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Instant messaging social networks: Individual, relational, and cultural characteristics

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Abstract

Most research on social media tends to focus on individual or group-level characteristics, neglecting to consider the influence of relational and cultural variables. To fill this void, we collected social network data in Israel ($N = 492$) and Canada ($N = 293$) to investigate the effect of individual, relational, and cultural variables on the frequency of communication via instant messaging (IM) and the multiplexity of communication topics. We found that geographic distance continues to matter in interpersonal contact in spite of heavy reliance on digital tools for connectivity. Similar patterns of association were discerned in both countries for propinquity, the use of IM, and closeness. We discuss the findings in terms of theories of networked individualism.

Keywords

Computer-mediated communication, instant messaging, online ties, relationship maintenance, relationship types, social networks, student life, youth communication

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The use of social media has dramatically increased with young people being the first adopters and the most frequent users of email, social network sites (SNSs), and instant messaging (IM). IM has become a key tool for students to stay connected with existing friends and family, as well as to create new friendships. According to a Pew survey, more than 40% of online Americans use IM often (Lenhart, Madden, & Hitlin, 2005). IM use among college students is almost ubiquitous: 89% of U.S. college students and 97% of Canadian college students reported using IM regularly (Hu, Fowler-Wood, Smith, & Westbrook, 2004; Quan-Haase, 2008). Thus, online communication in general, and IM in particular, has become a common way for young people to communicate with peers, friends, and family.

Numerous studies have focused on the effect of online communication on such factors as sociability, intimacy, and friendship (Anderson, 2001; Kindred & Roper, 2004; Kubey, Lavin, & Barrows, 2001; Matthews & Schrum, 2003). Online communication links intimate friends who are temporarily geographically separated, for instance when they take new jobs or move away for college (Cummings, Lee, & Kraut, 2006; Utz, 2007). Online communication provides an alternative channel, filling intervals between face-to-face meetings and facilitating the coordination of social gatherings (Quan-Haase, 2008). Some individuals find it easier to disclose their inner feelings in online communication than in face-to-face interactions, suggesting that online communication is appropriate for maintaining and even developing closeness between both individuals one knows and strangers (Bargh & McKenna, 2004).

The literature on IM communication is growing, but most studies have focused on the effects of individual or group-level characteristics (Boneva, Quinn, Kraut, Kiesler, & Shklovski, 2006; Cummings et al., 2006; Flanagin, 2005; Lenhart et al., 2005; Quan-Haase, 2007; Utz, 2007; Valkenburg & Peter, 2009). Based on this body of work we know, for example, that age and gender are associated with IM use: younger adolescents need to adjust their IM use to family norms and school schedules; by contrast, college students are more autonomous in their activities and therefore more frequent and extensive users (Grinter & Palen, 2002). Furthermore, the average IM session is longer for females than for males, because to some extent females use IM to establish, to nurture, and to develop personal relationships, while males tend to use it for providing information (Baron, 2004). IM use promotes rather than hinders intimacy, with frequent IM conversations encouraging the desire to meet face-to-face with friends (Hu et al., 2004). The main uses of IM are for socializing, event planning, task accomplishment, and meeting new people (Flanagin, 2005; Grinter & Palen, 2002). IM use is also regulated by domestic and work obligations (Grinter & Palen, 2002).

The extensive use of IM in one-to-one conversations calls for the investigation of relational variables because dating, friendship, and family relations are dyadic phenomena (Kadushin, 2011). Individuals develop and maintain different kinds of relationships with acquaintances, friends, romantic partners, and family members (Wellman & Wortley, 1990), and the characteristics of these relationships may be associated with the frequency of IM use as well as the content of IM conversations. Moreover, the emergence of the ''networked individualism'' perspective indicates that individuals are no longer confined to small, homogeneous closely knit groups, but rather tend to associate in diverse, unbounded networks (Rainie & Wellman, 2012). This perspective suggests that

communication patterns are largely driven by the nature of the social ties that bound two individuals, instead of kin affiliation and pre-established social circles.

An important research question that emerges from this body of work is how relational variables (e.g., tie homophily, relationship type, tie duration, and tie closeness) are related to IM communication patterns. There is some evidence that relationship type (or origin) predicts the choice of communication channel, the conversation topics, and the kinds of activities pursued together (Mesch & Talmud, 2006, 2007a; Valkenburg & Jochen, 2007; Valkenburg & Peter, 2009). However, these studies did not specifically examine IM interactions, focusing instead on general online communication. Investigating the effect of relational variables on communication through IM seems particularly relevant, because IM is a network-based technology, where users maintain their own ego-network of communication (Rainie & Wellman, 2012).

In addition, online communication requires an understanding of how culture influences the adoption and use of social media. Culture – as a source of norms and behaviors – influences online expectations, preferences, and usage patterns. Previous studies of the use of IM investigated primarily individual or group-level characteristics in a single country. Our study, by contrast, expands this work in two ways. Firstly, the nature of IM communication requires the examination of the differential effects of individual and relational variables on the frequency and content of communication. For this purpose, we employ social network theory (Rainie & Wellman, 2012; Wasserman & Faust, 1995) and relational sociology (Emirbayer, 1997; Emirbayer & Goodwin, 1994). Secondly, rather than imposing or disregarding cultural strips, we conduct a systematic cross-country comparison between Canada and Israel to investigate the link between cultural variables and the use of IM for relationship maintenance. This evaluation will provide unique insights into how networked individualism plays out in different cultural and geographic settings, leading the way for more comparative work to take place in the field.

The evolution of instant messaging

IM is considered a synchronous form of communication, where users send a message to their interlocutors and receive replies instantly, thus engaging in an almost real-time text-based exchange (Baron, 2004; Faulhaber, 2002). Among other features, IM applications include (1) a "pop-up" mechanism to display messages the moment they are received; (2) a visible "buddy list" of contacts compiled by the user; and (3) a method for indicating when "buddies" are online and available to receive a message (Alvestrand, 2002). Another unique feature of IM applications is that it is possible to have multiple conversations simultaneously, allowing dyadic conversations and group chats (Grinter & Palen, 2002; Hu et al., 2004).

