceived Likeability

Participants completed a perceived likeability scale that was adapted from Jones et al.'s 6-item scale (see Table 5-4) (2004). The inventory was originally formatted as responses to questions (e.g. "How friendly do you think this person is?"), with 11-point unipolar responses (e.g. "1 = *not at all friendly* to 11 = *very friendly*"). The questions were recast as statements (e.g. "This person is friendly") and responses rescaled to a bi-polar 7-point, strongly disagree to strongly agree format. This decision was made to reduce cognitive load on the participants

moving across inventories of the survey, by keeping item response formats similar. The items proved reliable in this format, so an average was taken of the six-items for each of the profiles.

Table 5-4 Descriptive statistics and reliability of perceived likeability by cue.

Perceived Likeability					
Cue	Min	Max	M	SD	α
Distance	2.17	6.5	4.36	.9	.85
Availability	3	7	4.9	.74	.79
Friends	1.83	6.5	4.53	.81	.81

5.2.4 Outcome Measure

The final outcome measure for each profile was, as before, action: swiping right or left on the given profile to express interest, or lackthereof, in future interaction. Across all the profiles in a given cue, about half of them received a left swipe and half received a right swipe (see Table 5-5). This breakdown helps in modeling so that there is variance that may be accounted for as parameters as added.

Table 5-5 Counts of left and right swipe action for profiles in survey

Action		
Profile Cue	Left	Right
Distance	46	50
Availability	47	49
Friends	50	46

5.2.5 Covariates

In addition to the dimensions of impression measures from above, I collected six covariates: gender, attitude towards sex, previous LBSA use, self-perceived mate success, openness to relationship, openness towards casual encounters, and agreeableness. Each of these covariates were reported on in Section 4.3.4.

5.2.6 Manipulation and Stimuli Checks

The manipulation and stimuli checks were the same as those used in Task 1. Enrollment continued until a balanced set of 96 participants performed better than chance across the set of manipulation checks (with none failing any set of manipulation check questions broken down by cue) and did not recognize any of the people in the photos used in the study. I use data from these 96 participants in the following analyses.

5.2.7 Analyses

The data from Task 2 was analyzed using conditional process modeling. In this type of analysis, a set of models is run at the same time to identify potential relationships among parameters within a process. For these analyses, following evolutionary psychology, I assume that the physical attractiveness (or self-generated cue) is the primary cue (X) and impression based action, or swiping, is the outcome measure (Y). The relationship between X and Y is mediated by various dimensions of impression (M1-4) and the relationship between physical attractiveness and dimensions of impression may be moderated by system-managed cues (W).

As each of the three profiles only displayed one system-managed cue in order to isolate its effects, I ran three sets of models. For each set of models, I began with the photo (X), the

system-managed cue (W), the dimensions of impression (M1-4), and the swipe direction (Y), with gender (C) as the single covariate. Using a forward hierarchical approach, I then added the remaining six covariates to run a second model for each of the three system generated cues. As results were pretty consistent, I emphasize reporting on the second, more complex model for each cue.

These models consist of moderated mediation analysis conducted using ordinary least squares path analyses, examining how cues, self- and system-, indirectly influence expressing interest through their effects on dimensions of impression. It is important to note at the outset the limitation of modeling in this manner given the particularity of these data. Commonly process modeling is carried out with data wherein the mediators and the outcome variable are of the same type, continuous. In the case of this study, the mediators are continuous, but the outcome is binary. There is currently no better alternative for modeling, but the limitations of ordinary least square regression on binary outcomes, especially within a process model, means that reporting must adjust. Instead of reporting as in Task 2, with specific increases or decreases in probabilities and predicted probabilities, reporting here focuses on the path. More central than the specific values of the coefficients are their sign (positive for increasing, negative for decreasing), and whether or not they are significant. The emphasize of the analysis is on exploring and tracing pathways through the system of relationships.

5.3 Results

5.3.1 Distance

From the moderated mediation analysis, the photo manipulation indirectly influenced expressing interest in future interaction through its effects on interpersonal physical attractiveness. As Figure 5-1 and Table 5-6 show, participants who were shown a profile with a photo of high attractiveness reported higher physical attractiveness on the interpersonal attraction measure (a_{31} = .932) than those who were shown a profile with a photo of moderate attractiveness. Participants who perceived a high physical attractiveness of profile using the interpersonal attraction scale were more likely to express interest in future interaction (b_4 = 3.127). A bias-corrected bootstrap confidence interval for the conditional indirect effect based on 10,000 bootstrap samples was not entirely above zero when distance was near (2.913 with 95% bootstrapped CI's [-.075, 7.133]) but was entirely above zero when distance was far (4.688 with 95% bootstrapped CI's [1.775, 9.968]). A comparison of the conditional indirect effects of photo on expressed interest through its effect on physical attractiveness under levels of distance near and far showed no difference (1.775 with 95% bootstrapped CI's [-2.306, 7.380]). I therefore conclude that despite its significant effects under the *far* condition, distance has no salient direct or indirect effects within the conditional process model. There was no evidence that the photo manipulation influenced expressing interest in future interaction outside of its effects on the physical attractiveness scale (c= .290, p = .701).

In addition to the indirect effect that can be traced from photo to action through physical attractiveness, there are also effects of covariates on dimensions of impression. Male participants found profiles to be less likeable (a_4 = -.920, p < .05); participants who were more interested in serious relationships also found profiles to be less likeable (a_9 = -.182, p < .05). In a similar vein,

as agreeableness increased, perceived levels of background homophily decreased (a_{26} = -.328, p < .05). None of these effects, however, led to indirect effects on action.

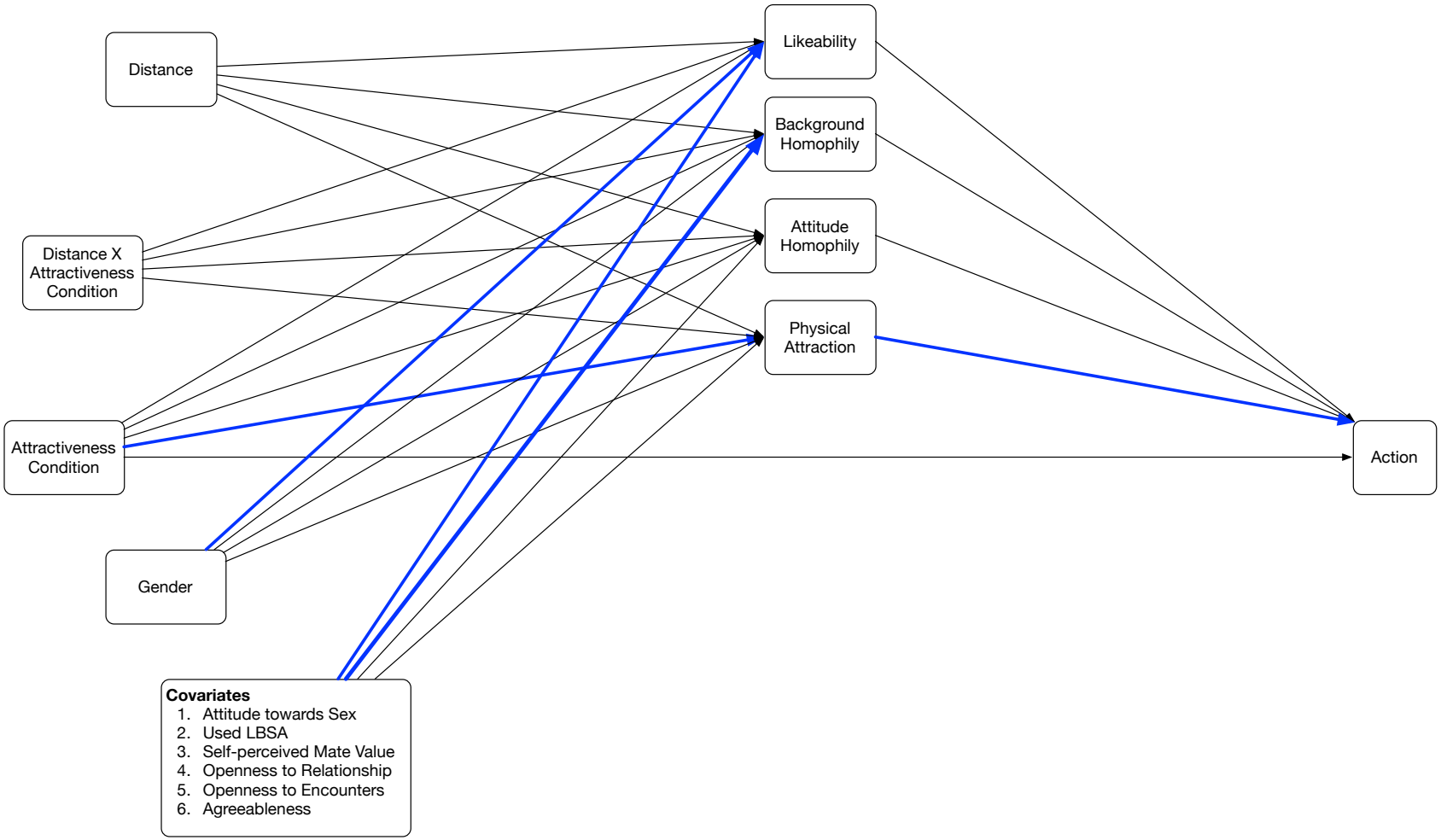


Figure 5-1 Theoretical model of attractiveness, gender, distance, covariates, dimensions of impression and action. Significant pathways are emphasized in blue.

Table 5-6 Conditional process model of attractiveness, gender, distance, covariates, dimensions of impression and action

		Likeability				Attitude Homophily				Background Homophily				Physical Attractiveness				Swipe Right		
		Coeff.	SE	P		Coeff.	SE	P		Coeff.	SE	P		Coeff.	SE	P		Coeff.	SE.	P
Photo	a_1	-0.060	0.219	0.787	a_{11}	0.077	0.236	0.743	a_{21}	-0.099	0.307	0.749	a_{31}	0.932	0.324	0.005	c	0.290	0.756	0.701
Distance	a_2	0.063	0.212	0.767	a_{12}	-0.108	0.228	0.636	a_{22}	-0.386	0.297	0.197	a_{32}	-0.352	0.314	0.265		—	—	—
Distance × Attractive	a_3	0.115	0.298	0.702	a_{13}	0.013	0.320	0.968	a_{23}	0.494	0.418	0.240	a_{33}	0.568	0.441	0.202		—	—	—
Male	a_4	-0.920	0.167	0.000	a_{14}	-0.231	0.179	0.200	a_{24}	0.134	0.233	0.566	a_{34}	0.353	0.246	0.155		—	—	—
Likeability		—	—	—		—	—	—		—	—	—		—	—	—	b_1	-0.251	0.485	0.605
Attitude Homophily		—	—	—		—	—	—		—	—	—		—	—	—	b_2	0.653	0.713	0.359
Background Homophily		—	—	—		—	—	—		—	—	—		—	—	—	b_3	0.364	0.552	0.510
Physical Attraction		—	—	—		—	—	—		—	—	—		—	—	—	b_4	3.127	0.751	0.000
Used LBSA	a_5	0.040	0.163	0.807	a_{15}	-0.029	0.175	0.867	a_{25}	-0.078	0.228	0.734	a_{35}	-0.282	0.241	0.245		—	—	—
Agreeableness	a_6	0.061	0.104	0.560	a_{16}	0.058	0.112	0.604	a_{26}	-0.328	0.146	0.027	a_{36}	-0.017	0.154	0.912		—	—	—
Mating Success	a_7	-0.143	0.076	0.063	a_{17}	-0.080	0.082	0.331	a_{27}	-0.062	0.107	0.561	a_{37}	-0.192	0.113	0.093		—	—	—
Openness to Sex	a_8	-0.073	0.055	0.193	a_{18}	-0.095	0.060	0.113	a_{28}	0.006	0.078	0.940	a_{38}	-0.046	0.082	0.576		—	—	—
Relationship Seeking	a_9	-0.182	0.081	0.028	a_{19}	-0.073	0.088	0.401	a_{29}	0.084	0.114	0.466	a_{39}	0.148	0.120	0.223		—	—	—
Casual Encounter Seeking	a_{10}	-0.079	0.079	0.322	a_{20}	0.077	0.085	0.370	a_{30}	0.016	0.111	0.886	a_{40}	0.193	0.117	0.103		—	—	—
Intercept	i_1	6.762	0.798	0.000	i_2	4.134	0.858	0.000	i_3	4.963	1.118	0.000	i_4	3.564	1.181	0.003	i_5	-17.384	4.885	0.000
		R^2= .429				R^2= .107				R^2= .102				R^2= .392				*Pseudo* R^2 = .617		
		$F(10,85) = 6.394$, p < .001				$F(10,85) = 1.018$, p > .10				$F(10,85) = .960$, p > .10				$F(10,85) = 5.489$, p < .001				*-2LL* = 50.918		

5.3.2 Availability

Figure 5-2 and Table 5-7 report the results for a second moderated mediation analysis, which again shows that the photo manipulation indirectly influenced expressing interest in future interaction through its effects on interpersonal physical attraction. Participants shown a photo of moderate attractiveness reported lower physical attraction than those who were shown a photo of high attractiveness ($a_{31} = 1.008$). As perceived physical attractiveness increased, so too did the participants likelihood of expressing interest in future interaction ($b_4 = 2.131$). Unlike the process model run for distance, this model definitively shows no conditional indirect effect of availability on physical attractiveness (-.129 with 95% bootstrapped CI's [-2.604, 2.366]) using a bias-corrected bootstrap confidence interval based on 10,000 bootstrap samples. There was no evidence of a direct effect of the photo on expressing future interaction ($c = 1.108, p = .108$), meaning that its effects were mediated by the physical attractiveness measure along the indirect path.

Covariates also had significant effects on some of the dimensions of impression. As interest in casual encounters increases, so too does perceived attitude homophily ($a_{19} = .270, p < .05$); attitude homophily does not, however, have an effect on action. For physical attractiveness, in addition to the photo having an effect, so too does gender, with males perceiving a higher level of physical attractiveness than females ($a_{34} = .736, p < .05$). In this way, gender plays a role in the indirect effect of photo on action through interpersonal physical attraction.

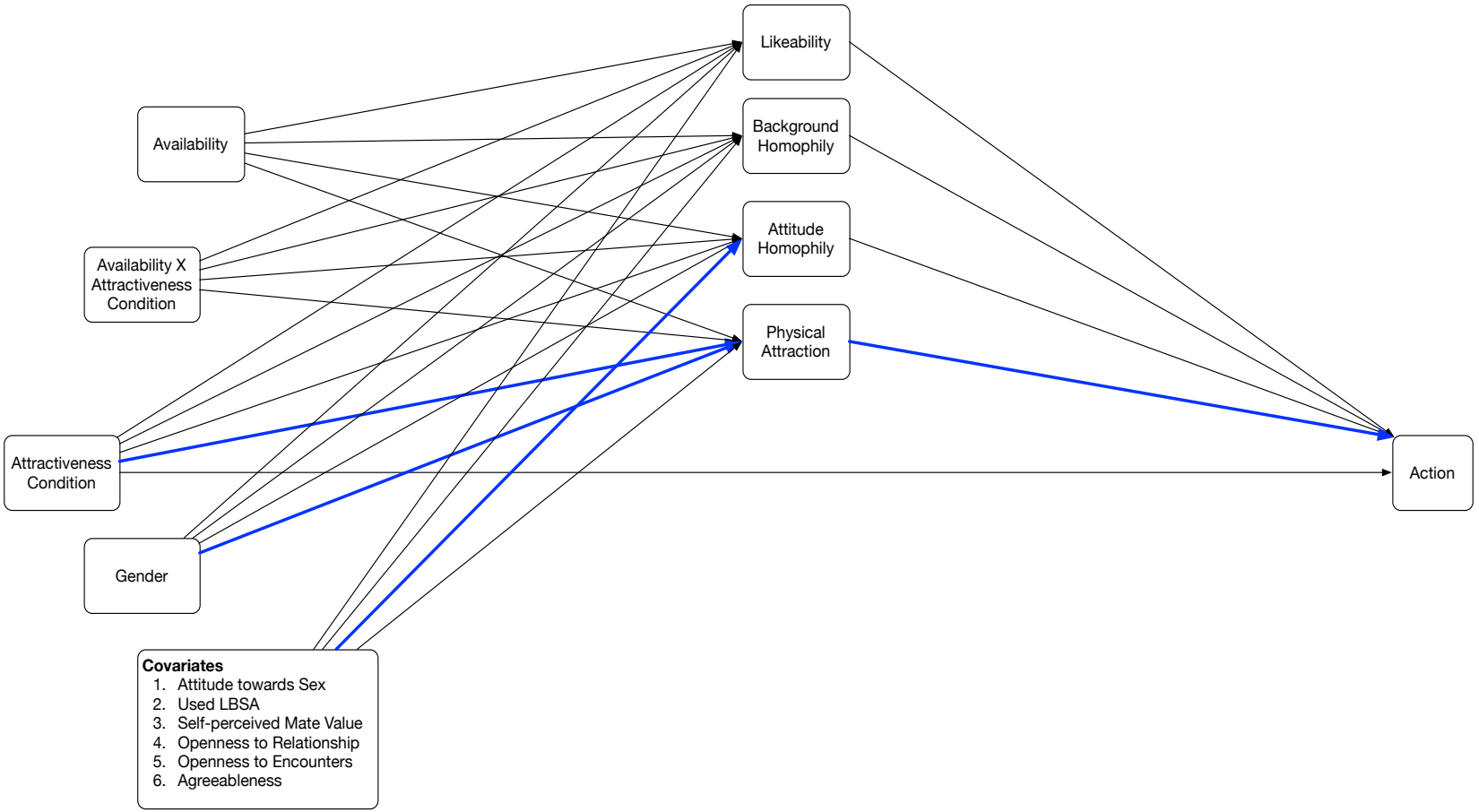


Figure 5-2 Theoretical model of attractiveness, gender, availability, covariates, dimensions of impression and action. Significant pathways are emphasized in blue.

