Computer-mediated communication and the reduction of prejudice: A controlled longitudinal field experiment among Jews and Arabs in Israel

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ABSTRACT

The promise of computer-mediated communication (CMC) to reduce intergroup prejudice has generated mixed results. Theories of CMC yield alternative and mutually exclusive explanations about mechanisms by which CMC fosters relationships online with potential to ameliorate prejudice. This research tests contact-hypothesis predictions and two CMC theories on multicultural, virtual groups who communicated during a yearlong online course focusing on educational technology. Groups included students from the three major Israeli education sectors—religious Jews, secular Jews, and Muslims—who completed pretest and posttest prejudice measures. Two sets of control subjects who did not participate in virtual groups provided comparative data. An interaction of the virtual groups experience × religious/cultural membership affected prejudice toward different religious/cultural target groups, by reducing prejudice toward the respective outgroups for whom the greatest initial enmity existed. Comparisons of virtual group participants to control subjects further support the influence of the online experience. Correlations between prejudice with group identification and with interpersonal measures differentiate which theoretical processes pertained.

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1. Introduction

Research on social impacts of Internet communication presents conflicting conclusions regarding the extent to which computer-mediated communication (CMC) facilitates or discourages positive social interaction in a variety of contexts. Ongoing conflicts over CMC's potential to reinforce stereotypes (Epley & Kruger, 2005) or reduce them (Walther, DeAndrea, & Tong, 2010) show that CMC's capacity to affect impressions and relations is not yet well-understood. Nowhere may this capacity be more critical than in the use of CMC to reduce prejudice. Scholarship addressing CMC and prejudice reduction (e.g., Amichai-Hamburger & McKenna, 2006) suggests that the Internet may foster salutary intergroup contact in small, diverse collectives by facilitating a number of conditions associated with Allport's (1954) contact hypothesis. Yet of the few implementations of CMC among Israeli sub-groups in conflict, for example, the results are contradictory (see Amichai-Hamburger, 2012).

In offline settings, abundant evidence supports the contact hypothesis: Interaction among members of oppositional groups stimulates affable interpersonal relations between individual group members, ameliorating stereotyped impressions of others and leading to a reduction of prejudice toward the groups as a whole. Meta-analyses of the hypothesis indicate robust, albeit modest effects (R^2 = .05), and support a number of facilitating conditions associated with the basic contact framework (Pettigrew & Tropp, 2006; Pettigrew & Tropp, 2008). Despite the relatively small effect across studies, observers recently suggested that the contact hypothesis is so strongly established, future research need not demonstrate whether it operates but should focus on how various communicative influences and channels may or may not affect it (Harwood, Hewstone, Amichai-Hamburger, & Tausch, 2012).

These observers identify communication channel, and CMC in particular, as one such factor deserving scrutiny. They note that Pettigrew and Tropp's (2006) meta-analysis excluded tests of extended cross-group friendship precisely because they do not

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involve face-to-face contact. We still know relatively little about mediated contact's potential effectiveness. Despite positive anecdotal reports from some cases of online intergroup interaction (Hoter, Shonfeld, & Ganayem, 2009; see for review Amichai-Hamburger, 2012), inconsistent results from a few empirical studies do little to settle the question. This may be because few CMC prejudice reduction efforts have focused on specific factors from various CMC theories that explicitly address online relationships, such as group identification or extended time and ongoing interaction.

Not only is the potential of CMC for intergroup prejudice reduction an important practical concern, it serves an important theoretical interest by providing a critical test-bed for the evaluation of alternative theories of CMC. For instance, Amichai-Hamburger and McKenna (2006) have suggested that the social identification/deindividuation, or SIDE model of CMC (see for review Postmes & Baym, 2005) can explain how visually-anonymous CMC groups reduce prejudice online. Other researchers have argued that SIDE involves certain theoretical stipulations that actually prevent its useful application in intergroup reconciliation, and that the social information processing (SIP) theory and hyperpersonal model of CMC can more readily integrate with the intergroup contact hypothesis to effect prejudice reduction through extended online interactions (Walther, 2009a). This study empirically tests not only the practical potential of CMC in prejudice reduction, but also the applicability of these different CMC theories with which to explain the effect.