IM is popular among young people. In the 18–27 age group, 46% reported using IM more often than email (Shiu & Lenhart, 2004). University students, a subset of the age group cited above, use IM extensively. A study of Canadian university students showed that IM was enormously popular: 97% of respondents were users (Quan-Haase, 2007). When asked how many hours they use IM on a typical day, 28% reported more than 3 hours of use, 41% reported 1–2 hours, and 31% reported using IM for less than an hour. IM occupies a unique niche in the communication spectrum of young people

because of its low cost for long-distance exchanges (Hu et al., 2004), its speed, ease of use, ubiquitous availability, and functionality (Farmer, 2005; Ramirez, Dimmick, & Lin, 2004), allowing users to detect whether or not their contacts are available to communicate.

Although IM communication is a global phenomenon, little comparative research is available (Mesch & Talmud, 2010; Utz, 2007). As yet, there is no knowledge about cross-country variations in the use of IM. Cultural differences in social norms and network cohesion may influence communication patterns and technology use (Moore, 1990). To begin examining how users' norms influence their use of IM for communication, we compare survey results from two countries – Canada and Israel. The comparison of two countries that differ in their cultural orientation, language, population composition, location, size, and history may provide more insight into cross-cultural differences in the uses and practices of online communication. National culture is a collective mindset, distinguishing the members of one nation from another (Hofstede, 1991). National culture influences a person's actions through taken-for-granted scripts, institutionalized role expectations, and cultural values, which valorize particular behaviors and discourage others.

Canada and Israel are two distinctly different nations. Canada is a country where individualism is prized. Indeed, on Hofstede's Individualism Index (IDV), Canada's score is 80, the highest score possible. This score is indicative of a society with a very individualistic attitude, whose populace maintains relatively loose bonds. Canadians are typically self-reliant and look out first and foremost for themselves and their close family members. By contrast, the IDV index for Israel is 56.[1] This low score indicates that the Israeli society is more group-oriented, collectivist, and cohesive. In this type of society, cohesion, family relations, and interpersonal ties are highly valued, and seen as important resources in every sphere of action.[2]

Despite these important differences, there is a striking similarity between the two countries in terms of their reliance on digital tools. Both countries have similar Internet adoption rates and usage patterns: among the top 58 countries with the highest Internet penetration rates, Canada and Israel occupy the 22nd (with a penetration rate of 75%) and 24th rankings (with a penetration rate of 72%), respectively.[3] That is, Canada and Israel occupy virtually the same position when examining international Internet rankings, thereby having the same stage of Internet adoption, despite being culturally and socially substantially different. This makes the comparison between the two countries analytically efficacious and informatively revealing.

Literature review and research questions

Research about online social relationships has mainly focused on the influence of the technical and social affordances of a communication channel on online communication patterns (Daft & Lengel, 1984; Katz & Rice, 2002; Rice, 1993; Schouten, Valkenburg, & Peter, 2007). ICT (information and communication technology) usage for communication purposes is often considered limited because of the technical nature of the medium, or narrowly focused in that it is molded solely by social needs (Katz & Rice, 2002; Mesch & Talmud, 2007b, 2010). In contrast to these dichotomous views, we argue that

many of the features of ICTs reflect socio-structural elements, particularly the different social statuses that individuals have, their relational patterns, and norms of social engagement. We draw on relational sociology, and in particular on social network theory, to define social structure as patterns of relationships among individuals. Social network theory is a part of the broad structural perspective that is prevalent in the social sciences (Barabási, 2002; Emirbayer, 1997; Kadushin, 2011; Newman, Watts, & Barabási, 2006; Wasserman & Faust, 1995). While the study of social structure is central to any sociological inquiry, social network analysis distinguishes itself from other approaches by focusing on concrete interactions between individuals, rather than on discrete attributes of actors. Social networks stem from individual interactions, but often produce extended social structures with emergent properties, often beyond the intended meaning of the actors or immediate consequences of the interaction (Kadushin, 2011). Network theory holds that relations reflect structural opportunities and constraints on communication patterns and friendship selection, which are deemed to impact the content and quality of relationships. Moreover, social network theory examines how patterns of relationships affect human behavior, over and above the effect of norms and attributes (Abbott, 1988; Haythornthwaite & Wellman, 1998; Kadushin, 2011; Knoke & Kuklinski, 1982; Wasserman & Faust, 1995; Wellman & Berkowitz, 1988). More specifically, network models of social structure put emphasis on relational patterns, such as tie homophily, relationship type, tie duration, multiplexity, and emotional and physical closeness, as a means for understanding how the characteristics of social ties affect how people communicate, what types of media they choose to use, and how they are connected to one another (Kadushin, 2011).

Relationship type

Recent studies have distinguished between the use of online communication to maintain existing ties and to develop new ones (Best & Krueger, 2006; Mesch & Talmud, 2006, 2007a, 2010; Valkenburg & Peter, 2007, 2009). While early research suggested that online communication would facilitate the establishment of new ties, recent evidence shows that online communication is primarily used for maintaining existing ties (Ellison, Steinfield, & Lampe, 2007). Others have found that online communication seems to be used more with friends than with family, probably reflecting a generational gap in technology skills (Baym, Zhang, & Lin, 2004). Another study on IM use among college students reported no significant difference between IM users and non-users in the average need for affiliation. According to the study, IM may not be the most appropriate tool to satisfy the need for affiliation with one's close friends or for more intimate relationships, but is more appropriate for communication with distant friends and co-workers (Chun & Nam, 2007). In another study, Mesch and Talmud (2007a) reported that online ties tend to be weaker than offline ones, merely because they are newer, and are based on a relatively narrow scope of topics of discussion and fewer joint activities. More importantly, Valkenburg and Peter (2009) have recently documented a direct, positive, and longitudinal effect of IM communication on the quality of adolescents' relationships, attributing it to the users' tendency to disclose intimate information online. Despite the accruing evidence of the existence of a direct link between IM communication and

strong, trusting relationships, little is known about the manners in which relationship type (e.g., relationship roles, such as friends, family, and romantic partners) impact IM communication patterns. Thus, our first research question is:

RQ1: Does type of relationship have an effect on the frequency of communication via IM and the multiplexity of communication topics?