Table 5-7 Conditional process model of attractiveness, gender, availability, covariates, dimensions of impression and action

		Likeability				Attitude Homophily				Background Homophily				Physical Attractiveness				Swipe Right		
		Coeff.	SE	P		Coeff.	SE	P		Coeff.	SE	P		Coeff.	SE	P		Coeff.	SE.	P
High Attractive	a_1	-0.032	0.221	0.884	a_{11}	0.131	0.250	0.601	a_{21}	-0.161	0.283	0.570	a_{31}	1.008	0.346	0.005	c	1.108	0.689	0.108
Availability	a_2	-0.097	0.225	0.667	a_{12}	0.047	0.254	0.854	a_{22}	-0.014	0.287	0.961	a_{32}	-0.095	0.352	0.788		—	—	—
Availability × Attractive	a_3	-0.002	0.316	0.996	a_{13}	-0.139	0.357	0.699	a_{23}	-0.161	0.404	0.691	a_{33}	-0.061	0.495	0.903		—	—	—
Male	a_4	0.226	0.177	0.204	a_{14}	0.324	0.199	0.108	a_{24}	0.411	0.226	0.072	a_{34}	0.736	0.276	0.009		—	—	—
Likeability		—	—	—		—	—	—		—	—	—		—	—	—	b_1	-0.171	0.543	0.753
Attitude Homophily		—	—	—		—	—	—		—	—	—		—	—	—	b_2	0.523	0.582	0.369
Background Homophily		—	—	—		—	—	—		—	—	—		—	—	—	b_3	0.626	0.506	0.216
Physical Attraction		—	—	—		—	—	—		—	—	—		—	—	—	b_4	2.131	0.544	0.000
Aggreableness	a_5	0.118	0.110	0.288	a_{15}	-0.149	0.125	0.236	a_{25}	-0.205	0.141	0.150	a_{35}	-0.241	0.173	0.167		—	—	—
Mating Success	a_6	-0.011	0.081	0.896	a_{16}	-0.045	0.091	0.624	a_{26}	-0.043	0.103	0.675	a_{36}	-0.092	0.126	0.470		—	—	—
Openness to Sex	a_7	-0.068	0.059	0.252	a_{17}	-0.059	0.066	0.377	a_{27}	0.010	0.075	0.893	a_{37}	-0.107	0.092	0.248		—	—	—
Relationship Seeking	a_8	-0.022	0.086	0.796	a_{18}	0.155	0.098	0.116	a_{28}	0.001	0.110	0.994	a_{38}	0.038	0.135	0.779		—	—	—
Casual Encounter Seeking	a_9	-0.027	0.084	0.750	a_{19}	0.270	0.095	0.006	a_{29}	-0.035	0.107	0.743	a_{39}	-0.127	0.131	0.335		—	—	—
Used LBSA	a_{10}	-0.114	0.173	0.510	a_{20}	-0.169	0.195	0.389	a_{30}	-0.070	0.221	0.753	a_{40}	-0.204	0.270	0.453		—	—	—
Intercept	i_1	4.913	0.871	0.000	i_2	1.281	0.983	0.196	i_3	4.641	1.112	0.000	i_4	2.854	1.362	0.039	i_5	-14.253	3.737	0.000
		R^2= .066				R^2= .188				R^2= .108				R^2= .281				*Pseudo* R^2 = .541		
		$F(10,85) = .597, p > .10$				$F(10,85) = 1.969, p > .10$				$F(10,85) = 1.034, p > .10$				$F(10,85) = 3.324, p < .05$				*-2LL* = 61.032		

5.3.3 Number of Mutual Friends

Finally, in examining the potential role of number of mutual friends in impression formation, I ran a final moderated mediation analysis. This analysis, reported in Figure 5-3 and Table 5-8, again shows, as above, that the photo manipulation indirectly influenced expressing interest in future interaction through its effects on interpersonal physical attraction. Participants shown a photo of high attractiveness reported higher interpersonal physical attraction than those shown a photo of moderate attractiveness ($a_{31} = 1.012$); this in turn affected the likelihood of expressing interest in future interaction ($b_4 = 2.420$). As with availability, a bias-corrected bootstrap confidence interval for the manipulation of number of mutual friends shows no significant difference between having no mutual friends and having some on interpersonal physical attraction (.324 with 95% bootstrapped CI's [-2.297, 2.875]). As in the previous two analyses, the photo manipulation showed no evidence of effect beyond the indirect path through interpersonal physical attraction, meaning no direct effect was found ($c = -.532, p = .445$).

Both covariates and dimensions of impression have effects in the process model in addition to the indirect path of photos. As above in the model with availability, gender has an effect on physical attractiveness, with men rating women of higher physical attractiveness than women rating men ($a_{34} = .746, p < .05$). Self-perceived mate value also has an effect on physical attractiveness, as self-perceived mate value increases, the perceived physical attractiveness of the profile decreases ($a = -.234, p < .05$); similarly, participants who have used LBSAs before also rated profiles less physically attractive than those who have not used LBSAs ($a = -.550, p < .05$). There are two other effects of partial indirect paths on action beyond the indirect path of photo

through physical attractiveness: as likeability increases, the probability of swiping right decreases (-1.310, $p < .05$); as attitude homophily increases, the probably of swiping right increases (1.960, $p < .05$).

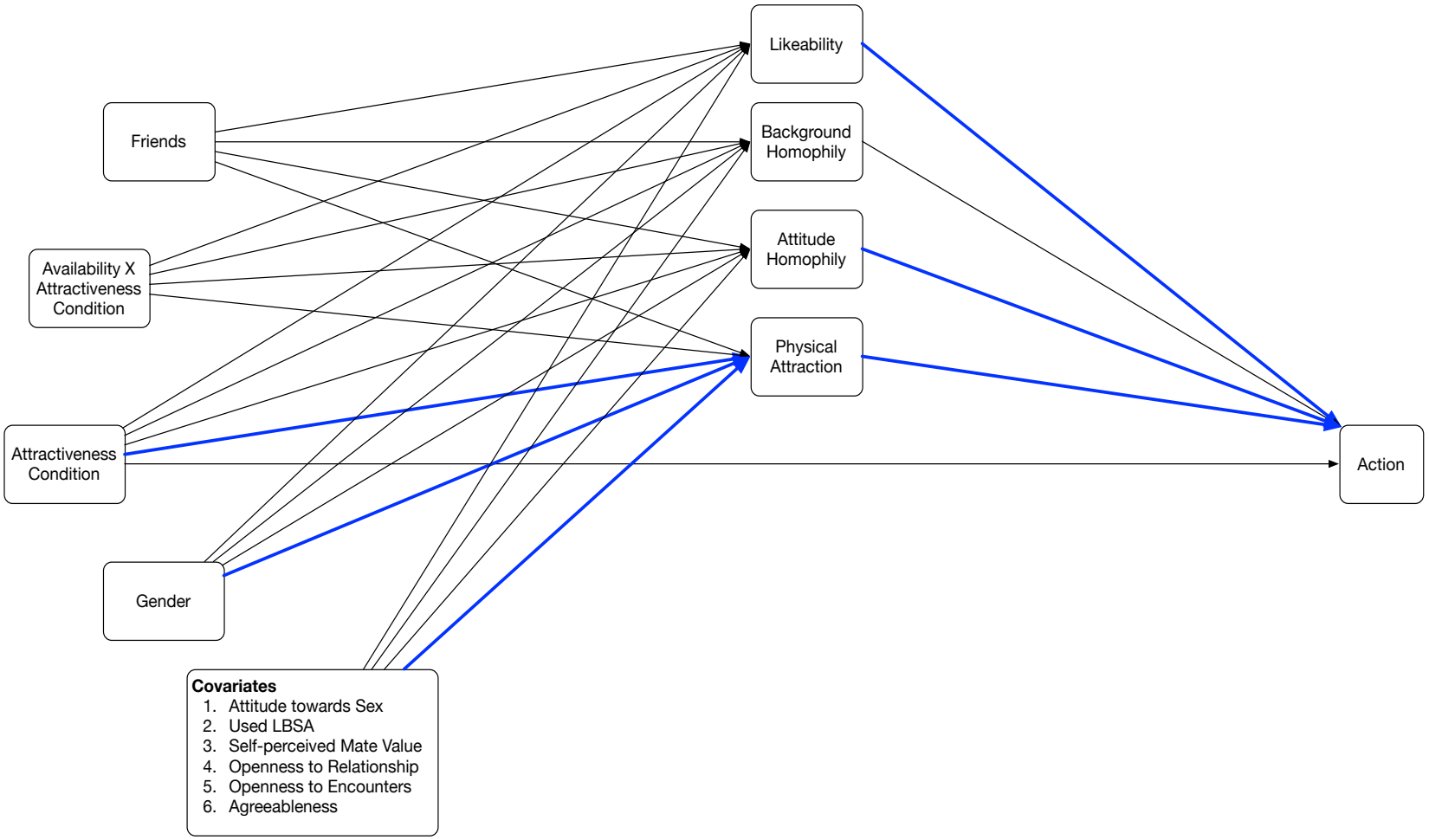


Figure 5-3 Theoretical model of attractiveness, gender, mutual friends, covariates, dimensions of impression and action. Significant pathways are emphasized in blue.

Table 5-8 Conditional process model of attractiveness, gender, mutual friends, covariates, dimensions of impression and action

		Likeability				Attitude Homophily				Background Homophily				Physical Attractiveness				Swipe Right		
		Coeff.	SE	P		Coeff.	SE	P		Coeff.	SE	P		Coeff.	SE	P		Coeff.	SE.	P
High Attractive	a_1	0.036	0.244	0.884	a_{11}	-0.030	0.251	0.906	a_{21}	0.074	0.300	0.805	a_{31}	1.012	0.316	0.002	c	-0.532	0.696	0.445
Friends	a_2	-0.037	0.236	0.875	a_{12}	-0.131	0.242	0.590	a_{22}	-0.091	0.290	0.753	a_{32}	0.151	0.306	0.622		—	—	—
Friends × Attractive	a_3	0.164	0.332	0.623	a_{13}	0.413	0.341	0.229	a_{23}	0.300	0.408	0.464	a_{33}	0.134	0.430	0.757		—	—	—
Male	a_4	0.223	0.185	0.232	a_{14}	0.351	0.190	0.069	a_{24}	0.343	0.228	0.135	a_{34}	0.747	0.240	0.003		—	—	—
Likeability		—	—	—		—	—	—		—	—	—		—	—	—	b_1	-1.310	0.667	0.050
Attitude Homophily		—	—	—		—	—	—		—	—	—		—	—	—	b_2	1.960	0.777	0.012
Background Homophily		—	—	—		—	—	—		—	—	—		—	—	—	b_3	-0.648	0.470	0.169
Physical Attraction		—	—	—		—	—	—		—	—	—		—	—	—	b_4	2.420	0.560	0.000
Used LBSA	a_5	-0.009	0.116	0.939	a_{15}	-0.102	0.119	0.394	a_{25}	-0.266	0.142	0.065	a_{35}	0.046	0.150	0.759		—	—	—
Agreeableness	a_6	-0.026	0.085	0.758	a_{16}	-0.054	0.087	0.536	a_{26}	-0.091	0.104	0.383	a_{36}	-0.234	0.110	0.037		—	—	—
Mating Success	a_7	-0.088	0.062	0.156	a_{17}	-0.070	0.063	0.273	a_{27}	0.022	0.076	0.772	a_{37}	-0.016	0.080	0.840		—	—	—
Openness to Sex	a_8	0.045	0.091	0.620	a_{18}	0.105	0.093	0.264	a_{28}	-0.086	0.111	0.445	a_{38}	-0.044	0.118	0.709		—	—	—
Relationship Seeking	a_9	-0.025	0.088	0.778	a_{19}	0.136	0.090	0.135	a_{29}	-0.035	0.108	0.750	a_{39}	0.113	0.114	0.327		—	—	—
Casual Encounter Seeking	a_{10}	-0.340	0.181	0.064	a_{20}	-0.289	0.186	0.124	a_{30}	-0.018	0.223	0.938	a_{40}	-0.550	0.235	0.022		—	—	—
Intercept	i_1	4.942	0.888	0.000	i_2	3.297	0.912	0.001	i_3	5.780	1.091	0.000	i_4	4.585	1.152	0.000	i_5	10.204	2.710	0.000
		R^2= .139				R^2= .173				R^2= .132				R^2= .425				*Pseudo* R^2= .542		
		$F(10,85) = 1.371, p > .10$				$F(10,85) = 1.778, p < .10$				$F(10,85) = 1.290, p > .10$				$F(10,85) = 6.287, p < .001$				*-2LL* = 60.914		

5.4 Discussion

The findings from this task offer two main points for discussion on impression formation considered as a process: that action is based on impressions, which are predicted by self-generated cues; and that no effect of system-managed cues was found, despite previous work that would suggest effects.

5.4.1 Action is based on impressions

Task 2 was conducted in order to test a system of relationships among cues, impressions, and action. Task 1 isolated the relationship between cues and action and found that cues and covariates predict action. Task 2 decomposes this relationship by introducing dimensions of impression as mediators for the predictive effects of cues. As the results show, the effects of cues on action on impression are indirect rather than direct. This means that actions appear to be based on impressions rather than cues themselves.

This distinction opens up possibilities around design and research for impression formation. Effectively, the new questions become which dimensions of impression affect action, and which cues affect those dimensions. In the context of LBSAs, this relationship appears dominated by photo and interpersonal physical attractiveness, but the self-generated cues and dimensions of impression taken up in this study are not exhaustive. Additionally, other contexts could support different cues and action could be driven by other dimensions of impression: for social spaces, this could be driven by interpersonal social attractiveness affected by number of mutual friends; for professional spaces, this could include interpersonal task attractiveness, driven by some other cue.

5.4.2 No effects of system-managed cues detected

This overall study was designed to explore what role system-managed cues play in the impression formation process. Operating under the assumption that the primary cues within impression formation are self-generated, and that system-managed cues are supplemental information and weighted accordingly by the person making decisions about the other, the analysis did not detect any effects of the system-managed cues. This lack of finding is especially pronounced given that the system-managed cues were pulled out and isolated in three separate studies, effectively increasing the likelihood that there would be an effect given the dearth of cues present on a given profile. Still, it could be a limitation of the study design, with cues affecting dimensions of impression that were not measured.

If, it turns out, that self-generated cues really are what is driving action through impression, further studies should be conducted to explore the variety of self-generated cues supported by LBSAs (or, alternatively, self-generated cues on other types of platforms). It may not be that system-managed cues interact as moderators with photo, but they may instead interact with other self-generated cues such as an "about me". For example, if an "about me" includes information about being up for NSA sex, then depending on context of the person looking at the profile, the availability and distance could certainly interact with that cue: if someone is looking for a hookup now, being near and available both in the sense of online and in the sense of also interested in sex, could drive action for connecting those two.

6 Discussion and Conclusion

6.1 Discussion

Study Task 1 was designed to explore the relationships among cues and action; Study Task 2 was designed to explore the relationships of cues, impressions, and action within impression formation. Considering the results of these two tasks together, I offer both practical implications, which speak to the design of these systems, and theoretical implications, which speak to impression formation as a research topic more broadly.