This research is also distinctive from many other contact hypothesis studies in other respects. First, the members' constituencies included three religious/cultural affiliations, whereas most research on intergroup encounters involves only two social subgroups. Second, participants' discussions were not deliberately focused on political conflict or intercultural differences (although they were free to do so incidentally; see Wojcieszak & Mutz, 2009); their interactions took place in the context of an online course in which they collaborated on educational technology assignments. Third, the contact period was extensive, facilitating longitudinal analysis. Whereas the clearest demonstration of prejudice reduction should exhibit changes between pre-contact and post-contact attitudes, most contact hypothesis research employs only cross-sectional surveys or one-shot experiments, to which the present study is an exception. Fourth, the study also included a post-test control group to strengthen its causal claims and increase its immunity to validity threats that accompany many longitudinal studies.

This quasi-experimental study involved Israelis from three different religious/cultural sectors—religious Jews, secular Jews, and Arab Muslims—working with one another in small groups via web-based computer conferencing over the course of an academic year. The findings indicate reduction in prejudice regarding the cultural outgroups toward which individuals' initial attitudes were initially most unfavorable, lending general support to CMC's potential for actuating Allport's (1954) contact hypothesis. The article concludes with a discussion of the potential disruption of the study by societal events, methodological limitations, and observations on the nature of CMC research.

1.1. Intergroup contact

Israel is home to a diverse and divided citizenry. Its major groups include Arabs (20.3%), Christians (4.2%), and a Jewish majority (75.5%). The Jewish population is, itself, comprised of different sects and subsets (Shonfeld, Hoter, & Ganayem, 2012), among whom differences and tensions between religious Jews and secular Jews are widely recognized (Ravitzky, 2000). Intercultural and political enmity among all of these groups is based upon

stereotypes and reinforced by relative segregation of groups from one another. As a result, "Secular Jews (are) anxious about collaborating with both orthodox Jewish students and Arab students, who look different and espouse different religious beliefs" (Hoter et al., 2009, n.p.). The construction of the educational system institutionalizes this separatism. Israeli state education is divided into three distinctive sectors, administered separately, which reflect different ethnic and religious affiliations: secular Jewish, religious Jewish, and the Arab sectors (IMPACT-SE, 2000). "Consequently…students from different educational streams seldom have the opportunity to meet or interact. As a result, in this conflict-ridden society, in which daily occurrences and events often serve to further divide rather than to unite, mutual stereotypes are reinforced" (Hoter, Shonfeld, & Ganayem, 2012, p. 16).

Numerous encounters designed to reduce prejudice among these groups exist (see Maoz, 2011), and most of these efforts draw on Allport's (1954) contact hypothesis framework: Because prejudice against groups other than one's own is based on stereotypes about those groups, the framework argues, contact among members of different groups stimulates interpersonal relationships between group members. Interpersonal contact facilitates information exchange about individual participants and knowledge about them, leading to more accurate and favorable impressions of specific outgroup members (see for review Stephan & Stephan, 1984), dissipation of stereotypes, and a reduction of prejudice toward the outgroup as a whole. Meta-analyses conclude that intergroup contact reduces prejudice, and they further support a number of conditions proposed by Allport (1954) that enhance the effect (e.g., equal status in encounters, common goals, and institutional support; Pettigrew & Tropp, 2006, 2008). The viability of intergroup contact in CMC interaction, however, remains debatable.

1.2. Online contact

Arguments both for and against the use of CMC in intergroup contact appear in the literature. On the optimistic side, CMC offers certain logistical and psychological advantages over face-to-face (FtF) interaction. Logistically, CMC may facilitate contact between conflicting groups who frequently avoid FtF interaction, and for whom institutional, geopolitical, and informal divides reduce FtF contact. Equal status in FtF contact is inhibited by culturally-proscribed dress and the unavailability of acceptable food in another group's locales (Amichai-Hamburger & McKenna, 2006). Psychologically, individuals often experience anxiety in FtF meetings with outgroup members (Stephan & Stephan, 1984). The use of CMC can reduce these logistical and psychological difficulties. Individuals from different sectors can meet online from the comfort of their own locales, and CMC masks the visual cues that connote disparate group memberships in FtF interaction. In light of these factors, researchers have suggested that Internet-based communication might facilitate intergroup contact even more successfully than FtF contact. A general hypothesis reflecting these contentions states,