Tie closeness

Tie closeness is a concept frequently used in network research to characterize the value of social relations (Wasserman & Faust, 1995). Closeness is a combination of emotional intensity, mutual confidence, time spent on the relationship, and reciprocal services granted (Granovetter, 1973; Marsden & Campbell, 1984). Close ties tend to be more multiplex in that they involve a wider range of topics of conversation (Knoke & Kuklinski, 1982; Mesch & Talmud, 2006), while distant ties tend to be more narrowly focused on a limited number of issues. Some studies have used multiplexity as a proxy for tie strength (e.g., Stoller, Miller, & Shenyang, 2001), but in their seminal work, Marsden and Campbell (1984) did not find multiplexity to be a component of relational strength. Yet a recent study comparing online and offline ties found that tie closeness was positively associated with topic multiplexity (Mesch & Talmud, 2006). Therefore, we hypothesize that:

H1: Perceived tie closeness is expected to be positively associated with the frequency of communication via IM and the multiplexity of communication topics.

Tie homophily

Studies on the formation, development, maintenance, and dissolution of close social relationships have emphasized the importance of social similarity (Hartup, 1997; MacCoby, 1998; Miller-McPherson, Smith-Lovin, & Cook, 2002). This notion holds that "contact and friendship formation between similar individuals occurs at a higher rate than among dissimilar individuals" (Miller-McPherson et al., 2002). Social similarity is the result of a structure of opportunities for interaction emerging from the social patterning of activities in society that provides possibilities for frequent meetings, allowing individuals to get to know each other better.

Social similarity is an exogenous variable, reflecting opportunities for both mutual exposure and friendship selection, and as such shapes the content and the quality of the relationships being created. Gender preferences for friendships are an example of homophily. Most men and women tend to favor same-sex rather than opposite-sex friendships (Baumgarte & Nelson, 2009; Rose, 1985). Same-sex relationships are preferred among college students because they are perceived as closer and more trusting than mixed-sex relationships (Baumgarte & Nelson, 2009). This preference for same-sex relationships was observed in studies of online relationships as well. A study of a large sample of profiles in a SNS found that males and females have a higher proportion of same-sex contacts listed in their top eight friends (Thelwall, 2008). Even though research has examined the association of gender similarity and online social

networks among young people (see a summary in Mesch & Talmud, 2010), no study has as yet examined the role of gender similarity in IM communication. Based on the widespread prevalence of online and offline preferences for same-sex communication, our hypothesis is:

H2: Same-sex relationships are expected to communicate more frequently via IM and on a larger number of topics than mixed-sex relationships.

Propinquity

Communication is an integral part of social relationships and takes place in a social context (Mesch & Talmud, 2010; Sproull & Kiesler, 1986; Walther, 1996). Geographic location promotes, or constrains, communication, thereby influencing the choice of communication channel. When individuals are located in close proximity to one another, they participate in joint activities and are physically exposed to each other through, for instance, meetings and get togethers. Feld (1981) uses the concept of foci of activity, defining it as social, psychological, legal, or physical objects around which joint activities are organized. Foci of activity can be formal (school) or informal (regular hangouts), large (neighborhood) or small (household). By embedding individuals in specific social spheres, the choices of friendship are systematically constrained, particularly among adolescents. According to this perspective, foci of activity place individuals in social or geographical proximity, facilitating the formation of social ties. For example, foci of activity provide opportunities for meetings in which people can come to know each other and develop friendship ties.

Geographical proximity, or access, is a necessary precondition for face-to-face interactions, but does not necessarily preclude the use of other channels for communication. Two studies have shown that IM communication between contacts is used for socializing, event planning, task accomplishment, and meeting new people (Flanagin, 2005; Grinter & Palen, 2002). IM communication is being used not as a substitute for in-person meetings, but rather as a functional equivalent that facilitates the coordination of face-to-face activities (Gershuny, 2003). This function is more likely to occur when individuals are geographical proximate.

A complementary argument focuses on the *cost* of accessibility. For individuals who live near one another, face-to-face communication is more convenient and inexpensive. However, as Hampton and Wellman (2002) note, physical distance increases the cost of face-to-face contact and, as a result, communication frequency drops (see also: Quan-Haase, Wellman, Hampton, & Witte, 2002; Wellman & Frank, 2001). In comparison, the cost of online contact does not vary with distance. Not only is the financial cost reduced, but asynchronous forms of online communication, such as email, also provide flexibility because they do not require the simultaneous co-presence of contacts. Supporting these findings, other studies have found that online communication is used more extensively with ties residing at a distance than with local ties (Mok, Wellman, & Carrasco, 2010; Utz, 2007). The arguments discussed are too vague to permit the construction of a clear hypothesis, so for the current study, we formulated a research question instead:

RQ2: How is propinquity associated with IM communication frequency and IM topic multiplexity?

Tie duration

Close ties are distinguished from other types of social relationships because of their intimacy and intensity. Typically, intimacy and intensity develop over the history of the relationship. Hence, relationship duration is an important factor to be considered. It is only over time that key characteristics of a relationship develop, such as a history of shared experiences, the defining of a common feeling of belonging, and a shared identity (Adams, 1998; Marsden & Campbell, 1984). In addition, the development of characteristics associated with friendship, such as trust and reciprocity, is a temporal process (Adams, 1998; Fehr, 2000). Trust in dyadic relationships evolves through a process of iterated mutual disclosures of personal information (Bargh & McKenna, 2004). Thus, in this study we expect:

H3: Tie duration increases the frequency of communication via IM and the multiplexity of communication topics.