6.1.1 Practical Implications

The popularity of LBSAs has continued to grow over the past five years (Bumble, 2016; Grindr LLC, 2015; Hinge, 2016; Tinder, 2016). This popularity suggests that people will continue to use these apps and that similar, new apps will continue to come to market. Given this, the findings from this study have several practical implications for design of these systems, including considerations for both the end user and the product teams.

6.1.1.1 Delay of cue utilization

This study examined the role of various types of cues in predicting expression of interest in future interaction. Cue utilization refers to whether or not someone perceives and takes into account a given cue when forming an impression of another individual. Upon reflection, this may have been too blunt of an approach for the way in which cue utilization unfolds through time in reciprocity-based LBSAs, as there are multiple, iterative moments during which cue utilization may take place.

The study operated under the assumption that when presented with a whole set of cues, participants would utilize the set in forming an impression. From the results, we see clearly that photo attractiveness was utilized, but that the other, system-managed cues, had no detectable effect. This suggests a potential alternative to the assumption of how impression formation works on these platforms. Instead of an initial, all-encompassing mediated first encounter through the profile, impression formation may be an iterative process in which people utilize cues across various moments of interaction. Teasing apart the moments of decision making within the interaction design of these applications, a user must: (1) decide which direction to swipe on a profile; (2) wait to see if it generates a match (either in the moment or later if/when the other person swipes right on him/her); (3) decide whether or not to initiate conversation; (4) decide what to talk about; (5) determine whether or not to meet up and coordinate where and when; and (6) finally meet in person. Across this set of moments, cues may come into play at different moments along the way.

This study detected no effect of distance, availability, and mutual friends on the initial decision of whether to swipe right or left on the profile. This does not necessarily mean that no effect exists during that decision (see Limitations), but the study design also does include these later moments of interactions during which these cues may prove effective. It may be the case that availability does not matter in the moment, per se, but at some point availability will matter if the emergent relationship is ever to go anywhere. Similarly, mutual friends may not matter during the initial moment of swiping, but as interaction continues, mutual friends may have eventual effects on the pair. Finally, distance as represented in these applications is mutable, as it

represents the distance between the pair in the moment of profile viewing. As people move about in the world, this distance could increase, decrease, or remain the same. The significance of distance in the initial moment of swiping may be low, but when eventually coordinating meeting face to face or determining whether or not to continue the relationship, distance has the potential to become insurmountable.

As a practical design implication, the lack of effects shown here point to a need to better understand the process and flow of users through a matching sequence, from viewing profiles to meeting up in person. Studying the different moments inside this process could illuminate the utility, or lack thereof, of different types of cues. Determining user needs across processes, and not just at the start of them, will lead to better design and support for interaction among users.

6.1.1.2 Redesign the current cues

The experimental app used in this study was designed in the style of swipe-based LBSAs. As such, the style and design of the cards, including layout, iconography, and relative sizes among the cues present, was bootstrapped from those apps. While the participants seem to register the system-managed cues, given the results of the manipulation checks, those cues did not have effects, direct or indirect, on expressing interest in future interaction with people. This could be attributable to the manipulation size: perhaps if more emphasis was put on the system-managed cue in the design, it could be that the cues would in turn have direct or indirect effects on expressed interest in future interaction. Of course, as the manipulation size increases, ecological validity decreases and the effects and findings become less significant (Abelson, 1995).

There are design alternatives to the ways in which current cues are represented and experienced on LBSAs. Instead of altering location and size of a given cue within a *card*, one could design a more relative approach around a given cue across *cards*. For example, distance and number of mutual friends could be used to sort cards before the app displays them to users. This shift would essentially put a stronger emphasis on relating profile cards to one another over time, as distance increases card to card or number of mutual friends decreases card to card, making cue utilization relative instead of absolute. Users may be more or less likely to express interest in individuals if the cards are pre-sorted with regard to a particular cue.

6.1.1.3 Replace current cues for others

Swipe-gesture LBSAs typically put new users through a validation process through another app such as Facebook. This authentication process serves two central functions. From the app and design perspective, it allows these apps to access a wealth of data, including name, age, education, friend network, et cetera: from a user perspective, this makes for a less tedious on-boarding process, but also a reassurance that other users have been authenticated in the same way. It is through this process that these apps may show some of the cues on the profile cards, including mutual friends. As this study has shown, the three most common system-managed cues have no direct or indirect effects on action. These cues, however, only represent a fraction of what cues are available from user data repositories such as Facebook.

Alternative cues may be explored to affect expressing interest in others. In addition to the three cues used in this study, data from Facebook includes possible cues such as Page likes, interests, hometown, job, education, language(s), religion, and political views. With a simple

function, even birthdays could be converted to Zodiac signs. One can even imagine a textual analysis of all the posts someone has made on their timeline for sentiment, vocabulary size, reading level, et cetera, which could in turn be summarized and displayed to potential matches. Given the wealth of data that people, and their friends, generate about themselves on these platforms, there are boundless opportunities for product teams to explore with regard to cues present on profiles.

Of course, these cues have potential for risks. In contrast to availability, which represent the Other's current use or non-use of the app, distance, which represents a relationship between the Person and the Other, and mutual friends, which represents shared social connections, alternative cues may operate differently. For example, adding interests to profiles runs the risk of someone having a polarizing or esoteric interest that could dramatically decrease (or increase) right swipes. Religion and political views could function in a similar way as they are usually expressed as a single word (e.g. Catholic or Republican), but in practice have large gradients and several dimensions of practice (e.g. non-practicing Sunni Muslim, fiscally conservative but socially liberal utilitarian). This slipperiness is compounded by the fact that these data are generated by people in one context (e.g. Facebook), and then ported over to a different context by the systems (see 6.1.2.3).

6.1.1.4 Ethical design for intervening in a human process

LBSAs and similar systems are designed for connecting people: these connections are made, however, on a product whose monetization comes from ad revenue and premium paid features. It is not necessarily in the best interest of the product teams to design products which would

ultimately connect users who in turn would leave the app. This tension between the products function and bottom line raises questions around what to maximize and what information should be provided on the profiles when people are making decisions.

Though no direct or indirect effects of system-managed cues on action were found in the set of two tasks, one may consider the implications of having found such effects. If, for example, there was a strong main effect of showing that people were online now with expressing future interaction, how should that be accounted for in design? One possibility is to continue to show both people who are online now and offline, which would give an advantage to matching those who are both online now. (A separate question would be whether or not to communicate to people that online users receive more matches than offline users.) An alternative would be to pivot the app design a bit and only show people who are online, which would level the playing field. A third option would be to design for ambiguity (Aoki & Woodruff, 2005) and not show availability so people would not know one way or another. Any choice raises questions about what these systems are actually designing for.

When first encounters rely exclusively on self-generated cues, the outcome of such an encounter can be traced back to the individuals present, even if the encounter is mediated by a product. As product teams insert themselves as more active third parties in this process through providing additional cues, they must make design decisions that could impact this process and its outcome. Teams must carefully consider what to design for and how to measure it. For example, apps could maximize the number of right swipes or connections, but that may not maximize user satisfaction or some measure of quality of these connections. Alternatively, apps could maximize

for connections that lead to chat interaction, which may mean fewer overall connections, but more engaging ones. As product teams decide what additional information to supplement on top of the self-generated cues curated by the users, it is important to understand their position within this process.

6.1.2 Theoretical Implications

Taken together at a research and theoretical level, the two tasks of this study offer contributions in filling gaps in the literature of cues and impression formation. Whereas previous work has examined how cues have affected dimensions of impression and how dimensions of impression may predict action, this current project tests and establishes relationships among cues, impressions, and action.

6.1.2.1 Effects of self-generated cues are strong

In both tasks, the significance and the effect size of the self-generated cue, photo physical attractiveness, was very high. In fact, in Task 1, the photo was the only cue found to have a main effect; in Task 2, the photo was the only cue that had a significant indirect path, through impression of interpersonal physical attractiveness. It is not surprising that these relationships are significant, given the body of research in evolutionary psychology; it is surprising, however, that relationships among the system-managed cues were not significant, especially in light of the previous research on each of them in related contexts.

There could be several reasons for not seeing effects of system-managed cues. One plausible rationale is the dating and hookup context that these cues are operating within. We know from the manipulation checks that people were attending to the system-managed cues. The lack of

effect in task 1 suggests that people, albeit aware of the cues across the stack of cards, may not be using them to inform action. Task 2 pulls this apart further by isolating each cue and slowing down participant responses. We might assume that given more time to process, the system-managed cues may play a role, but again we do not find any significant effects. In partitioning off interaction to a later stage, people are able to defer investment and streamline action in response to photos. The easy swipe-based gesture reinforces this logic by making it easy to expressly swipe through a stack of profiles and see what connections may result. The dominance of photos in this space enables researchers to ask new questions in this space, including how would these cues operate in a scarce environment.

6.1.2.2 Impression formation includes aspects of the Other and the Person

There have been three central perspectives used in decomposing the PO dyad for study, classical realist, constructivist, and emergent. Classical realist approaches center their study on attributes and qualities of the Other (e.g. Crandall, 1994; Hatfield & Sprecher, 1986; D. Kenrick, 1994), manipulating and investigating how Others drive the impressions and actions of People. Swinging the other direction, the constructivist perspective focuses instead on how individual differences of People may drive differences in impression formation of Others (e.g. Berscheid et al., 1976; Graziano et al., 2007; Kelley et al., 2003; Lemay et al., 2007). Finally, the emergent perspective positions impression formation as an interactive process and takes up interaction as its unit of analysis, arguably accounting for both the Person and the Other in their work (e.g. Aron & Aron, 1986; Aron et al., 2006; M. Clark & Pataki, 1995; M. S. Clark & Mills, 1991).

This study puts yet another distinct emphasis on PO dyads in mediated contexts. In terms of the Other, this study accounts for the photo physical attractiveness, distance, availability, and mutual friends, all four of which are common feature of LBSAs. In terms of the Person, this study accounts for covariates such as gender, previous use of these systems, attitudes toward sex, and relational goals, all of which are arguably at play when someone is using an LBSA. As such, the study design synthesizes classical realist and constructivist approaches to impression formation. Furthermore, the LBSA context in which this study was conducted necessitated a different approach than the emergent perspective, as swipe-interaction LBSA force action before interaction.

From the results, we see that in fact that the impression formation process is affected by both attributes and qualities of the Other (notably physical attractiveness) as well as attributes and qualities of the Person (notably gender, previous use of system, and relational goals). This finding calls for more robust future research that accounts for both Person and Other in impression formation processes, particular across contexts. For example, it would be worthwhile applying this synthesized approach to a professional context such as a résumé review, as current studies of résumé review tend to focus on manipulations of the résumé only (e.g. Bertrand & Mullainathan, 2004; Dipboye, Fromkin, & Wiback, 1975; Koedel & Tyhurst, 2012; Lahey, 2008).

6.1.2.3 Cue stability across contexts

Culling data from one source and context, as LBSAs commonly do during a bootstrap on-boarding, and porting it to a new context runs risks. People communicate in consideration of the

context and audiences; moving communication acts to new audiences has potential to mess with the intended meaning and understanding of the communication act. For example, Hinge added another system-managed cue of whether or not someone was already in a relationship, shifting it over from users' Facebook profiles (Hinge, 2015). This was marketed as a response to infidelity of people on the system, and was designed to let people know they were connecting with others who were ostensibly cheating. Of course, this design response presupposes that the relationship field on Facebook operates as a ground truth. Pausing for a second to ignore possibilities of consensual non-monogamy, users also may engage in "relationships" with others who are actually just close friends ("Why do some straight girls set their Facebook page to say they are in a relationship with another girl?," 2012). Pages Likes offer another example: sometimes businesses run promotions through their pages, so liking a Page may not necessarily represent "liking" a page.

System-managed cues are therefore subject to issues of *cue stability*, or the consistency of meaning of the cue across different contexts or settings. This is perhaps especially significant for cues that systems generate from an individuals' residue, or traces of activity, on another platform or system. Communicating these traces in another context reconfigures the ways in which they may convey meaning to others. For example, Charlie may be Facebook friends with Erin but not actually interact with or know her very well; Nora, also Facebook friends with Erin and viewing Charlie's profile on an LBSA, could see this relationship and use it to inform her swiping direction. Should Nora like Erin and consequently swipe right on Charlie, Charlie is at a loss: should Nora not like Erin and consequently swipe left on Charlie, she's at a loss because Charlie

isn't close to Erin anyway. The ways in which cue stability may be retained or the ways in which it may break down, especially given the changing actors across contexts, is a rich future avenue for research in this space.

6.2 Limitations

This study is subject to the usual limitations of experimental work and research more broadly, including population sampling, the levels of manipulations, the number of participants, and the ecological validity of the procedure.

To the first point, the population sampled is not directly representative of the population of LBSA users. Northwestern University undergraduate students represent one type of user on the platform, but LBSA users range beyond just university undergrads at an elite private school in the Midwest. This fact, compounded by the app being contextually sensitive to time and place, could affect the findings. It may be the case that though distance and availability cues were not significant in this sample of the population, it may be significant in others. It could be that distance matters for someone who is more established within a specific location, and/or for someone who is later in life (i.e. a single ~30-year-old who owns a house in a specific neighborhood) rather than someone who is younger and potentially more mobile. Additionally, availability may matter to someone who is using the app under different contexts. For example, someone who uses LBSAs for casual sex in the now could be very dependent on availability and distance cues to facilitate encounters. It is, admittedly, unrealistic that experimental conditions of a lab study supported this type of use.

In novel experimental work, another common limitation is the unpredictability of sample size, or how large of a sample of the population should be run in order to detect certain size effects. Statistical power (the probability of detecting an effect), effect size, sample size, and alpha are all mathematically related and can be defined as functions of one another. In new work, the effect size of a type of manipulation and the sample size are both unknown; one can rely on guidelines or standards to input into the equations to get an estimated sample size, but in fact this number is merely a reflection of an assumption. In this project, 96 participants were run so that each order of configurations in the Latin Square was shown to 2 participants. Increasing the sample size with balanced sets so that each order was shown to 3 or 4 participants would increase the power and therefore increase the likelihood of detecting a smaller effect. It could be that system-managed cues are significant, just at a smaller effect size than photo physical attractiveness.

The levels of the manipulations offer a complementary limitation. The cues were manipulated at specific, reasonable levels that were anticipated to have an effect on outcomes. For example, distance was shown at near (between a half mile and a mile) and far (between three and five miles). Campus life at Northwestern suggests there would be a lower likelihood of students traveling more than a mile (i.e. off-campus) to connect with others. At four miles, within range of Loyola's campus, there was reason to expect that this distance would cause a decline in expressing interest, but not rule it out entirely (knowing that relationships exist between the campuses). Still, no effect of distance was detected at this distance, even though participants labeled distance as "moderately important." Further work could explore distance as a

continuous rather than categorical variable within a sample population and see at what distance decline happens. If no decline is found, it could be that expectations change around what expressing interest may mean across distance (i.e. meeting up in person vs. chatting online).

Similarly, availability was manipulated as a dichotomous categorical variable, offline and online now. No effect was found at this level of manipulation for this sample. While availability does not as easily lend itself to transformation to a continuous variable, one could imagine a different expression of availability that might have an effect. For example, if expressed as "active now", "active today", and "active one week ago", one could imagine a possible effect of decreasing probability in right swipes as length of time since last active increases. Similar to above, if no effect is found it could be that the Person is swiping indiscriminately with regard to availability because it is not a connection now that is important, but rather the possibility for a connection at some point.

Finally, there is the issue of ecological validity. Given the procedure was a controlled experiment, it involved participants coming to a location, giving consent, being handed a new system, logging on, being primed through a script, and asked to complete the task. While measures were taken to make this as smooth and familiar as possible, it is still far from the casual in situ use of these apps writ large. For example, all subjects were run between the hours of 1:00pm and 9:00pm Monday through Friday, in order to control for time of day and day of week effects. The cues that were tested in this study could have different effects on LBSAs, which people use at all times of day and all days of the week. (In fact, online articles suggest 9pm (Beres, 2016) and the first Sunday of the new year (Chatel, 2017) are the most popular and best

times to use these apps.) This limitation is perhaps further compounded by the participants own attitudes and opinions towards LBSA platform, which was not captured in the study, and their openness towards answering questions about themselves with regard to dating and sex.

Overall, each of these limitations are common in experimental work. Despite these limitations, the study still represents a strong first step in research on mediated impression formation with action before interaction. The design took steps to strengthen internal validity, including using measures with strong construct validity where/when possible, accounting for confounds through measuring covariates and open recruiting across campus, and choosing appropriate modeling methods for statistical analysis. Given this, I argue that the findings present here offer initial insight into the processes at play in these exceptionally popular applications, as well as a point of departure to deeper and further exploration into the mechanisms of impression formation.