H1. *Participation in multicultural virtual groups causes a reduction in individuals' prejudice over time toward the religious/cultural outgroups that their small group partners represent.*

On the pessimistic side, contact hypothesis research has generally assumed that intergroup encounters might occur through direct FtF interaction. Aronson and Patnoe (1997) asserted that the positive socioemotional communication that facilitates cooperation requires FtF communication. Early CMC research mirrored the assumption that the medium's lack of nonverbal cues occludes socioemotional content (see Rice & Love, 1987), a notion that still emerges in the literature today (e.g., Sprecher, 2014).

Previous empirical research involving CMC interventions among Arabs and Jews is also conflicted. Mollov and Lavie (2001) hosted email exchanges between Israeli and Palestinian students that focused specifically on Jewish and Islamic religious practices. The dialogues helped to surface commonalities and build Israeli–Palestinian understanding. Oren, Mioduser, and Nachmias (2002) studied the development of social climate in online learning groups that involved teachers and students from Jewish and Arab Israeli high schools and colleges. The social climate was stronger for online students, and interpersonal acquaintances became more intimate over time online than they did among students in a comparable FtF environment. In contrast, online group discussions among Jews and Palestinians focusing on issues related to their asymmetrical, ongoing political and social conflict did not abate intergroup hostility. In studies using real-time CMC chat, the channel appeared to exacerbate divergent argument styles that typify Israeli Jewish and Arab cultures, which increased rather than decreased tensions between participants (Ellis & Maoz, 2007; Maoz & Ellis, 2008). Different CMC theories offer divergent explanations for the mixed findings to date.

1.3. Theories of CMC

1.3.1. Social identification/deindividuation model of CMC

The SIDE model predicts that, when CMC users are visually anonymous and they identify themselves and others via salient social groups and categories, they exhibit social identification. Social identification, in turn, creates attraction toward ingroup members as a collective, and disdain for outgroup members (see Postmes & Baym, 2005, for review). This form of social attraction is generalized attraction to the group; members do not relate to each other on the basis of individual, interpersonal relationships when operating in social identification.

This aspect of SIDE may offer advantages in groups of diverse members, as seen in small group experiments involving actual or seemingly intercultural participants. Research initially predicted that, within a single online group, subgroups of geographically and culturally similar members would dislike culturally dissimilar (outgroup) participants. However, results showed more positive than negative appraisals of ostensible outgroup members (Lea, Spears, & de Groot, 2001). This led to a re-articulation of SIDE theory suggesting that CMC users identify with their entitative, interacting virtual group, and remain oblivious to the potential external, intergroup categories that its members otherwise represent. This dynamic, Amichai-Hamburger and McKenna (2006) suggested, may reduce prejudice in multicultural Jewish/Arab online groups by distracting members from their partners' offline constituencies and focusing identification and attraction toward the virtual group itself. Although it did not focus on prejudice reduction, a field study by Mortensen and Hinds (2001) demonstrated that the more that distributed work groups shared a common group identity, the less conflict they experienced and the less disruption they experienced due to the use of telecommunication. A SIDE-based hypothesis for the reduction of prejudice in virtual groups suggests,

H2a. *Prejudice reduction is associated with social identification in virtual groups.*

Although the SIDE approach to prejudice reduction has not been subjected to direct empirical assessment, it received a critical conceptual appraisal (Walther, 2009a) regarding its fit with the requirements of Allport's contact hypothesis and research that extended that model. The contact hypothesis requires that members of different groups develop an interpersonal relationship sufficiently intimate that they recognize one another's idiosyncracies, and thereby dismiss the stereotypes they previously held about outgroup members. The SIDE model explicitly excludes the development of interpersonal knowledge during online interaction and considers it a barrier to social identification (Postmes & Baym, 2005). Likewise, the form of attraction that SIDE dynamics promote—generalized liking toward the group—differs from the kind of personal relationship that the contact hypothesis specifies.