Online communication and instant messaging

In the present study, we focused on IM communication, which has become a preferred method of communication among young people (Latzko-Toth, 2010; Quan-Haase, 2007). A survey of American college students found that 86% used the Internet, and that college students are more frequent users of IM than the overall Internet population: whereas only half of all Internet users have ever sent an instant message, nearly three quarters of students have done so (Jones & Madden, 2002). In addition, data show that IM is used by a large percentage of the population. The 2009 Canadian Internet Survey reports that 83% use a SNS and 45% use IM (Statistics Canada, 2010). Likewise in Israel, the Internet has created a flexible and convenient way for individuals to form and maintain their social networks. According to a study of Internet use among young people in Israel, IM is the most frequent Internet activity, with 77% of high school students reporting using IM on a daily basis (Lamish & Ribak, 2007). According to that study, IM use was more popular with girls than boys, with 70% and 64%, respectively, making use of this method of communication (Lamish & Ribak, 2007). A study in Israel reports that among the population 36% use IM and 46% use a SNS (Mesch, Mano, & Tsamir, in press).

IM differs from other online textual communication channels, such as email and chat rooms. Firstly, IM users predominantly engage in messaging with known others. One-to-one and small group chat characterizes use in peer groups and the workplace, where IM is considered an essential communication tool. A study on IM communication among young and older adolescents found that IM communication was generally restricted to one's "real space friends," people who first met face-to-face in physical settings, such as school or summer camp (Grinter & Palen, 2002). Furthermore, in another study the amount of IM use was associated with perceived intimacy between friends (Hu et al.,

2004). The amount of IM use was positively associated with verbal, affective, and social intimacy, and frequent conversations via IM actually encouraged the desire to meet face-to-face.

Secondly, studies have shown that because of IM's positive network externalities,[4] the rate of adoption among peers grows exponentially by sheer in-group pressure. Hence, IM is well suited for the study of social ties (Wang, Hsu, & Fang, 2004). IM adoption is the outcome of a desire to conform to peers and to increase socializing opportunities with them, an integral aspect of belonging to an in-group and being socially accepted (Boneva et al., 2006; Grinter & Palen, 2002). Thirdly, the primary purposes of IM are informal talk and socializing (Jacobs, 2004; Lewis & Fabos, 2005; Roper & Kindred, 2004; Valkenburg & Peter, 2009). Since IM peers know each other and share experiences, the nature of their conversations is similar to those taking place in person: reflections on their day's events, gossip, including what clothes were worn and who was seen with whom (Grinter & Palen, 2002; Lewis & Fabos, 2005). Fourthly, IM is often used as an efficient channel for allowing multiple social network members to coordinate face-to-face meetings, ease communication, and increase social attention (Flanagin, 2005; Leung, 2001).

Methods

Data collection

The data collection took place in Canada and Israel between October 2005 and August 2006. Ethical approval was obtained before initiation of the study. With the exception of country-specific questions, the surveys were identical in the two countries, and included a name-generator procedure. Participants in Israel completed a paper-and-pencil questionnaire in Hebrew, and participants in Canada completed an online survey in English. In Canada, students were recruited through posters, which were displayed across the campus. Participation was voluntary. In Israel, the data were collected at three institutions of higher education. For the purposes of this study, a list of all courses offered at these institutions was compiled and a random sample of courses was selected for the study. Course instructors were contacted and asked for permission to administer the questionnaire to their students. The questionnaire was completed during class meetings.

The Canadian sample

In Canada, participants were undergraduate students at a large, research-intensive university in English Canada. The final sample consisted of 293 respondents. The mean age of respondents was 21 ($SD = 2.24$, age range = 18–34). We obtained a good distribution across year of enrollment: 17% in their first year, 23% in their second year, 34% in their third year, 20% in their fourth year, and 6% of students enrolled for more than four years. The majority of students were enrolled in social sciences and humanities (55%), followed by sciences (41%), and business (4%). The sample was computer savvy, with 44% having used a computer for 11 years or more, 42% for 7–10 years, and 13% for 4–6 years. The respondents reported spending long hours on the Internet, with 65% spending more than three hours a day online, 29% spending 1–2 hours a day online, and 6% spending less than an hour a day online.

The Israeli sample

The Israeli sample consisted of 492 participants. The average age of Israeli participants was 25 ($SD = 4.04$, age range = 18–32) and 51% were women. The participants were distributed as follows: 30% were first-year students, 36% second-year, and 33% third-year. University students were enrolled in the following programs: 45% in social sciences and humanities, 32% in natural sciences, and 25% in law. Most of the students were experienced computer users: 58% reported using the computer over more than 11 years, 33% using a computer for 4–10 years, and only 9% reported three years or less of computer usage. In terms of daily use, 43% reported using the Internet three hours a day and 31% reported four hours a day.

Measures

The two dependent variables examined in this study are dyadic, with the unit of observation being relational. We defined *i* as ego, the focal individual in the study, and *j* as the network contact listed in the name generator: $j = 1$ or 2. The first dependent variable measured the frequency of communication via IM for each pair (i, j) on an eight-point scale from 1 = "never" to 8 = "several times a day". The second dependent variable, IM topic multiplexity, measured the number of topics discussed by each pair (i,j), ranging from 0 to 11 topics. The measure of multiplexity was developed and tested in previous studies (Mardsen & Campbell, 1984; Mesch & Talmud, 2006). Respondents were provided with a list of 11 topics of conversation from which to choose, such as school, family, and personal. Positive responses were coded 1, and a scale was created based on the sum of all the topics discussed among each pair (i, j).

In Canada, $M = 6.03$ ($SD = 3.0$) for the first contact and $M = 4.94$ ($SD = 2.80$) for the second contact. The scale measures of reliability for Canada were $\alpha_1 = .88$ and $\alpha_2 = .84$ for the first and second contact, respectively. In Israel, $M = 4.25$ (SD=3.62) for the first contact and $M = 3.60$ ($SD = 3.64$) for the second contact. The reliability measures for the first and second contact in Israel were $\alpha_1 = .80$ and $\alpha_2 = .77$, respectively.