6.3 Future Work

There are two clear points of departure from this work, one concerning the impression formation process itself, the other, cue stability of system-managed cues. This study explored impression formation processes within a particular context. As such, the design itself was based on previous research around different dimensions of impressions and situated within a context that had specific system-managed cues. Neither of these are exhaustive in their scope and it would be reasonable to expand each. For example, one could add additional dimensions of impression to explore if there are other indirect paths. Additional plausible cues such as a "bio" or "about me" could also be added to explore design potential of these systems. Finally, moving

the study to a different context, such as within social or professional networks, would help reinforce, or perhaps call into question, the impression formation process. (Of course, these other contexts would warrant their own set of cues, dimensions of impression, and outcome.)

To the second point, more work can be done investigating the integrity or stability of these cues. As above, I argued that these cues may have different meanings depending on context, and that given the limited set of cues available within LBSAs, these differences could affect impression and/or action. Facebook, for example, has been around for 13 years now, meaning that users have been able to pour years' worth of their data into the system and onto their profiles. As time passes, however, some of these data can become outdated: liked a band in college but don't listen to them anymore? moved to a new city but didn't update your current location? has your friend group shifted over the last five years? Exploring ways to question and test the ways in which cues are subject to stability or instability would deepen our understanding of what's at stake in designing and using systems that borrow from other platforms.

6.4 Conclusion

This project was designed as an investigative response to the shifting configuration of impression formation in new, popular LBSA systems. The shifts of this system are twofold: whereas previously impression formation was an interactive process unfolding through time between two individuals, systems now intervene by (1) putting stops in the process and by (2) adding additional information that is not directly controlled by people. A Person now must make a decision about whether or not they want to connect with an Other by utilizing the cues the Other has provided as well as cues that the system supplements. Only when this combination of

cues yields an interest in future interaction for both parties does the previously theorized interactive, emergent process (i.e. chat) become enabled. Intervening in these two ways raises questions about the system-managed cues themselves and the role of the system inside this process.

To this end, the two complementary tasks of the study were run to see if the system-managed cues predict action and how the system-managed cues operate within impression formation as a process. The first contribution of this work is the theoretical model of impression formation, that connects self- and system-managed cues, dimensions of impression, and action together. Previous work has focused on the relationship between cues and impression or the relationship between impressions and action. Given the intervention of systems such that action needs to be taken from the limited set of self- and system-managed cues, configuring a theoretical model that looks across these relationships and testing it demonstrates the way in which impression formation unfolds in mediated first encounters. Future work in this space could do further empirical testing of the model and/or expand the model through the addition of more covariates, mediators, moderators, and outcomes, as well as applying it to other contexts, such as online friendship formation or connection making on professional networks.

The second contribution of this work is the broad consideration of the role of systems within a human process. Even with the lack of finding with regard to the role system-managed cues play in the impression formation process, the continued proliferation of these types of applications and the ways in which data moves through contexts raises questions. This suggests more work needs to be done in this space, especially with regard to the utility and stability of the system-

managed cues in people's decision making process. By exploring the ways in which systems integrate into our lives and asking questions about their effects, we will continue to design for better interaction.

References

Abelson, R. P. (1995). *Statistics as principled argument*. *American Statistician* (Vol. 50). http://doi.org/10.2307/2684678

Agresti, A. (2013). *Categorical Data Analysis* (3rd Editio). Hoboken, New Jersey: John Wiley & Sons.

Allen, J. L., & Post, D. J. (2004). Source valence in assessing candidate image in a local election. *Communication Research Reports*, *21*(2), 174–187. http://doi.org/10.1080/08824090409359979

Altman, I., & Taylor, D. (1973). *Social Penetration: The Development of Interpersonal Relationships*. New York: Holt, Rinehart & Winston.

Ambady, N. (2010). The Perils of Pondering: Intuition and Thin Slice Judgments. *Psychological Inquiry*, *21*(4), 271–278. http://doi.org/10.1080/1047840X.2010.524882

Ambady, N., Hallahan, M., & Rosenthal, R. (1995). On judging and being judged accurately in zero-acquaintance situations. *Journal of Personality and Social Psychology*, *69*(3), 518–529. http://doi.org/10.1037/0022-3514.69.3.518

Ambady, N., & Rosenthal, R. (1997). Judging Social Behavior Using "Thin Slices." *CHANCE*, *10*(4), 12–51.

Andersen, P. A., & Kibler, R. J. (1978). Candidate Valence as a Predictor of Voter Preference.

Human Communication Research, *5*(1), 4–14.

Aoki, P. M., & Woodruff, A. (2005). Making Space for Stories: Ambiguity in the Design of Personal Communication Systems. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 181–190). CHI '05.

Argyle, M., Alkema, F., & Gilmour, R. (1971). The communication of friendly and hostile attitudes by verbal and non-verbal signals. *European Journal of Social Psychology*. http://doi.org/10.1002/ejsp.2420010307

Ariely, D., & Loewenstein, G. (2006). The heat of the moment: the effect of sexual arousal on sexual decision making. *Journal of Behavioral Decision Making*, *19*(2), 87–98. http://doi.org/10.1002/bdm.501

Aron, A., & Aron, E. N. (1986). *Love and the Expansion of Self: Undersatnding Attraction and Satisfaction*. New York: Hemisphere/Harper & Row.

Aron, A., Steele, J., Kashdan, T. B., & Perez, M. (2006). When Similars do not Attract: Test of a Prediction from the Self-Expanision Model. *Personal Relationships*, *13*, 387–396.

Back, M. D., Schmukle, S. C., & Egloff, B. (2008). Becoming friends by chance: Short report. *Psychological Science*, *19*(5), 439–440. http://doi.org/10.1111/j.1467-9280.2008.02106.x

Beres, D. (2016). Here's The Best Time To Get Tinder Matches. Retrieved from http://www.huffingtonpost.com/entry/how-to-get-tinder-matches_us_56a78f4be4b0172c659422da

Berger, C. R. (1986). Uncertain Outcome Values in Predicted Relationships. *Human Communication Research*, 34–38.

Berger, C. R., & Calabrese, R. J. (1975). Some explorations in initial interaction and beyond. *Human Communication Research*, *1*(2), 99–112.

Berscheid, E. (1985). Interpersonal Attraction. In G. Lindzey & E. Aronson (Eds.), *Handbook of Social Psychology: Volume II* (Third, pp. 413–484). New York: Random House.

Berscheid, E., Brothen, T., & Graziano, W. G. (1976). Gain/loss Theory and the "Law of Infidelity": Mr. Doting vs. the Admiring Stranger. *Journal of Personality and Social Psychology*, *33*, 709–718.

Bertrand, M., & Mullainathan, S. (2004). Are Emily and Greg More Employable Than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination. *American Economic Review*, *94*(4), 991–1013. http://doi.org/10.1257/0002828042002561

Birnholtz, J., Fitzpatrick, C., Handel, M. J., & Brubaker, J. R. (2014). Identity, Identification and Identifiability: The Language of Self-Presentation on a Location-Based Mobile Dating App. In *Proceedings of the 16th international conference on Human-computer interaction with mobile devices and services* (pp. 3–12). Toronto: MobileHCI '14.

Blackwell, C., Birnholtz, J., & Abbott, C. (2014). Seeing and being seen: Co-situation and impression formation using Grindr, a location-aware gay dating app. *New Media & Society*, 1–20. http://doi.org/10.1177/1461444814521595

Brown, G., Maycock, B., & Burns, S. (2005). Your picture is your bait: Use and meaning of cyberspace among gay men. *Journal of Sex Research*, *42*(1), 63–73. http://doi.org/10.1080/00224490509552258

Brunswik, E. (1956). *Percpetion and the Representative Design of Psychological Experiments*. Berkeley: University of California Press.

Bumble. (2016). Bumble: About. Retrieved May 10, 2016, from https://bumble.com/en-us/about

Burgoon, J. K. (1994). Nonverbal Signals. In M. L. Knapp & G. R. Miller (Eds.), *Handbook of Interpersonal Communication* (pp. 229–285). Thousand Oaks, CA: Sage.

Burgoon, J. K., Coker, D. A., & Coker, R. A. (1986). Communicative Effects of Gaze Behavior. *Human Communication Research*, *12*(4), 495–524. http://doi.org/10.1111/j.1468-2958.1986.tb00089.x

Burgoon, J. K., & Hale, J. L. (1988). Nonverbal Expectancy Violations: Model Elaboration and Application to Immediacy Behaviors. *Communication Monographs*. http://doi.org/10.1080/13552600410001470973

Cattell, R. B. (1966). The scree test for the numbers of factors. *Multivariate Behavioral Research*, *1*(2), 245–276. http://doi.org/10.1207/s15327906mbr0102

Chatel, A. (2017). The Best Day To Use Tinder Is January 8, 2017, So Here's How To Make The Most Of "Dating Sunday." Retrieved from https://www.bustle.com/p/the-best-day-to-use-tinder-is-january-8-2017-so-heres-how-to-make-the-most-of-dating-sunday-28297

Clark, M., & Pataki, S. P. (1995). Interpersonal Processes Influencing Attraction and Relationships. In A. Tesser (Ed.), *Advanced Social Psychology* (pp. 283–332). New York: McGraw Hill.

Clark, M. S., & Mills, J. (1991). Reactions to and Willingness to Express Emotion in Communal and Exchange Relationships. *Journalof Experimental Social Psychology*, *27*, 324–336.

Crandall, C. S. (1994). Prejudice Against Fat People: Idealogy and Self-Interest. *Journal of Personality and Social Psychology*, *66*, 882–894.

Deandrea, D. C. (2014). Advancing Warranting Theory. *Communication Theory*, *24*(2), 186–204. http://doi.org/10.1111/comt.12033

DePaulo, B. M., Rosenthal, R., Eisenstat, R. A., Rogers, P. L., & Finkelstein, S. (1978). Decoding Discrepant Nonverbal Cues. *Journal of Personality and Social Psychology*, *36*, 313–323.

Dipboye, R. L., Fromkin, H. L., & Wiback, K. (1975). Relative Importance of Applicant Sex, Attractiveness, and Scholastic Standing in Evaluation of Job Applicant Résumés. *Journal of Applied Psychology*, *60*(1), 39–43. http://doi.org/10.1109/EMR.1979.4306782

Eastwick, P. W., & Finkel, E. J. (2008). Sex differences in mate preferences revisited: Do people know what they initially desire in a romantic partner? *Journal of Personality and Social Psychology*, *94*(2), 245–264. http://doi.org/10.1037/0022-3514.94.2.245

Ebbesen, E. B., Kjos, G. L., & Konecni, V. J. (1976). Spatial ecology: Its effects on the choice of

friends and enemies. In *Journal of Experimental Social Psychology* (Vol. 12, pp. 505–518). http://doi.org/10.1016/0022-1031(76)90030-5

Edwards, C., Spence, P. R., Gentile, C. J., Edwards, A., & Edwards, A. (2013). How much Klout do you have ... A test of system generated cues on source credibility. *Computers in Human Behavior*, *29*(5). http://doi.org/10.1016/j.chb.2012.12.034

Ellison, N. B., & boyd, dana. (2013). Sociality through Social Network Sites. In W. H. Dutton (Ed.), *The Oxford Handbook of Internet Studies* (pp. 151–172). Oxford: Oxford University Press.

Ellison, N. B., Hancock, J. T., & Toma, C. L. (2012). Profile as promise: A framework for conceptualizing veracity in online dating self-presentations. *New Media & Society*, *14*(1), 45–62. http://doi.org/10.1177/1461444811410395

Ellison, N. B., Heino, R., & Gibbs, J. (2006). Managing Impressions Online: Self-Presentation Processes in the Online Dating Environment. *Journal of Computer-Mediated Communication*, *11*(2), 415–441. http://doi.org/10.1111/j.1083-6101.2006.00020.x

Feingold, A. (1990). Gender differences in effects of physical attractiveness on romantic attraction: A comparison across five research paradigms. *Journal of Personality and Social Psychology*, *59*(5), 981–993. http://doi.org/10.1037/0022-3514.59.5.981

Festinger, L., Schachter, S., & Back, K. (1950). *Social Pressure in Informal Groups: a Study of Human Factors in Housing*. Stanford, CA: Stanford University Press.

Finkel, E. J., & Baumeister, R. F. (2009). Attraction and Rejection. In E. Finkel & R. F. Baumeister (Eds.), *Advanced Social Psychology* (pp. 419–459). Oxford University Press.

Finkel, E. J., Eastwick, P. W., & Matthews, J. (2007). Speed dating as an invaluable tool for studying romantic attraction: A methological primer. *Personal Relationships*, *14*, 149–166. http://doi.org/10.1111/j.1475-6811.2006.00146.x

Fiore, A. T., Taylor, L. S., Mendelsohn, G. A., & Hearst, M. A. (2008). Assessing Attractiveness in Online Dating Profiles (pp. 1–10).

Fiore, A. T., Taylor, L. S., Zhong, X., Mendelsohn, G. A., & Cheshire, C. (2010). Who's right and who writes: People, profiles, contacts, and replies in online dating. *Proceedings of the Annual Hawaii International Conference on System Sciences*, 1–10. http://doi.org/10.1109/HICSS.2010.444

Fitzpatrick, C., & Birnholtz, J. (2016). "I Shut the Door": Interactions, Tensions, and Negotiations from a Location-Based Social App. In *Interactional Communication Association Annual Conference*. Fukuoka, Japan: ICA.

Fitzpatrick, C., Birnholtz, J., & Gergle, D. (2016). People, Places, and Perceptions: Effects of Location Check-in Awareness on Impressions of Strangers. In *MobileHCI 2016*.

Gardner, D. G., Cummings, L. L., Dunham, R. B., & Pierce, J. L. (1998). Single-item versus multiple item measurement scales: An empirical comparison. *Educational and Psychological Measurement*. http://doi.org/10.1177/0013164498058006003

Garrison, J. P., Pate, L. E., & Sullivan, D. L. (1981). An Extension of Source Valence Research Using Multiple Discriminant Analysis. *The Journal of Social Psychology*, *115*(2), 259–269. http://doi.org/10.1080/00224545.1981.9711665

Garrison, J. P., Sullivan, D. L., & Pate, L. E. (1976). Interpersonal Valence Dimensions as Discriminators of Communication Contexts: An Empirical Assessment of Dyadic Linkages. In *Annual Meeting of the Speech Communication Association* (p. 33). San Francisco, CA.

Gibbs, J. L., Ellison, N. B., & Lai, C.-H. H. (2010). First Comes Love, Then Comes Google: An Investigation of Uncertainty Reduction Strategies and Self-Disclosure in Online Dating. *Communication Research*, *38*(1), 70–100. http://doi.org/10.1177/0093650210377091

Goffman, E. (1959). *The Presentation of Self in Everyday Life*. New York: Anchor Books.

Gonzaga, G. C., Campos, B., & Bradbury, T. (2007). Similarity, convergence, and relationship satisfaction in dating and married couples. *Journal of Personality and Social Psychology*, *93*(1), 34–48. http://doi.org/10.1037/0022-3514.93.1.34

Gosling, S. D., Ko, S. J., Mannarelli, T., & Morris, M. E. (2002). A room with a cue: Personality judgments based on offices and bedrooms. *Journal of Personality and Social Psychology*, *82*(3), 379–398. http://doi.org/10.1037//0022-3514.82.3.379

Grandhi, S. A. (2008). Interpersonal Interruptibility. *CHI '08: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 2633–2636.

Graziano, W. G., & Bruce, J. W. (2008). Attraction and the Initiation of Relationships: A Review

of the Empirical Literature. In S. Sprecher, A. Wenzel, & J. Harvey (Eds.), *Handbook of Relationship Initiation* (pp. 269–295). New York: Taylor & Francis Group. http://doi.org/10.1017/CBO9781107415324.004

Graziano, W. G., Bruce, J. W., Sheese, B., & Tobin, R. M. (2007). Attraction, Personality, and Prejudice: Liking None of the People Most of the Time. *Journal of Personality and Social Psychology*, *93*(3), 565–581.

Graziano, W. G., Jensen-Campbell, L. A., Shebilske, L. J., & Lundgren, S. R. (1993). Social Influence, Sex Differences, and Judgments of Beauty: Putting the Interpersonal Back in Interpersonal Attraction. *Journal of Personality and Social Psychology*, *65*(3), 522–531.

Griffitt, W., & Veitch, R. (1974). Preacquaintance Attitude Similarity and Attraction Revisited : Ten Days in a Fall-Out Shelter. *Sociometry*, *37*(2), 163–173.

Grindr LLC. (2015). Grindr Press. Retrieved from http://grindr.com/press

Gudykunst, W. B. (1985). The Influence of Cultural Similarity, Type of Relationship, and Self-Monitoring on Uncertainty Reduction Processes. *Communication Monographs*, *52*(3), 203–217.

Gudykunst, W. B., Yang, S.-M., & Nishida, T. (1985). A Cross-Cultural Test of Uncertainty Reduction Theory: Comparisons of Acquaintances, Friends, and Dating Relationships in Japan, Korea, and the United States. *Human Communication Research*, *11*(3), 407–454. http://doi.org/10.1111/j.1468-2958.1985.tb00054.x

Hancock, J. T., & Dunham, P. J. (2001). Impression Formation in Computer-Mediated Communication Revisited: An Analysis of the Bready and Intensity o Impressions. *Communication Research*, *28*(3), 325–347.

Hancock, J. T., Toma, C. L., & Fenner, K. (2008). I Know Something You Don't : The Use of Asymmetric Personal Information for Interpersonal Advantage. *Psychology*, 413–416. http://doi.org/10.1145/1460563.1460629

Hatfield, E., & Sprecher, S. (1986). *Mirror, mirror... The Importance of Looks in Everyday Life*. Albany: State University of New York Press.

Hinge. (2015). Relationship Status on Hinge Profiles. Retrieved January 1, 2016, from http://blog.hinge.co/blog/2015/7/7/relationship-status-on-hinge-profiles

Hinge. (2016). Hinge FAQ. Retrieved May 10, 2016, from http://hinge.co/faq/

Hitsch, G. J., Hortaçsu, A., & Ariely, D. (2010). What makes you click?—Mate preferences in online dating. *Quantitative Marketing and Economics*, *8*(4), 393–427. http://doi.org/10.1007/s11129-010-9088-6

John, O. P., & Srivastava, S. (1999). Big Five Trait Taxonomy: History, Measurement, and Theoretical Perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of Personality: Theory and Research* (pp. 102–138). New York: Guilford Press.

Jones, J. T., Pelham, B. W., Carvallo, M., & Mirenberg, M. C. (2004). How do I love thee? Let me count the Js: implicit egotism and interpersonal attraction. *Journal of Personality and*

Social Psychology, *87*(5), 665–683. http://doi.org/10.1037/0022-3514.87.5.665

Kalman, Y. M., Scissors, L. E., Gill, A. J., & Gergle, D. (2013). Online chronemics convey social information. *Computers in Human Behavior*, *29*(3), 1260–1269. http://doi.org/10.1016/j.chb.2012.12.036

Kelley, H. H., Holmes, J. G., Kerr, N., Reis, H. T., Rusbult, C. E., & Van Lange, P. A. M. (2003). *An Atlas of Interpersonal Situations*. Cambridge: Cambridge University Press.

Kenrick, D. (1994). Evolutionary Social Psychology: From Sexual Selection to Social Cognition. In M. P. Zanna (Ed.), *Adances in Experimental Social Psychology, Vol 26* (pp. 75–118). San Diego: Academic Press.

Kenrick, D. T., Groth, G. E., Trost, M. R., & Sadalla, E. K. (1993). Integrating evolutionary and social exchange perspectives on relationships: Effects of gender, self-appraisal, and involvement level on mate selection criteria. *Journal of Personality and Social Psychology*, *64*(6), 951–969. http://doi.org/10.1037/0022-3514.64.6.951

Kleck, R. E., & Rubenstein, C. (1975). Physical attractiveness, perceived attitude similarity, and interpersonal attraction in an opposite-sex encounter. *Journal of Personality and Social Psychology*, *31*(1), 107–114. http://doi.org/10.1037/h0076243

Koedel, C., & Tyhurst, E. (2012). Math skills and labor-market outcomes: Evidence from a resume-based field experiment. *Economics of Education Review*, *31*(1), 131–140. http://doi.org/10.1016/j.econedurev.2011.09.006

Lahey, J. N. (2008). Age, Women, and Hiring: An Experimental Study. *Journal of Human Resources*, *43*(1), 30–56. http://doi.org/10.1353/jhr.2008.0026

Landolt, M. A., Lalumière, M. L., & Quinsey, V. L. (1995). Sex differences in intra-sex variations in human mating tactics: An evolutionary approach. *Ethology and Sociobiology*, *16*(1), 3–23. http://doi.org/10.1016/0162-3095(94)00012-V

Langlois, J. H., Kalakanis, L., Rubenstein, a J., Larson, a, Hallam, M., & Smoot, M. (2000). Maxims or myths of beauty? A meta-analytic and theoretical review. *Psychological Bulletin*, *126*(3), 390–423. http://doi.org/10.1037/0033-2909.126.3.390

Lea, M., & Spears, R. (1991). Computer-mediated communication, de-individuation and group decision-making. *International Journal of Man-Machine Studies*, *34*(2), 283–301. http://doi.org/10.1016/0020-7373(91)90045-9

Lea, M., & Spears, R. (1995). Love at First Byte? Building Personal Relationships Over Computer Networks. In J. T. Wood & S. Duck (Eds.), *Under-studied Realtionships: Off the Beaten Track* (Vol. 6). London: Sage Publications.

Lemay, E. P., Clark, M. S., & Feeney, B. C. (2007). Projection of Responsiveness to Needs and the Construction of Satisfying Communal Relationships. *Journal of Personality and Social Psychology*, *92*, 834–853.

Leslie, L. a, Huston, T. L., & Johnson, M. P. (1986). Parental Reactions to Dating Relationships: Do They Make a Difference? *Journal of Marriage and the Family*, *48*(1), 57.

http://doi.org/10.2307/352228

Li, N. P., & Kenrick, D. T. (2006). Sex similarities and differences in preferences for short-term mates: what, whether, and why. *Journal of Personality and Social Psychology*, *90*(3), 468–489. http://doi.org/10.1037/0022-3514.90.3.468

Licoppe, C., Riviere, C. A., & Morel, J. (2015). Grindr casual hook-ups as interactional achievements. *New Media & Society*. http://doi.org/10.1177/1461444815589702

Liebman, N., & Gergle, D. (2016). It's (Not) Simply a Matter of Time: The Relationship Between CMC Cues and Interpersonal Affinity. In *CSCW '16*. San Francisco, CA: ACM.

Litt, E. (2012). Knock, Knock. Who's There? The Imagined Audience. *Journal of Broadcasting & Electronic Media*, *56*(3), 330–345. http://doi.org/10.1080/08838151.2012.705195

Maner, J. K., Gailliot, M. T., Rouby, D. A., & Miller, S. L. (2007). Can't take my eyes off you: Attentional adhesion to mates and rivals. *Journal of Personality and Social Psychology*, *93*(3), 389–401. http://doi.org/10.1037/0022-3514.93.3.389

Marwick, A. E., & boyd, d. (2011). I tweet honestly, I tweet passionately: Twitter users, context collapse, and the imagined audience. *New Media & Society*, *13*(1), 114–133. http://doi.org/10.1177/1461444810365313

Mascaro, C. M., Magee, R. M., & Goggins, S. P. (2012). Not Just a Wink and Smile: An Analysis of User-Defined Success in Online Dating. In *Proceedings of the 2012 iConference* (pp. 200–206). Toronto. Retrieved from

http://seangoggins.net/sites/default/files/winksmile-plus.pdf

McCroskey, J. C., & McCain, T. A. (1974). The Measure of Interpersonal Attraction. *Speech Monographs*, *41*, 261–266.

McCroskey, L., McCroskey, J., & Richmond, V. (2006). Analysis and Improvement of the Measurement of Interpersonal Attraction and Homophily. *Communication Quarterly*, *54*(1), 1–31. http://doi.org/10.1080/01463370500270322

Mcpherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a Feather: Homophily in Social Networks. *Annual Review of Sociology*, *27*, 415–444.

Nahemow, L., & Lawton, M. P. (1975). Similarity and Propinquity in Friendship Formation. *Journal of Personality and Social Psychology*, *32*(2), 205–213. http://doi.org/10.1037/0022-3514.32.2.205

Nissenbaum, H. (2009). *Privacy in Context: Technology, Policy, and the Integrity of Social Life*. Stanford, CA: Stanford University Press.

Norton, M. I., Frost, J. H., & Ariely, D. (2007). Less is more: the lure of ambiguity, or why familiarity breeds contempt. *Journal of Personality and Social Psychology*, *92*(1), 97–105. http://doi.org/10.1037/0022-3514.92.1.97

Posner, M. I., Nissen, M. J., & Klein, R. M. (1976). Visual Dominance: An Information-Processing Account of Its Origins and Significance. *Psychological Review*, *83*, 157–171.

Ramirez, J. A., & Burgoon, J. K. (2004). The Effect of Interactivity on Initial Interactions: the Influence of Information Valence and Modality and Information Richness on Computer-Mediated Interaction. *Communication Monographs*, *71*(4), 422–447. http://doi.org/10.1080/0363452042000307461

Ramirez, J. A., & Zhang, S. (2007). When Online Meets Offline: The Effect of Modality Switching on Relational Communication. *Communication Monographs*, *74*(3), 287–310. http://doi.org/10.1080/03637750701543493

Ramirez Jr, A., Walther, J. B., Burgoon, J. K., & Sunnafrank, M. (2002). Information-Seeking Strategies, Uncertainty, and Computer-Mediated Communication, 1–16.

Rayner, K., Rotello, C. M., Stewart, A. J., Keir, J., & Duffy, S. A. (2001). Integrating Text and Pictorial Information: Eyemovements when looking at Print Advertisements. *Journal of Experimental Psychology: Applied*, *7*, 219–226.

Reicher, S. D., Spears, R., & Postmes, T. (1995). Social Identity Model of Deindividuation Phenomena. *European Review of Social Psychology*, *6*(1), 161–198.

Reis, H. T., Nezlek, J., & Wheeler, L. (1980). Physical attractiveness in social interaction. *Journal of Personality and Social Psychology*, *38*(4), 604–617. http://doi.org/10.1037/0022-3514.38.4.604

Richmond, V. P. (1978). The Relationship Between Trait and State Communication Apprehension and Interpersonal Perceptions During Acquaintance Stages. *Human*

Communication Research, *4*, 338–349.

Rocca, K. A., & McCroskey, J. C. (1999). The Interrelationship of Student Ratings of Instructors' Immediacy, Verbal Aggressiveness, Homophily, and Interpersonal Attraction. *Communication Research*, *48*, 308–316.

Rosen, L. D., Cheever, N. A., Cummings, C., & Felt, J. (2008). The impact of emotionality and self-disclosure on online dating versus traditional dating. *Computers in Human Behavior*, *24*(5), 2124–2157. http://doi.org/10.1016/j.chb.2007.10.003

Rosenfeld, M. J., & Thomas, R. J. (2012). Searching for a Mate: The Rise of the Internet as a Social Intermediary. *American Sociological Review*, *77*(4), 523–547. http://doi.org/10.1177/0003122412448050

Segal, M. W. (1974). Alphabet and attraction: An unobtrusive measure of the effect of propinquity in a field setting. *Journal of Personality and Social Psychology*, *30*(5), 654–657. http://doi.org/10.1037/h0037446

Shepard, R. N. (1967). Recognition Memory for Words, Sentences, and Pictures. *Journal of Verbal Learning and Verbal Behavior*, *6*, 156–163.

Simpson, J. A., & Gangestad, S. W. (1991). Individual differences in sociosexuality: evidence for convergent and discriminant validity. *Journal of Personality and Social Psychology*, *60*(6), 870–883. http://doi.org/10.1037/0022-3514.60.6.870

Simpson, J. A., & Gangestad, S. W. (1992). Sociosexuality and Romantic Partner Choice.

Journal of Personality, *60*(1), 31–51. http://doi.org/10.1111/j.1467-6494.1992.tb00264.x

Social Security Administration. (2016). Popular Names in 1996. Retrieved September 1, 2016, from https://www.ssa.gov/cgi-bin/popularnames.cgi

Spears, R., & Lea, M. (1994). Panacea or Panopticon?: The Hidden Power in Computer-Mediated Communication. *Communication Research*, *21*(4), 427–459. http://doi.org/10.1177/009365094021004001

Sprecher, S., & Felmlee, D. (1992). The Influence of Parents and Friends on the Quality and Stability of Romantic Relationships : A Three-Wave Longitudinal Investigation. *Journal of Marriage and Family*, *54*(4), 888–900. http://doi.org/10.2307/353170

Sprecher, S., Wenzel, A., & Harvey, J. (Eds.). (2008). *The Handbook of Relationship Initiation*. New York: Guilford Press.

Sunnafrank, M. (1986). Predicted Outcome Value During Initial Interactions. *Human Communication Research*, *13*(1), 3–33.

Tidwell, L. C., & Walther, J. B. (2002). Computer-Mediated Communication effects on self-disclosure, impressions, and interpersonal evaluations. *Human Communication Research*, *28*(3), 317–348.

Tidwell, N. D., Eastwick, P. W., & Finkel, E. J. (2013). Perceived, not Actual, Similarity Predicts Initial Attraction in a Live Romantic Context: Evidence from the Speed-Dating Paradigm, *20*, 199–215. http://doi.org/10.1111/j.1475-6811.2012.01405.x

Tinder. (2016). About Tinder. Retrieved May 9, 2016, from https://www.gotinder.com/press

Toma, C. L., & Hancock, J. T. (2012). What Lies Beneath: The Linguistic Traces of Deception in Online Dating Profiles. *Journal of Communication*, *62*(1), 78–97. http://doi.org/10.1111/j.1460-2466.2011.01619.x

Toma, C. L., Hancock, J. T., & Ellison, N. B. (2008). Separating Fact From Fiction: An Examination of Deceptive Self-Presentation in Online Dating Profiles. *Personality and Social Psychology Bulletin*, *34*(8), 1023–1036. http://doi.org/10.1177/0146167208318067

Tong, S. T., Van Der Heide, B., Langwell, L., & Walther, J. B. (2008). Too much of a good thing? The relationship between number of friends and interpersonal impressions on facebook. *Journal of Computer-Mediated Communication*, *13*(3), 531–549. http://doi.org/10.1111/j.1083-6101.2008.00409.x

Turner, J. R. (1993). Interpersonal and psychological predictors of parasocial interaction with different television performers. *Communication Quarterly*, *41*(4), 443–453. http://doi.org/10.1080/01463379309369904

Utz, S. (2010). Show me your friends and I will tell you what type of person you are: How one's profile, number of friends, and type of friends influence impression formation on social network sites. *Journal of Computer-Mediated Communication*, *15*(2), 314–335. http://doi.org/10.1111/j.1083-6101.2010.01522.x

Van De Wiele, C., & Tong, S. T. (2014). Breaking Boundaries: The Uses & Gratifications of

Grindr. In *Proceedings of the 2014 ACM international joint conference on Pervasive and ubiquitous computing* (pp. 619–630). UbiComp '14. http://doi.org/10.1145/2632048.2636070

Walster, E., Aronson, V., & Abrahams, D. (1966). Importance of Physical Attractiveness in Dating Behavior. *Journal of Personality and Social Psychology*, *4*(5), 508–516.

Walther, J. B. (1992). Interpersonal Effects in Computer-Mediated Interaction. *Communication Research*, *19*(1), 52–90. http://doi.org/0803973233

Walther, J. B. (1993). Impression Development in Computer-Mediated Interaction. *Western Journal of Communication*, *57*(Fall), 381–398.

Walther, J. B. (1996). Computer-Mediated Communication: Impersonal, Interpersonal, and Hyperpersonal Interaction. *Communication Research*, *23*(1), 3–43. http://doi.org/10.1177/009365096023001001

Walther, J. B., & Parks, M. R. (2002). Cues Filtered Out, Cues Filtered In: Computer-Mediated Communication and Relationships. *Handbook of Interpersonal Communication*.

Walther, J. B., Slovacek, C. L., & Tidwell, L. C. (2001). Is a Picture Worth a Thousand Words?: Photographic Images in Long-term and Short-term Computer-Mediated Communication. *Communication Research*, *28*(1), 105–134.

Walther, J. B., & Tidwell, L. C. (1995). Nonverbal Cues in Computer-mediated Communication, and the Effect of Chronemics on Relational Communication. *Journal of Organizational*

Computing, *5*(4), 355–378.

Walther, J. B., Van Der Heide, B., Hamel, L. M., & Shulman, H. C. (2009). Self-Generated Versus Other-Generated Statements and Impressions in Computer-Mediated Communication. *Communication Research*, *36*(2), 229–253.