Individual-level variables

Demographic variables are the characteristics of the focal individuals (ego) that could predict the frequency of communication via IM and IM topic multiplexity. We included standard demographic characteristics, such as age, sex, and relationship status. The last was a dichotomous variable measuring ego's relationship status, with 1 = "single" and 0 = "in a relationship". Relationship was broadly defined and included dating (girlfriend or boyfriend), engaged, married, and common-law marriage. Single covered no relationship, separated, divorced, and widowed.

Two variables measured the extent of IM use. The first, number of regular IM contacts, was operationalized using an item asking for the number of individuals with whom the respondent engaged in regular IM conversations. Responses were coded on an ordinal scale from 1 = "none" to 7 = "60 or more", with higher values indicating a larger number of individuals on the active contact list (Canada: $M = 3.58$, $SD = 1.01$;

Table 1. Relationship type to instant messaging (IM) contacts: Israel ($N = 492$) and Canada data ($N = 293$)

	First IM contact		Second IM contact	
	Israel	Canada	Canada	Israel
Family	11%	16%	10%	20%
Close friend	48%	42%	44%	49%
Distant friends	23%	12%	35%	16%
Romantic partner	14%	21%	5%	6%
Online tie	4%	1%	6%	1%

Israel: $M = 4.30$ $SD = 1.20$). The second variable, hours of daily IM use, was operationalized by an item that measured how often respondents used IM on a daily basis. Responses ranged from 1 = "none" to 7 = "more than 15 hours", with higher values indicating greater use (Canada: $M = 2.97$; $SD = .84$; Israel: $M = 2.54$; $SD = 1.03$).

Relational-level variables

These are the characteristics of the ties that describe the nature of the relationship between *i*, the focal individual or ego, and *j*, the IM network contact or alter. Relationship type was measured by an item that asked the respondents to indicate for each of the two IM contacts listed in the name generator whether they were family members, close friends, distant friends (including fairly close friends and acquaintances), romantic partners, or online contacts. The variable was coded as a series of dummy variables and was entered into the models with the reference category "close friends" (see descriptives in Table 1).

We measured dyadic tie homophily for each *ij* pair by examining gender similarity and propinquity. We included gender similarity to determine whether same-sex pairs communicated differently from mixed-sex pairs. The latter were coded 1 and the former as 0. In Canada, for contacts 1 and 2, same-sex pairs constituted 50% and 60% of the responses, respectively, and in Israel, for contacts 1 and 2, same-sex pairs constituted 42% and 50% of the responses, respectively. Propinquity was measured by an item that asked the respondents to indicate whether the alter resided in the university dorms, in the same city of the university, or in another locality. Responses were coded 1 for dorms or the same city and 0 for another locality. The response "another locality" had further choices: within three hours from the university, another region in the same country, or in another country. In Canada, for the first and the second contacts, 51% and 47% resided in the same city, respectively; in Israel 41% and 37% resided in the same city, respectively.

Relationship duration was measured by an item asking respondents how long they had known each of the two contacts provided in the name generator. Responses were on a five-point scale: 1 = "less than five months", 2 = "6–11 months", 3 = "1–3 years", 4 = "4–6 years", and 5 = "seven or more years". Higher values indicated a longer

duration of the relationship (in Canada, $M_{i,1} = 3.61$; $SD_{i,1} = 1.31$ and $M_{i,2} = 3.64$; $SD_{i,2} = 1.27$; in Israel, $M_{i,1} = 3.54$; $SD_{i,1} = 1.16$ and $M_{i,2} = 3.59$; $SD_{i,2} = 1.18$).

Tie closeness can be measured in several ways, but Marsden and Campbell (1984) compared different measures and concluded that a self-assessment of closeness was the most useful determinant. Using a previously developed self-report item measuring closeness, participants could indicate how close they felt to each network member on a five-point scale from 1= "distant" to 5= "very close" (in Canada, $M_{i,1} = 4.70$; $SD_{i,1} = .57$ and $M_{i,2} = 4.48$; $SD_{i,2} = .68$; in Israel, $M_{i,1} = 4.54$; $SD_{i,1} = .65$ and $M_{i,2} = 4.31$; $SD_{i,2} = .72$).

Analytic procedures

To test Hypotheses 1–4, a generalized linear model (GLM) analysis was conducted for each country's sample, predicting IM dyadic communication frequency and dyadic topic multiplexity between the respondent and his or her first and second contacts (Cameron & Trivedi, 2010). As a result, our final sample size for Canada is $N = 526$ and for Israel it is $N = 654$.

Given that the dyadic relations between contact i and contact j are not independent observations from the relations between contacts i and k, we utilized a clustering procedure with Robust Standard Error Estimates (RSEs) to control for the dependence of the observations. In this way, we analyzed both contacts in a single model, controlling for joint variance resulting from the clustered contacts (Cameron & Trivedi, 2010; Mok, Wellman, & Carrasco, 2010; Wellman & Frank, 2001).

Results

Relationship type for the first and second contacts was similarly distributed in Israel and Canada (see Table 1). In both Canada and Israel, IM was used primarily to keep in touch with close friends. Almost half of the students in Canada reported that their first and second contacts were close friends (42% and 49%, respectively). Similar results were obtained in Israel (48% and 44%, respectively). In Canada, IM use was more frequent with family members than in Israel. In Canada, 16% of the first contacts and 20% of the second contacts were family members, whereas in Israel the results were 11% and 10%, respectively. Distant friends were named more often in Israel than in Canada: there were 11% and 19% fewer distant friends in Canada than in Israel for first and second contacts, respectively.

Overall, the results suggest that in Canada the vast majority of communication via IM is with close ties; by contrast, in Israel it consists of a mix of close and distant ties. In Canada, 58% of first contacts and 69% of second contacts were a family member or a close friend. In Israel, 71% of the first contacts and 79% of the second contacts were close or distant friends. A salient finding of the study is that in both countries the percentage of first and second contacts that the respondents had met online was quite small. It seems that communication via IM takes place primarily with individuals one has met previously face-to-face.