Walther, J. B., Van Der Heide, B., Kim, S.-Y., Westerman, D., & Tong, S. T. (2008). The Role of Friends' Appearance and Behavior on Evaluations of Individuals on Facebook: Are We Known by the Company We Keep? *Human Communication Research*, *34*(1), 28–49. http://doi.org/10.1111/j.1468-2958.2007.00312.x

Wang, S. S., Moon, S. Il, Kwon, K. H., Evans, C. A., & Stefanone, M. A. (2010). Face off: Implications of visual cues on initiating friendship on Facebook. *Computers in Human Behavior*, *26*(2), 226–234. http://doi.org/10.1016/j.chb.2009.10.001

Wanous, J. P., Reichers, a E., & Hudy, M. J. (1997). Overall job satisfaction: how good are single-item measures? *The Journal of Applied Psychology*, *82*(2), 247–252. http://doi.org/10.1037/0021-9010.82.2.247

Watson, D., Klohnen, E. C., Casillas, A., Simms, E. N., Haig, J., & Berry, D. S. (2004). Match makers and deal breakers: Analyses of assortative mating in newlywed couples. *Journal of Personality*, *72*(5), 1029–1068. http://doi.org/10.1111/j.0022-3506.2004.00289.x

Whitty, M. T. (2008a). Liberating or debilitating? *Computers in Human Behavior*, *24*, 1837–1850. http://doi.org/10.1016/j.chb.2008.02.009

Whitty, M. T. (2008b). Revealing the “Real” me, Searching for the “Actual” You: Presentations of self on an internet dating site. *Computers in Human Behavior*, *24*(4), 1707–1723. http://doi.org/10.1016/j.chb.2007.07.002

Why do some straight girls set their Facebook page to say they are in a relationship with another girl? (2012). Retrieved February 1, 2017, from https://www.quora.com/Why-do-some-straight-girls-set-their-Facebook-page-to-say-they-are-in-a-relationship-with-another-girl

Wright, K. B. (2004). On-line relational maintenance strategies and perceptions of partners within exclusively Internet-based and primarily Internet-based relationships. *Communication Studies*, *55*(2), 239–253. http://doi.org/10.1080/10510970409388617

Appendix A – Building a swipe-gesture LBSA

While the topic of study, the role of system-managed cues on impression formation, could be investigated using a number of approaches and methods, the question specifically about cues potential influence on action lent itself to a controlled experimental approach. Given that I did not have access to data from any of the popular swipe-gesture LBSAs, I needed to build my own app in the style popular LBSAs. To this end, I ended up stitching together a few different resources for programming the app so that it would ultimately run as a hybrid web-based app that had a "native" feel on iOS.

I alone developed the app over the course of six months, from March 27, 2016 to September 27, 2016. The final version that was used in the study consisted of 156 files with 147,870 substantive lines of code across JavaScript, CSS, SASS, JSON, HTML, Typescript, and XML.

To be clear, a significant amount of the code came from pulling different packages and libraries together. My role as a developer consisted of making sure that they stitched together appropriately and that the experimental design laid on top of it functioned correctly. The foundation of the code base comes from the Ionic JavaScript Framework, itself a build out of AngularJS. The Ionic team had, thankfully, already created a Tinder Card swipe gesture interface with "cards." Ionic also provides builds in XCode that converts the JavaScript-based application into an app that functions as though it is native on iOS devices. The majority of the effort then came from styling the cards itself, as well as the user flow across Task 1 while using the application.

I added Login through Facebook and specific interaction and styling in order to give the app the look and feel of an LBSA. I added login through Facebook using the facebookConnectPlugin and connecting it with the Graph API v. 2.7. For interaction and styling, I included both swipe-gesture interaction with the cards as well as button-based interaction, with an ✖ or ♥ symbol reinforce left and no interest in future interaction or right and interest in future interaction respectively.

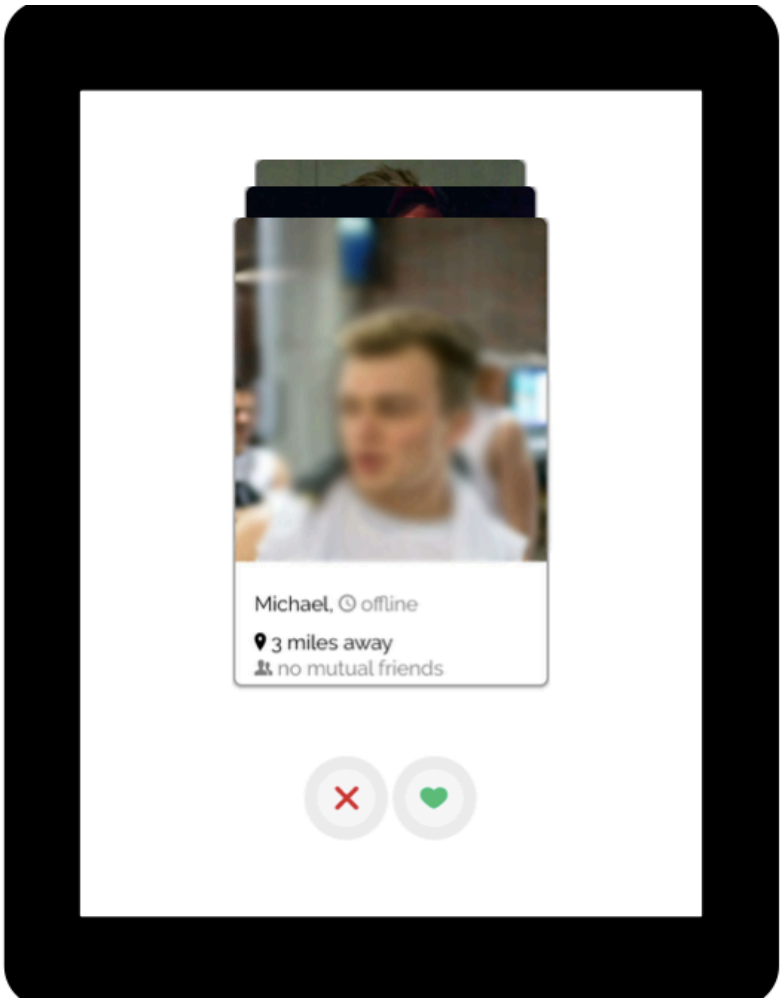


Figure A-1 Screenshot of custom-made LBSA used in the study (photo blurred for privacy).

Appendix B – Study Design and Sample Stimuli Sets

Figure B-1 Diagram of flow of study, from assignment to Task 1, Task 1 to 2, and Task 2 to the post tasks survey.

Table B-1 Manipulations and levels for task 1 experimental stimuli cards.

Photo Attractiveness		Distance		Availability		Mutual Friends	
Level	Representation	Level	Representation	Level	Representation	Level	Representation
--	--	Near	random integer between 2370 and 5280 displayed with text " feet away"	Online	green dot with text "online now"	None	"0" displayed with text "no mutual friends"
Moderate	Photo from middle quintile of photo set normalized for physical attractiveness	--	--	--	--	Few	random integer between 2-5 displayed with text "mutual friends"
High	Photo from upper quintile of photo set normalized for physical attractiveness	Far	random integer between 2 and 5 miles displayed with text "miles away"	Offline	grayed out clock icon with text "offline"	Several	random integer between 13-17 displayed with text "mutual friends"

Table B-2 Sample profiles cards used in Task 1

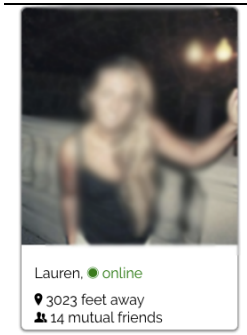
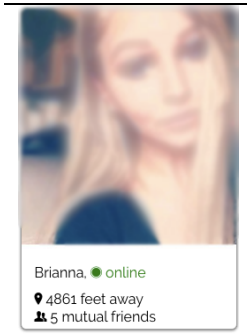
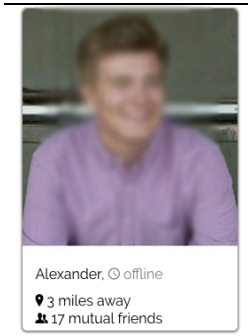
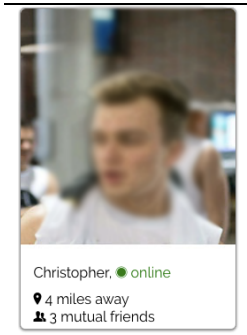
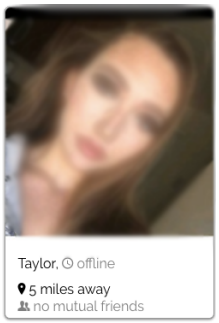
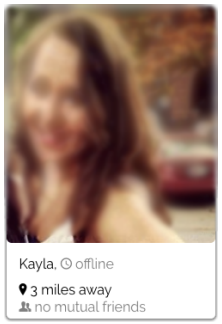
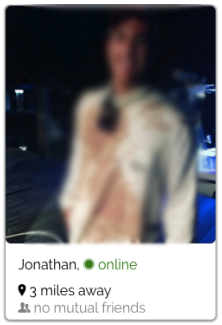
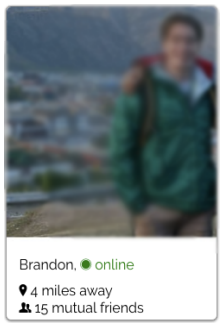
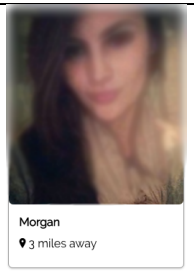
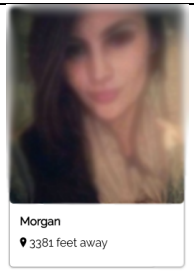
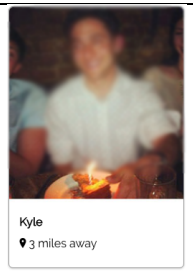
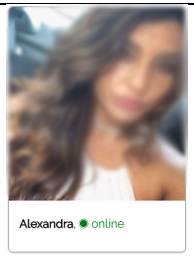
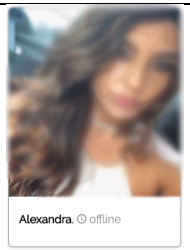
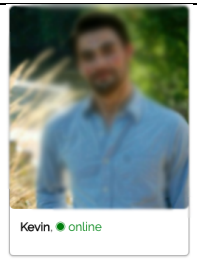
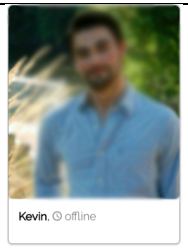
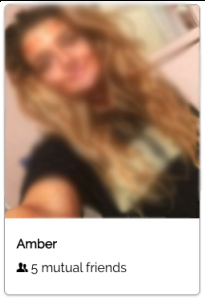
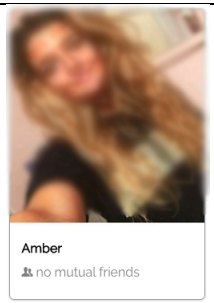
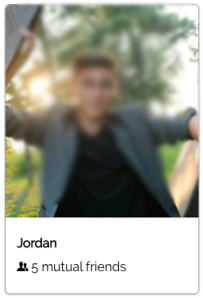
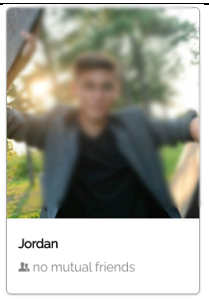
Card	Conditions	Card	Conditions	Card	Conditions	Card	Conditions
	available ✕ near ✕ several mutual friends		available ✕ near ✕ few mutual friends		unavailable ✕ far ✕ several mutual friends		available ✕ far ✕ few mutual friends
	unavailable ✕ far ✕ no mutual friends		unavailable ✕ far ✕ no mutual friends		available ✕ far ✕ no mutual friends		available ✕ far ✕ several mutual friends

Table B-3 Sample profile stimuli used in Task 2

Type of Cue	Profile Stimuli			
Distance				
Availability				
Mutual Friends				

Appendix C – Task 1 Priming Script

Recently, social apps designed for connecting people have become widely popular. On these apps, people view brief profiles of others and determine if they wish to connect or not. Once a connection is made, they determine if they want to get together, which can range from a date to a casual sexual encounter.

The study today looks at how those profiles may affect these evaluations.

This app shows a photo of a user on a swipeable card [points to card]. There are three practice cards to start, and then there is a stack of study cards. Each study card will show a person, his or her name, whether or not they are online, how far away they are, and how many mutual friends you and the person have in common. Your task is to decide if you are interested in future interaction with each person by swiping right to express interest, and left to express no interest.

When ready, go ahead and swipe through the stack of cards by yourself. There will be a popup when there are no more cards. Knock on the door and we'll come collect the iPad and get you started on the survey.

Appendix D – Qualitative Survey Data

The post task survey included a series of questions about cues present within the study. Included was a prompt to add any additional comments about the cues, with a free text response. Of the 96 participants, 23 provided a response to this question, and the 23 responses can be clustered into six different themes: additional cues, about me/bio, friends, photos, race, and miscellaneous.

The additional cue group and about me/bio group each refer to cues that were not present in this study. For the additional cue group, participants reported on what additional information they thought would be useful or have found useful in making a decision about someone in this context. This information included interests and hobbies, age, what types of people the profile owner is attracted, what type of relationship the profile owner is interested in, and the profile owner's occupation. For the about me/bio group, participants explained that the profiles "could have been improved with a short blurb" and that they "make judgements based on the bio".

The photo and friends groups both refer to cues present within the study. Commenters in the photo group explained that they "almost exclusively judged profiles based on pictures" and that the "picture is the most important, because I can't not know what you look like." This logic of the significance of photos was reflected in the findings from the study. For mutual friends, one participant explained that the mutual friends made them more comfortable; the other comments pointed out that offering who specifically the mutual friends are is more helpful and more important. (This is technically beyond the scope of this study given the limitations of the

Facebook API, which restricts calls that reveal mutual friends to dyads where one must pass the user ID of both users.)

The race group of comments all centered around the fact that the photos were all of white-presenting individuals. Participants asked, "why were they all white girls?" and "why were they all white men?" Another explained that she is only attracted to people of her own ethnicity, so the whiteness affected her responses. This is good in terms of reducing the variance in the stimuli, and confirms in some way that the participants experienced the photos as of white people. These comments suggest, however, that other studies around how race is experienced inside of LBSAs is warranted. (Adding a race manipulation here would have increased the total number of participants again, and diffused focus from examining system-managed cues.)

The miscellaneous group contained two comments. The first stated that the person had never used a Tinder like platform before. (This was actually covered in an earlier question as well.) The second participant explained in their comment that the cues present in the study don't actually tell them much about the person, "unless [he] starts analyzing their choices or behavior, like the types of pictures they chose to upload or things they decide to reveal about themselves." For this participant, it seems that he does not read into cues too much at this stage in the impression formation process; he may, instead, be deferring until a later interactive stage.

Appendix E – Additional Process Models Figures and Tables

Below are the figures and tables for the first set of process models run without the full set of covariates.

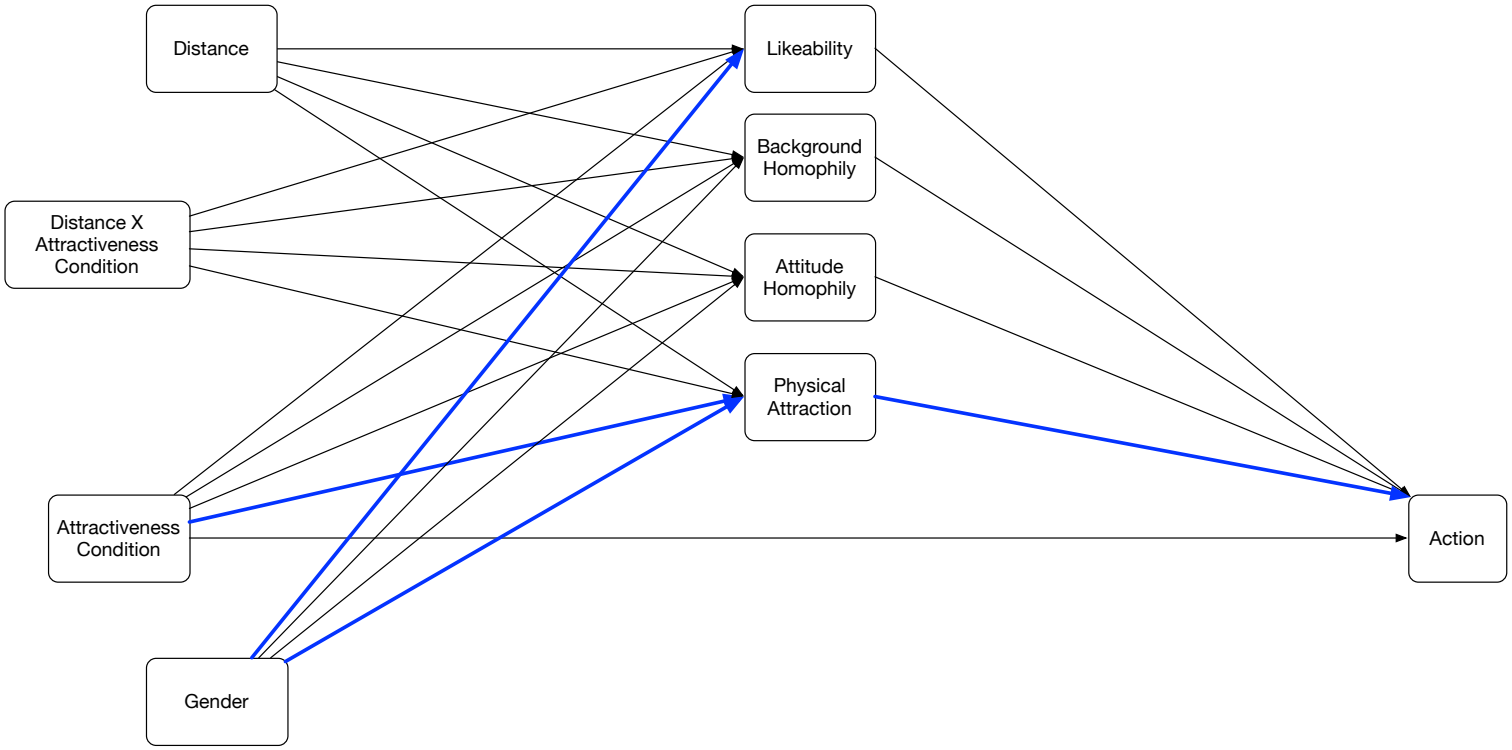


Figure E-1 Theoretical model of attractiveness, gender, distance, dimensions of impression, and action. Significant pathways are emphasized in blue.

Table E-1 Conditional process model of attractiveness, gender, distance, dimensions of impression, and action

	Likeability			Attitude Homophily			Background Homophily			Physical Attractiveness			Swipe Right		
	Coeff.	SE	P	Coeff.	SE	P	Coeff.	SE	P	Coeff.	SE	P	Coeff.	SE.	P
High Attractive	-0.042	0.213	0.845	0.116	0.222	0.845	0.008	0.230	0.977	1.135	0.310	0.000	0.290	0.756	0.701
Male	-1.056	0.150	0.000	-0.276	0.157	0.000	0.210	0.205	0.307	0.441	0.219	0.048	—	—	—
Distance	-0.028	0.213	0.896	-0.119	0.222	0.896	-0.325	0.290	0.265	-0.254	0.310	0.416	—	—	—
Distance × Attractive	0.097	0.301	0.747	0.019	0.314	0.747	0.396	0.409	0.336	0.472	0.439	0.285	—	—	—
Likeability	—	—	—	—	—	—	—	—	—	—	—	—	-0.251	0.485	0.605
Attitude Homophily	—	—	—	—	—	—	—	—	—	—	—	—	0.653	0.713	0.359
Background Homophily	—	—	—	—	—	—	—	—	—	—	—	—	0.364	0.552	0.510
Physical Attraction	—	—	—	—	—	—	—	—	—	—	—	—	3.127	0.751	0.000
Intercept	4.896	0.168	0.000	3.591	0.175	0.000	3.536	0.229	0.000	3.835	0.245	0.000	-17.383	4.885	0.000
	R^2= .352			R^2= .044			R^2= .036			R^2= .327			*Pseudo* R^2= .617		
	$F(4,91) = 12.371, p < .001$			$F(4,91) = 1.061, p > .10$			$F(4,91) = .848, p > .10$			$F(4,91) = 11.060, p < .001$			*-2LL* = 50.918		

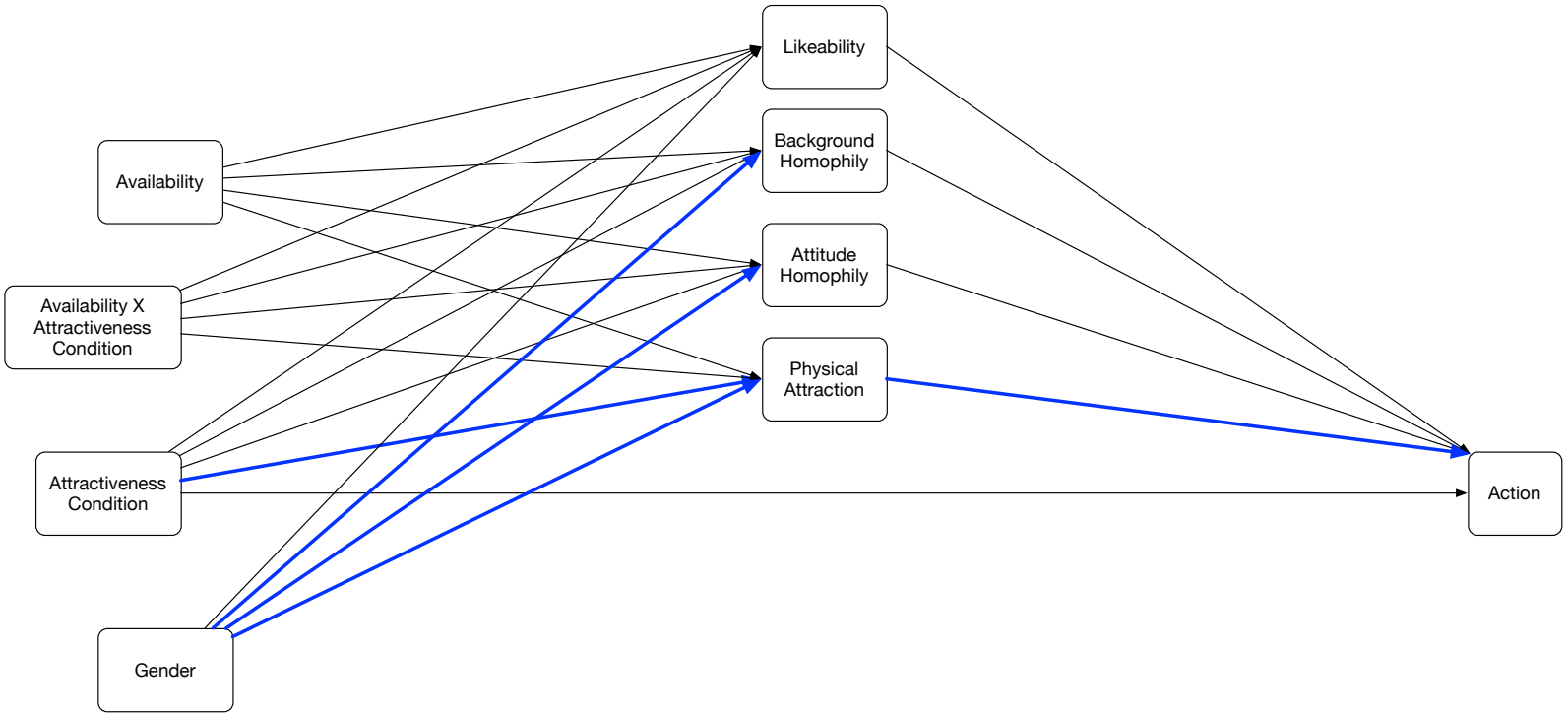


Figure E-2 Theoretical model of attractiveness, gender, availability, dimensions of impression, and action. Significant pathways are emphasized in blue.

Table E-2 Conditional process model of attractiveness, gender, availability, dimensions of impression, and action.

	Likeability			Attitude Homophily			Background Homophily			Physical Attractiveness			Swipe Right		
	Coeff.	SE	P	Coeff.	SE	P	Coeff.	SE	P	Coeff.	SE	P	Coeff.	SE.	P
High Attractive	-0.014	0.218	0.949	0.242	0.255	0.346	0.167	0.275	0.546	1.097	0.343	0.002	1.108	0.689	0.108
Male	0.094	0.154	0.545	0.426	0.180	0.020	0.508	0.195	0.011	0.653	0.243	0.009	—	—	—
Availability	-0.056	0.218	0.800	-0.067	0.255	0.795	-0.042	0.275	0.880	-0.108	0.343	0.755	—	—	—
Availability × Attractive	-0.035	0.308	0.911	-0.136	0.361	0.707	-0.125	0.389	0.749	-0.076	0.485	0.875	—	—	—
Likeability	—	—	—	—	—	—	—	—	—	—	—	—	-0.171	0.543	0.753
Attitude Homophily	—	—	—	—	—	—	—	—	—	—	—	—	0.523	0.582	0.369
Background Homophily	—	—	—	—	—	—	—	—	—	—	—	—	0.626	0.506	0.216
Physical Attraction	—	—	—	—	—	—	—	—	—	—	—	—	2.131	0.544	0.000
Intercept	4.898	0.172	0.000	3.492	0.202	0.000	3.579	0.218	0.000	3.861	0.271	0.000	-14.253	3.737	0.000
	R^2= .007			R^2= .073			R^2 = .076			R^2= .227			*Pseudo* R^2= .541		
	$F(4,91) = .162, p > .10$			$F(4,91) = 1.802, p > .10$			$F(4,91) = 1.876, p > .10$			$F(4,91) = 6.668, p < .001$			*-2LL* = 61.032		

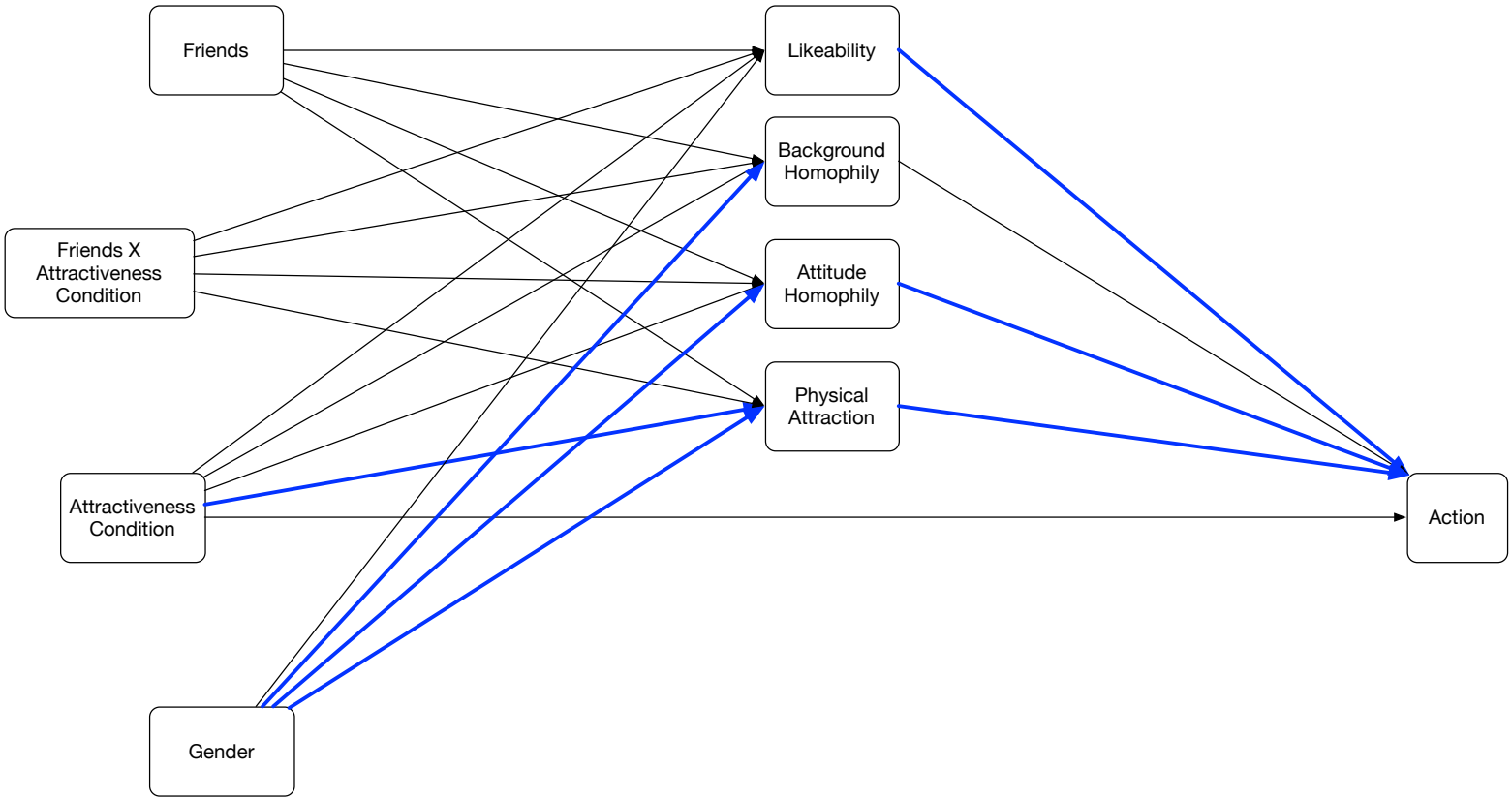


Figure E-3 Theoretical model of attractiveness, gender, mutual friends, dimensions of impression, and action. Significant pathways are emphasized in blue.

Table E-3 Conditional process model of attractiveness, gender, mutual friends, dimensions of impression, and action

	Likeability			Attitude Homophily			Background Homophily			Physical Attractiveness			Swipe Right		
	Coeff.	SE	P	Coeff.	SE	P	Coeff.	SE	P	Coeff.	SE	P	Coeff.	SE.	P
High Attractive	0.056	0.238	0.816	0.064	0.238	0.789	0.108	0.283	0.703	1.094	0.312	0.001	-0.532	0.696	0.445
Friends	-0.063	0.238	0.793	-0.067	0.238	0.780	-0.104	0.283	0.714	0.132	0.312	0.674	—	—	—
Friends × Attractive	0.181	0.336	0.592	0.392	0.337	0.248	0.246	0.400	0.541	0.135	0.442	0.760	—	—	—
Male	0.083	0.168	0.621	0.390	0.168	0.023	0.427	0.200	0.036	0.852	0.221	0.000	—	—	—
Likeability	—	—	—	—	—	—	—	—	—	—	—	—	-1.310	0.667	0.050
Attitude Homophily	—	—	—	—	—	—	—	—	—	—	—	—	1.960	0.777	0.012
Background Homophily	—	—	—	—	—	—	—	—	—	—	—	—	-0.648	0.470	0.169
Physical Attraction	—	—	—	—	—	—	—	—	—	—	—	—	2.420	0.560	0.000
Intercept	4.451	0.188	0.000	3.227	0.188	0.000	3.503	0.224	0.000	3.595	0.247	0.000	-10.204	2.710	0.000
	R^2= .014			R^2= .096			R^2= .065			R^2= .323			*Pseudo* R^2= .542		
	$F(4,91) = .329, p > .10$			$F(4,91) = 2.422, p < .10$			$F(4,91) = 1.570, p > .10$			$F(4,91) = 10.872, p < .001$			*-2LL* = 60.914		

Appendix F – Survey

What is your gender?

Male

Female

Considering the profile shown above, please mark the extent to which you agree with each of the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree
I would like to get to know this person.	1	2	3	4	5	6	7
This person is happy.	1	2	3	4	5	6	7
This person is smart.	1	2	3	4	5	6	7
This person is honest.	1	2	3	4	5	6	7
This person is nice.	1	2	3	4	5	6	7
This person is friendly.	1	2	3	4	5	6	7

Considering the profile shown above, please mark the extent to which you agree with each of the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree
This person thinks like me.	1	2	3	4	5	6	7
This person doesn't behave like me.	1	2	3	4	5	6	7
This person is different from me.	1	2	3	4	5	6	7
This person shares my values.	1	2	3	4	5	6	7
This person is like me.	1	2	3	4	5	6	7
This person treats people like I do.	1	2	3	4	5	6	7
This person doesn't think like me.	1	2	3	4	5	6	7
This person is similar to me.	1	2	3	4	5	6	7
This person doesn't share my values.	1	2	3	4	5	6	7
This person behaves like me.	1	2	3	4	5	6	7
This person is unlike me.	1	2	3	4	5	6	7
This person doesn't treat people like I do.	1	2	3	4	5	6	7
This person has thoughts and ideas that are similar to mine.	1	2	3	4	5	6	7
This person expresses attitudes different from mine.	1	2	3	4	5	6	7
This person has a lot in common with me.	1	2	3	4	5	6	7

Considering the profile shown above, please mark the extent to which you agree with each of the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree
This person is from a social class similar to mine.	1	2	3	4	5	6	7
This persons' status is different from mine.	1	2	3	4	5	6	7
This person is from an economic situation different from mine.	1	2	3	4	5	6	7
This person's background is similar to mine.	1	2	3	4	5	6	7
This person's status is like mine.	1	2	3	4	5	6	7
This person is from a social class different from mine.	1	2	3	4	5	6	7
This person is from an economic situation like mine.	1	2	3	4	5	6	7
This person's background is different from mine.	1	2	3	4	5	6	7
This person and I come from a similar geographic region.	1	2	3	4	5	6	7
This person's life as a child was similar to mine.	1	2	3	4	5	6	7

Considering the profile shown above, please mark the extent to which you agree with each of the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree
I think she is pretty/he is handsome.	1	2	3	4	5	6	7
She/He is sexy looking.	1	2	3	4	5	6	7
I don't like the way she/he looks.	1	2	3	4	5	6	7
She/He is ugly.	1	2	3	4	5	6	7
I find him/her attractive physically.	1	2	3	4	5	6	7
She/He is not good looking.	1	2	3	4	5	6	7
She/He looks appealing.	1	2	3	4	5	6	7
I don't like the way this person looks.	1	2	3	4	5	6	7
She/He is nice looking.	1	2	3	4	5	6	7
She/He has an attractive face.	1	2	3	4	5	6	7
She/He is not physically attractive.	1	2	3	4	5	6	7
She/He is good looking.	1	2	3	4	5	6	7

Please indicate which direction you would have swiped if you had been shown this profile in the first task:

Right (interested in future interaction)

Left (not interested in future interaction)

Considering both the profiles that you saw during the iPad task and those you just saw in the previous pages of this survey, please mark true or false for each of the following statements.