Table 2. Generalized linear model (GLM) results for the final models predicting frequency of communication via instant messaging (IM) for Israel and Canada

	Israel			Canada		
Predictors	β	RSE	z	β	RSE	z
Age	–.02	.01	–1.31	–.03	.02	–1.64
Gender (1 = male)	–.02	.11	–.23	–.05	.09	–.58
Relationship status (1 = single)	.10	.10	.96	0	.09	–.03
Gender similarity (1 = same)	.08	.08	–.96	.06	.10	. 57
Propinquity (1 = nearby)	.49***	.10	4.78	.70***	.08	8.13
Hours of daily IM use	.21***	.05	4.03	.34***	.05	6.40
Number of IM regular contacts	.31***	.05	6.27	.26***	.06	4.43
Online relationship	–.07	.26	–.25	.29	.26	1.10
Family	–.20	.17	–1.18	.19	.12	1.55
Distant friend	–.33*	.13	–2.54	–.37*	.14	–2.53
Partner	.34*	.16	2.14	.89***	.13	6.63
Close friend	—		—			
Duration of relationship	–.15**	.04	–3.28	–.04	.04	–1.07
Closeness	.43***	.09	4.70	.34***	.09	3.99
Constant	3.99***	.65	6.11	4.26***	.58	7.38
Adjusted *R* square	.32***			.40***		

Note. ***$p < .001$, ** $p < .01$, * $p < .05$, two-tailed.
RSE: Robust Standard Error Estimate

Table 2 presents the results for communication frequency via IM for Israel and Canada. Individual-level characteristics, such as age, gender, and relationship status, proved not to be associated with frequency of communication in either Canada or Israel. Hours of daily IM use was positively associated with frequency of communication via IM in both countries. The number of regular IM contacts was also positively associated with frequency of communication via IM both in Israel and Canada. Apparently, the larger the IM network of respondents, and the more they use IM, the more likely they are to communicate frequently with their first and second contacts via IM.

Surprisingly, there was no effect of gender similarity in either Israel or Canada, indicating no difference in frequency of communication between same-sex and mixed-sex dyads. This finding is probably the result of the age categories used, as it is known that in late adolescence the gender composition of friendship changes and the social network of both males and females become more integrated and less sex segregated.

In Canada and Israel, propinquity was positively associated with IM frequency of communication. If the residence of the contact was in the university dorms or the same city, frequency of communication was higher than in the case of contacts residing in another city or another country.

Results for relationship type showed a similar pattern for Israel and Canada. Relationship type predicted frequency of communication via IM: with a romantic partner communication was more frequent than with a close friend. By contrast, IM communication with a distant friend was less frequent than with a close friend. Finally, IM

Table 3. Generalized linear model (GLM) results for the final models predicting topic multiplexity for Israel and Canada

	Israel			Canada		
Predictors	β	RSE	z	β	RSE	z
Age	–.08*	.04	–2.25	–.09	.10	–.89
Gender (1 = male)	–.61*	.25	–2.44	–.74	.42	–1.8
Relationship status (1 = single)	.02	.25	.09	.07	.37	.21
Gender similarity (1 = same)	–.49*	.21	–2.22	.36	.34	1.08
Propinquity (1 = nearby)	.18	.22	.82	–.24	.33	–.74
Hours of daily IM use	.41**	.15	2.72	.63**	.24	2.65
Number of IM regular contacts	.34*	.14	2.47	.34*	.17	2.09
Online relationship	–1.17	.68	–1.74	–1.26	.71	–1.77
Family	–1.65***	.35	-4.64	–2.06***	.48	-4.31
Distant friend	–.89**	.27	–3.26	–.91	.52	–1.75
Partner	.05	.39	0.14	2.17***	.57	3.80
Close friend	—	—	—	—	—	—
Duration of relationship	.10	.11	.92	.39*	.15	2.51
Closeness	.96***	.17	5.60	1.38***	.29	4.78
Constant	2.0	1.23	1.62	6.33*	2.48	2.55
Adjusted *R* square	.23***			.23***		

Note. ***$p < .001$, ** $p < .01$, * $p < .05$, two-tailed.
RSE: Robust Standard Error Estimate, IM: instant messaging

communication with an online friend or family member was as frequent as IM communication with a close friend.

Relationship duration did not have an effect in Canada, but had a negative one in Israel, indicating that the longer the respondent had known the contact, the less frequently they communicated. This finding suggests that long-term friends in Israel were part of the IM network, but they were not necessarily contacted as frequently as friends the respondents had met more recently.

Tie closeness was positively related to the frequency of IM communication, a finding that held for Canada and Israel alike, suggesting that the effect of tie closeness is independent of type of relationship.

Table 3 presents the GLM results for IM topic multiplexity for Israel and Canada. As with frequency of communication, relationship status was not associated with IM topic multiplexity in either Canada or Israel. However, age and gender were negatively associated with IM topic multiplexity in Israel. In Israel, older respondents shared fewer topics via IM with their contacts than younger respondents. In addition, males discussed fewer topics via IM with their contacts than did female participants. No association was found with these variables in Canada.

Number of regular IM contacts and hours of daily IM use were both positively associated with IM topic multiplexity in Canada and in Israel. This finding suggests that IM topic multiplexity, like frequency of IM communication, is dependent on how extensive one's contact list is and how often one contacts the people on it.

Gender similarity was not associated with IM topic multiplexity in Canada, but had a negative association in Israel. This finding suggests that in Canada same-sex and opposite-sex pairs discuss diverse topics to the same extent, whereas in Israel same-sex pairs are less likely than opposite-sex pairs to discuss a diverse set of topics. Unlike frequency of communication, propinquity had no effect on topic multiplexity. Hence, the distance between communication partners is no deterrent to the discussion of diverse topics, but it reduces the frequency of communication.