I saw at least one person listed as online now.

I saw at least one person listed as more than a mile away.

I saw only men.

I saw only women.

I saw at least one person listed as having no mutual friends with me.

I saw no one who was listed as offline.

I saw at least one person listed as some number of feet away.

I saw no one shown as having some mutual friends with me.

I found some people more attractive than others.

Considering both the profiles that you saw during the iPad task and those you just saw in the previous pages of this survey, please mark true or false for each of the following statements.

I saw at least one person that I recognize.

I saw at least one person that I have met.

I saw at least one person that I know

I do not know any person I saw.

I see myself as someone who:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree
Tends to find fault with others.	1	2	3	4	5	6	7
Is helpful and unselfish with others.	1	2	3	4	5	6	7
Starts quarrels with others.	1	2	3	4	5	6	7
Has a forgiving nature.	1	2	3	4	5	6	7
Is generally trusting.	1	2	3	4	5	6	7
Can be cold and aloof.	1	2	3	4	5	6	7
Is considerate and kind to almost everyone.	1	2	3	4	5	6	7
Is sometimes rude to others.	1	2	3	4	5	6	7
Likes to cooperate with others.	1	2	3	4	5	6	7

Please enter the number of different sex partners you've had in the past year: (free text)

Please enter the number of different sex partners you foresee in the next five years: (free text)

Please enter the number of times you have engaged in sex with someone on one and only one occasion: (free text)

Please mark the extent to which you agree with each of the following statements.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree
Sex without love is OK	1	2	3	4	5	6	7
I can imagine being comfortable and enjoying casual sex with different partners.	1	2	3	4	5	6	7
I would have to be closely attached to someone (both emotionally and psychologically) before I could feel comfortable and fully enjoy having sex with him or her.	1	2	3	4	5	6	7

Thinking about yourself as you are today, please mark the extent to which you agree with each of the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree
I would like to have a serious relationship.	1	2	3	4	5	6	7
I am looking for something more than casual sex.	1	2	3	4	5	6	7
I am open to dating people.	1	2	3	4	5	6	7

I am open to casual encounters with people.	1	2	3	4	5	6	7
I am not looking for anything serious right now.	1	2	3	4	5	6	7
I would like to have casual encounters with others.	1	2	3	4	5	6	7

Please mark the extent to which you agree with each of the following statements.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree
I am a desirable dating partner.	1	2	3	4	5	6	7
In general, I tend to have many options for romantic partners.	1	2	3	4	5	6	7
Members of the opposite sex that I like tend to like me back.	1	2	3	4	5	6	7
Members of the opposite sex notice me.	1	2	3	4	5	6	7
I receive many compliments from members of the opposite sex.	1	2	3	4	5	6	7
Members of the opposite sex are not very attracted to me.	1	2	3	4	5	6	7
I receive sexual invitations from members of the opposite sex.	1	2	3	4	5	6	7
Members of the opposite sex are attracted to me.	1	2	3	4	5	6	7
I can have as many sexual partners as I chose.	1	2	3	4	5	6	7

I do not receive many compliments from members of the opposite sex.	1	2	3	4	5	6	7

The profiles shown in the survey and during the iPad task included an image, the person's name, how far away s/he was, whether or not s/he was online, and how many mutual friends you have with him/her. Of these pieces of information, please rank the following three of them in terms of usefulness in deciding about interest in future interactions:

Distance: how far away that person is

Availability: whether or not that person is currently online

Friends: the number of mutual friends you have

Considering each of the following types of information available on a profile, please mark how important each of them is.

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
Photo	1	2	3	4	5
Name	1	2	3	4	5
Age	1	2	3	4	5
Distance (how far away the person is)	1	2	3	4	5
Availability (whether or not the person is online)	1	2	3	4	5

Friends (number of mutual friends)	1	2	3	4	5

Please add any additional thoughts or comments you have about the pieces of information available on profiles: (free text)

Location based dating or hookup apps, such as Tinder, are quite popular. Like the app you saw today, they show brief profiles of people nearby for connections. How would you describe your use of these types of apps?

I have never used any of these types of apps.

I am a current user of one of these types of apps.

I am a current user of more than one of these types of apps.

I have used at least one of these types of apps in the past month, but now no longer use them.

I have used at least one of these types of apps in the past year, but now no longer use them.

Which of the following location based dating or hookup apps have you used? Please mark all that apply.

Tinder

Bumble

Happn

Hinge

Other (please enter name(s)): (free text)

Please enter your age: (free text)

What is your race?

Black/African American

Asian

Caucasian/White

Biracial or Multiracial

Native American/Alaskan Native/Inuit

Pacific Islander

Other

Prefer not to respond

What is your ethnicity?

Hispanic/Latino/a

Not Hispanic/Latino/a

Prefer not to respond

How long have you lived in the Evanston (or Chicago) area?

Less than 1 year

Between 1 and 2 years

Between 2 and 3 years

Between 3 and 4 years

More than 4 years

Appendix G – Correlation Matrix of Independent Variables and Mediators

Correlations

	Distance Condition		Availability Condition		Number Mutual Friends Condition		Photo Attractive-ness Condition	
Distance Condition	—							
Availability Condition	-1	**	—					
Number Mutual Friends Condition	1	**	-1	**	—			
Photo Attractiveness Condition	0		0		0		—	
Used LBSA	0		0		0		0.042	
Perceived Photo Cue Importance	0.054		-0.054		0.054		-0.126	
Perceived Name Cue Importance	-0.073		0.073		-0.073		-0.115	
Perceived Age Cue Importance	0.118		-0.118		0.118		-0.039	
Perceived Distance Cue Importance	0		0		0		-0.093	
Perceived Availability Cue Importance	0.023		-0.023		0.023		0.023	
Perceived Friends Cue Importance	-0.048		0.048		-0.048		0.048	
Age	0.243	*	-0.243	*	0.243	*	0.2	
Big 5 - Agreeableness	-0.015		0.015		-0.015		-0.015	
Self-Perceived Mate Value	0.113		-0.113		0.113		-0.203	*
SOI - Open Attitude Towards Sex	0.024		-0.024		0.024		-0.069	
Interest in Pursuing Relationships	0.067		-0.067		0.067		0.145	
Interest in Pursuing Casual Encounters	0.157		-0.157		0.157		0.06	

Male	0	0	0	0	
Distance Profile Likeability	0.012	-0.012	0.012	0.004	
Distance Profile Attitude Homophily	-0.072	0.072	-0.072	0.083	
Distance Profile Background Homophily	-0.064	0.064	-0.064	0.104	
Distance Profile Physical Attractiveness	-0.007	0.007	-0.007	0.537	**
Availability Profile Likeability	0.049	-0.049	0.049	-0.021	
Availability Profile Attitude Homophily	0.075	-0.075	0.075	0.097	
Availability Profile Background Homophily	0.054	-0.054	0.054	0.054	
Availability Profile Physical Attractiveness	0.055	-0.055	0.055	0.402	**
Friends Profile Likeability	0.017	-0.017	0.017	0.09	
Friends Profile Attitude Homophily	0.076	-0.076	0.076	0.154	
Friends Profile Background Homophily	0.01	-0.01	0.01	0.117	
Friends Profile Physical Attractiveness	0.078	-0.078	0.078	0.454	**

Correlations

	Used LBSA		Perceived Photo Cue Importance		Perceived Name Cue Importance		Perceived Age Cue Importance	
Used LBSA	—							
Perceived Photo Cue Importance	0.134		—					
Perceived Name Cue Importance	0.062		0.189		—			
Perceived Age Cue Importance	-0.071		-0.013		0.144		—	
Perceived Distance Cue Importance	0.041		0.029		0.213	*	0.208	*
Perceived Availability Cue Importance	-0.162		0.17		0.079		-0.021	
Perceived Friends Cue Importance	-0.083		-0.181		-0.11		0.027	
Age	0.106		0.01		0.112		0.011	
Big 5 - Agreeableness	0.017		-0.037		0.127		0.079	
Self-Perceived Mate Value	0.217	*	0.292	**	0.08		0.033	
SOI - Open Attitude Towards Sex	0.303	**	0.132		-0.019		-0.32	**
Interest in Pursuing Relationships	0.005		-0.133		0.067		0.123	
Interest in Pursuing Casual Encounters	0.18		0.218	*	-0.065		-0.255	*
Male	-0.042		0.054		-0.115		-0.329	**
Distance Profile Likeability	-0.058		-0.037		0.132		0.303	**
Distance Profile Attitude Homophily	-0.076		-0.052		-0.014		0.192	
Distance Profile Background Homophily	-0.06		-0.094		0.117		0.121	
Distance Profile Physical Attractiveness	-0.122		-0.135		-0.008		-0.047	
Availability Profile Likeability	-0.142		-0.015		0.073		-0.024	
Availability Profile Attitude Homophily	-0.076		0.017		0.16		-0.056	
Availability Profile Background Homophily	-0.045		0.027		0.184		-0.032	

Availability Profile Physical Attractiveness	-0.107		-0.121	0.102	-0.029
Friends Profile Likeability	-0.287	**	-0.006	0.029	0.179
Friends Profile Attitude Homophily	-0.206	*	0.012	0.09	0.071
Friends Profile Background Homophily	-0.039		-0.033	0.165	0.136
Friends Profile Physical Attractiveness	-0.237	*	-0.025	-0.072	-0.046

Correlations

	Perceived Distance Cue Importance		Perceived Availability Cue Importance		Perceived Friends Cue Importance		Age
Perceived Distance Cue Importance	—						
Perceived Availability Cue Importance	0.256	*	—				
Perceived Friends Cue Importance	-0.087		0.069		—		
Age	0.042		-0.057		0.091		—
Big 5 - Agreeableness	0.032		0		0.122		0.137
Self-Perceived Mate Value	0.155		0.199		0.031		-0.004
SOI - Open Attitude Towards Sex	0.11		0.078		-0.29	**	-0.002
Interest in Pursuing Relationships	-0.073		-0.118		0.083		0.079
Interest in Pursuing Casual Encounters	0.031		0.171		-0.218	*	0.196
Male	-0.162		-0.047		-0.067		0.086
Distance Profile Likeability	0.317	**	0.086		0.156		0.036
Distance Profile Attitude Homophily	0.045		0.053		0.155		0.077
Distance Profile Background Homophily	0.045		-0.129		0.127		-0.006
Distance Profile Physical Attractiveness	-0.012		0.126		0.071		0.134
Availability Profile Likeability	-0.03		0.082		0.179		0.133
Availability Profile Attitude Homophily	-0.089		0.132		-0.026		-0.026
Availability Profile Background Homophily	0.062		-0.068		-0.01		0.013
Availability Profile Physical Attractiveness	-0.113		-0.018		0.008		0.185
Friends Profile Likeability	0		0.062		0.347	**	0.076
Friends Profile Attitude Homophily	-0.082		0.063		0.087		0.122
Friends Profile Background Homophily	-0.038		-0.099		0.001		-0.022
Friends Profile Physical Attractiveness	-0.169		0.15		0.084		0.138

Correlations

	Big 5 - Agreeableness		Self-Perceived Mate Value		SOI - Open Attitude Towards Sex		Interest in Pursuing Relation-ships	
Big 5 - Agreeableness	—							
Self-Perceived Mate Value	0.088		—					
SOI - Open Attitude Towards Sex	-0.158		0.158		—			
Interest in Pursuing Relationships	0.255	*	-0.112		-0.238	*	—	
Interest in Pursuing Casual Encounters	-0.104		0.055		0.54	**	-0.436	**
Male	-0.158		0.013		0.388	**	-0.145	
Distance Profile Likeability	0.096		-0.157		-0.375	**	-0.03	
Distance Profile Attitude Homophily	0.065		-0.143		-0.216	*	-0.058	
Distance Profile Background Homophily	-0.238	*	-0.109		0.036		0.008	
Distance Profile Physical Attractiveness	-0.028		-0.277	**	-0.023		0.107	
Availability Profile Likeability	0.113		-0.031		-0.157		0.036	
Availability Profile Attitude Homophily	0.116		-0.078		0.062		0.059	
Availability Profile Background Homophily	-0.204	*	-0.058		0.131		-0.085	
Availability Profile Physical Attractiveness	0.096		-0.161		-0.053		0.069	
Friends Profile Likeability	0.013		-0.122		-0.241	*	0.111	
Friends Profile Attitude Homophily	-0.093		-0.135		-0.035		0.038	
Friends Profile Background Homophily	-0.261	*	-0.109		0.111		-0.138	
Friends Profile Physical Attractiveness	-0.064		-0.296	**	0.035		-0.032	

Correlations

	Interest in Pursuing Casual Encounters		Male		Distance Profile Likeability		Distance Profile Attitude Homophily	
Interest in Pursuing Casual Encounters	—							
Male	0.374	**	—					
Distance Profile Likeability	-0.285	**	-0.593	**	—			
Distance Profile Attitude Homophily	-0.021		-0.18		0.492	**	—	
Distance Profile Background Homophily	0.024		0.106		0.068		0.501	**
Distance Profile Physical Attractiveness	0.157		0.173		0.158		0.389	**
Availability Profile Likeability	-0.078		0.064		0.095		-0.035	
Availability Profile Attitude Homophily	0.284	**	0.238	*	-0.106		0.267	**
Availability Profile Background Homophily	0.155		0.263	**	-0.122		0.22	**
Availability Profile Physical Attractiveness	0.137		0.248	*	0.036		0.189	
Friends Profile Likeability	-0.144		0.052		0.191		0.067	
Friends Profile Attitude Homophily	0.141		0.231	**	-0.014		0.317	**
Friends Profile Background Homophily	0.109		0.216	*	-0.041		0.277	**
Friends Profile Physical Attractiveness	0.214	*	0.333	**	-0.176		0.051	

Correlations

	Distance Profile Background Homophily		Distance Profile Physical Attractive-ness		Availability Profile Likeability		Availability Profile Attitude Homophily	
Distance Profile Background Homophily	—							
Distance Profile Physical Attractiveness	0.32	**	—					
Availability Profile Likeability	-0.012		0.052		—			
Availability Profile Attitude Homophily	0.234	*	0.308	**	0.438	**	—	
Availability Profile Background Homophily	0.647	**	0.226	*	0.202	*	0.537	**
Availability Profile Physical Attractiveness	0.203	*	0.559	**	0.341	**	0.538	**
Friends Profile Likeability	0.16		0.168		0.364	**	0.077	
Friends Profile Attitude Homophily	0.435	**	0.318	**	0.213	*	0.338	**
Friends Profile Background Homophily	0.65	**	0.186		0.114		0.245	*
Friends Profile Physical Attractiveness	0.229	*	0.471	**	0.304	**	0.251	*

Correlations

	Availability Profile Background Homophily	Availability Profile Physical Attractive-ness	Friends Profile Likeability	Friends Profile Attitude Homophily	Friends Profile Background Homophily
Availability Profile Background Homophily	—				
Availability Profile Physical Attractiveness	0.415 **	—			
Friends Profile Likeability	0.083	0.14	—		
Friends Profile Attitude Homophily	0.277 **	0.197	0.566 **	—	
Friends Profile Background Homophily	0.655 **	0.195	0.321 **	0.516 **	—
Friends Profile Physical Attractiveness	0.221 *	0.374 **	0.482 **	0.605 **	0.339 **

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).