Type of relationship had an effect on IM topic multiplexity. In Canada and Israel, family was negatively associated with topic multiplexity. In Canada, romantic partners were positively associated with IM topic multiplexity, whereas no association was observed in Israel. In Israel, distant friends showed a negative association with IM topic multiplexity, indicating that fewer topics were discussed with these ties than with close friends. In the Canadian data set, distant friends had no association with IM topic multiplexity. No association with IM topic multiplexity was observed for online relationship for both Israel and Canada.

As in the analysis conducted for communication frequency, we included tie closeness and relationship duration in the second model. In both countries perceptions about tie closeness were positively associated with topic multiplexity. Relationship duration was positively associated with multiplexity only in Canada. This finding suggests that in Canada the amount of time one has known a communication partner has an impact on the diversity of topics discussed, but this is not the case in Israel.

Discussion

In this paper, we contribute to the body of research examining the uses and social consequences of IM. We expand previous studies by integrating individual, relational, and cultural factors into the analysis. The most salient result of this study is the explanatory power of relational variables in the understanding of the use and content of IM. The current study provides strong support for the argument that online communication is used primarily, but not exclusively, to maintain existing ties rather than to develop new ties. Furthermore, communication patterns and topic multiplexity are largely embedded in local contacts and strong ties, with individuals one already knows and with whom one has a close relationship.

The systematic cross-country comparison of the manners in which young people have integrated IM into their communication repertoire provides new insight into the ways in which relational variables affect online communication and advances social network theory in three ways. Firstly, the results corroborate a general claim of network theory that relational variables are better predictors of breadth and depth of communication. As in face-to-face communication, we found that perceived offline tie closeness is a strong predictor for both IM communication frequency and IM topic multiplexity.

Secondly, our study makes an additional important contribution to social network theory by examining how propinquity relates to IM communication frequency and IM topic multiplexity. For both Canada and Israel, the association between propinquity and IM communication frequency was positive. When contacts live near one another, they

tend to communicate more often. Even for online relations, distance continues to constrain communication frequency.

While the research on propinquity has been extensive, our study adds to this body of work by showing how distance affects frequency of communication and type of communication differently. We found no effect of propinquity on IM topic multiplexity in either country. Hence, our findings suggest that distance affects the frequency with which individuals communicate, but it does not affect the diversity and complexity of their IM communications.

Thirdly, our study expands on existing social network theory by showing that in online social relations homophily does not predict communication frequency or topic multiplexity (as Hypothesis 2 was not supported). In addition, in neither Israel nor Canada did we find an association between gender similarity and frequency of communication via IM.

Fourthly, a key finding of the present study is the association between relationship type and tie closeness with the dependent variables (communication frequency via IM and IM topic multiplexity). IM communication was less frequent with distant friends than with close friends, and was more frequent with romantic partners than with close friends. Family members and close friends were contacted equally frequently, suggesting that these individuals represent important relationships for communication partners. Consequently, relationship type seems to create a social distance hierarchy, represented in communication frequency. In addition to type of relationship, tie closeness also predicts communication frequency, with close ties communicating more frequently than loosely connected ties. Similar patterns emerge with regard to the number of topics discussed. We discuss each of the findings in more detail below.

Overall, this study demonstrated the analytical efficacy of using social network theory to examine online patterns of communication on a relational level. We showed that the social organization of tie formation and maintenance predicted IM communication patterns over and above individual and cultural factors.

Relationship type and duration

Topic multiplexity is a measure of the extent of relationship development and thus reflects the level of intimacy and confiding that exists between ties. We find that IM communication is used to support intimacy and closeness mostly among romantic partners and close friends. In this study, tie duration is associated with IM topic multiplexity only in the Canadian sample, not in the Israeli sample. One possible explanation for this discrepancy is consistent with previous studies that found that the main use of IM is for socializing, event planning, and meeting new people (Flanagin, 2005; Grinter & Palen, 2002). In that sense, it seems that regardless of relationship duration, IM is used more for instrumental purposes (i.e., coordinating activities and scheduling meetings) than predictive purposes (i.e., companionship and social support). This distinction in use may explain the non-significant effect of relationship duration on frequency of communication.

Tie closeness

Perceived tie closeness was associated with both communication frequency and IM topic multiplexity. This finding is in accord with the results about relationship type, indicating

that people who are close to each other are more likely to communicate online than people who are only loosely connected. This finding has an important theoretical implication, because it provides direct support for the Internet social integration hypothesis. According to this theoretical perspective, online communication is not conducive to the development of strong ties, but rather supports existing offline relationships (Mesch & Talmud, 2010).

Tie homophily

A surprising finding was the lack of association between gender homophily and frequency of communication, which may reflect either the unique composition of the sample or the particular nature of IM as a medium. Most likely this "non-finding" is the result of the age categories used, as it is known that in late adolescence the gender composition of friendship changes and the social network of both males and females becomes more integrated and less sex segregated (Ibarra, 1992; Miller-McPherson & Smith-Lovin, 1986; Miller-McPherson et al., 2002; Moore, 1990; Sippola, 1999).

Still, even for employed adults, when age and structural characteristics are controlled for, gender differences in network composition are virtually non-existent (Moore, 1990). The personal networks of men and women often differ in composition, with women's networks being comprised of family and men's of non-kin, especially co-workers. These gender differences largely arise not only from personal preferences for same-sex homophily, but also from the dissimilar social structural locations, or foci or activity, of men and women, leading in turn to distinct opportunities for and constraints on the formation of close personal ties. Most gender differences in network composition disappear or are considerably reduced when variables related to employment, family status, and age are controlled for (Moore, 1990). Kossinets and Watts (2009) found that the propensity for forming ties is heavily biased not only by individual preferences, homophily, and transitive relations, but also predicted by the selection of similar individuals to structurally proximate positions.

Tie propinquity

Even though IM is a communication channel well suited for long-distance communication and for the maintenance of weak ties, we found that a large proportion of IM communications were conducted with close and local friends. This result is counterintuitive, because IM's low cost relative to those of the telephone and cell phone would suggest that it is a good medium for overcoming the constraints resulting from distance.

In this sample, the age range and the span of interests are relatively narrow. As noted, this sample was limited to college students. A college is a foci of activity, exposing young men and women to one another during classes, homework, and other school-related activities. IM can be used to coordinate activities that must be done together, often regardless of the extent of preference for same-sex or cross-gender communication. A recent study that investigated the association of ethnic/racial homophily and propinquity on the social network structure of college students as reflected in Facebook, found that propinquity, based on shared academic foci or co-residence, was at least as important for the generation of the overall network structure as homophily (Wimmer & Lewis, 2010).

Indeed, in our study propinquity was associated in both countries with frequency of communication, corroborating with Wimmer and Lewis' (2010) findings. Despite the availability of online communication and the countries' differences in size, IM was used to a large extent for local communication. Living in the same city as that of the contact increased the frequency of communication. One plausible explanation is that propinquity provides an easy social context for communication with individuals living nearby who have more social interaction offline, and hence more shared experiences. Thus, online communication is integrated into everyday life and serves to supplement face-to-face meetings and fill communication gaps. By contrast, findings also suggest that distance has an effect on how often we communicate, but does not have a pronounced effect on IM communication richness, breadth, or complexity.

Differences and similarities between Canada and Israel

The goal of this study was to examine how cultural differences and similarities between Canada and Israel affect IM communication patterns. Firstly, the results show that young people in both countries have strikingly similar patterns of usage. Participants in both countries indicated that their primary communication partners to be close friends, and family members. Contacts who met online were rare in both countries, suggesting that IM is used to maintain existing relationships rather than to generate new online ties.[5] A more important finding is the strikingly equivalent patterns of association found between social and physical distance and communication via IM. This finding is particularly relevant considering the geographical and cultural differences between the two countries.

Secondly, Canada is a more individualistically oriented country than Israel, as is evident in the differences in their scores on the Hofstede's IDV. Thirdly, differences exist in the demographic composition of the two college populations. In Israel, students tend to enroll in colleges near their hometowns. A recent study of the student population in Israel found that students are more likely to choose a college or university close to their permanent residence than to move to another region of the country (Kranzler, 2010). In Canada, university enrollment often implies leaving one's hometown, and moving to a higher education institution situated a long distance from family and friends. The finding that in Canada there was more use of IM in order to stay in touch with family members than in Israel reflects these differences in school location.

Another important difference is that Israeli students are, on average, four years older than their Canadian counterparts, as some of the Israeli Jewish students enroll in school after having served in the conscription army. In addition, Israeli students face a somewhat truncated academic year, due to reserve army duty. Still, the key finding is that despite the significant differences between the two countries, overall relational patterns have strikingly similar effects on IM communication ties in both countries.

Future research

By comparing two dissimilar countries we showed, on the one hand, the remarkably similar communication patterns between young people in Canada and Israel and, on the other hand, some fundamental differences in terms of the impact of relationship type and

tie duration, gender dynamics, and age. To further investigate the effect of cultural factors on IM communication patterns, future research can expand the findings by conducting more systematic and extensive cross-country analysis. These types of comparative studies will enable researchers to decompose individual, relational, and cultural-level effects.

Rather than examining individual-level variables alone, future studies should continue to rely on relational variables (Emirbayer, 1997; Kadushin, 2011; Rainie & Wellman, 2012; Wasserman & Faust, 1995). In this study, we showed that online communication patterns are embedded in the patterning of social ties and social networks, over and above individual attributes and cultural differences. More specifically, we found significant effects of the key relational variables, such as tie closeness, tie propinquity, and tie duration, on communication patterns. Future research should include other variables, such as information uncertainty, information management, disclosure patterns, relational influence, supportive messages, and identity management.

The digital communication ecology has become complex in recent years with the increase in the use of SNSs. Are the results of this study relevant for individuals using SNSs (e.g., Facebook)? Our research does not allow answering this question, but a number of studies suggest that the principles of use of Facebook and IM for interpersonal communication are similar. In line with our findings, most Facebook social interactions were found to be conducted with members of the face-to-face network and others that are similar in terms of age, gender, and residence (Subramayan, Reich, Waechter, & Espinoza, 2008). A study that examined the uses and gratifications of the use of IM and Facebook concluded that both IM and Facebook possess a similar factor structure, suggesting that they have very similar uses and fulfill similar communication and socialization needs (Quan-Haase & Young, 2010). In the study, IM and Facebook are seen as important tools for feeling involved with friends' lives and keeping up-to-date with their activities. Sociability is a central gratification obtained from both forms of social media. Yet, future studies need to conduct further tests on the generality of our findings to new channels of online communication.

A fruitful prospective avenue of research should be cross-level analyses, enabling decomposing observed variation in IM communication patterns into cultural, relational, and individual levels (Wellman & Frank, 2001). In particular, studying the interaction between cultural, relational, and individual levels is especially interesting (Kossinets & Watts, 2009; Wimmer & Lewis, 2010). As this study is limited to college students, future studies need to examine the development of IM relational patterns over the life course. Finally, as the present study focused on IM, future studies should compare other media types, such as Facebook, Twitter, and mobile text-messaging devices.

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Notes

1. Canada and Israel are considered countries with high immigration, internal multi-cultural diversity, whilst demonstrating strong sedimentation and "founding effects" of the dominant cultures and on the prevailing institutionalized norms and values of each country.
2. Source: http://www.geert-hofstede.com/hofstede_dimensions.php.
3. The internet penetration rate corresponds to the percentage of the total population of a given country or region that uses the Internet. Only countries with a penetration rate higher than 50% qualify for this list. At present only 58 countries or territories meet this condition, out of the 273 countries and territories logged by Internet World Stats (http://www.Internetworld stats.com). The Internet penetration rate is update for 2009.
4. For every user, the value of IM usage directly increases when the size of the network grows.
5. See Mesch and Talmud (2010).

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