Finally, the matter of outgroup cognizance clouds the issue. Research on the contact hypothesis by Hewstone and Brown (1986) found that, in order for a pair of intergroup partners to go beyond individual liking and to reduce prejudice toward their partners' entire social group, individuals must remain cognizant that their partner really is a member of the outgroup (and not an exception to it). If CMC dynamics occur as stipulated by SIDE, focusing attention and attraction to the interacting group as a whole, keeping members from focusing on the fact that they are from different religious or ethnic groups, they should not experience outgroup cognizance that is necessary for prejudice reduction. In other words, if SIDE dynamics are aroused and if they provide an accurate account of online group cognition and behavior, the contact hypothesis' theoretical requirements cannot be met, and the prospects for prejudice reduction are doubtful.

1.3.2. Social information processing and hyperpersonal models of CMC

Another approach to online relations in CMC focuses on interpersonal attraction and relational communication. The SIP theory proposes that CMC users overcome the lack of nonverbal cues online by adapting their expressive messages through variations in verbal content and style, and with time enough to exchange sufficient messages, they are able to develop interpersonal attraction and relationships among one another (Walther, 1992). Moreover, the hyperpersonal model of CMC, which builds upon SIP's notion of linguistic adaptation, suggests that users exploit the medium's capacities in order to exchange impressions and relational communication even more favorable than FtF communication affords (Walther, 1996). Users can plan and edit their messages so that they express desired characteristics. Receivers may gain more positive impressions of their partners on the basis of these messages, and reciprocate them through progressive interactions over time. This cycle leads to relationships reflecting greater affection and attraction than individuals would be expected to develop offline. This development takes time, however, in which CMC users anticipate mutual interdependency and exchange sufficient messages with which to enact these relationships.

In addition to numerous laboratory studies, the SIP and hyperpersonal predictions have been verified using multicultural, international (but not hostile) online groups involved in task-oriented discussions and educational activities (see for review Walther, 2011). These include field experiments involving both group-based and interpersonally-based factors that interacted to produce heightened attraction in CMC (Walther, 1997). Other studies with both group and interpersonal effects on positive online relations and conflict reduction include Jarvenpaa and Leidner's (1998) work on globally-distributed student teams, in which communication frequency correlated with trust over an extended period of time. From a SIP perspective,

H2b. *Prejudice reduction is associated with interpersonal attraction and relational communication.*

2. Method

In order to examine CMC's potential for the reduction of prejudice, and to assess the conflicting premises of the SIDE and SIP models in this domain, the present research employed multicultural groups of six college students. Each group contained two stu-

dents from each of the three religious/cultural sectors, who worked together online completing collaborative projects for a period of an academic year.

2.1. Setting: the inter-college multi-cultural course on ICT in teaching

The course, entitled "Advanced Educational Environments," was taught in parallel at nine Israeli teachers colleges, including three colleges from each religious/cultural sector (i.e., secular Jewish, religious Jewish, and Arab). The participants worked in small multicultural groups of six members. Each group's members came from different colleges, and every two colleges represented in each group were affiliated with one of the three respective religious/educational sectors.

The course activities focused on the use of computerized tools and online teaching methods. Students worked on collaborative projects online using both synchronous chat and asynchronous text-based discussion boards embedded in a web-based courseware system, Highlearn. The online activity followed an initial face-to-face meeting within each respective college in which lecturers oriented students to the course and prepared students for the online modules that would involve students from other colleges and sectors. A complete description of the curriculum and assignments that required students' interaction appears in Hoter et al. (2009).

The course design incorporates several principles derived from the contact hypothesis conditions, based on the TEC Model (a pedagogical model for trust-building developed by the Center for Technology Education and Cultural Diversity; see Hoter et al., 2012). Participants had equal formal status; instructors (themselves collectively multicultural) minimized informal differences that might arise due to variation in Hebrew fluency or ICT skill. The course had institutional support, a factor that Allport (1954) recommended but one which is seldom researched (Harwood & Joyce, 2012); credit was administered at each college, and the heads of the colleges publicly endorsed the course and the Center for Technology and Multiculturalism that facilitated it (http://www.youtube.com/watch?v=6XndCPNWD1c). The curriculum incorporates cooperative pedagogies (see Ligorio & Veermans, 2005) that facilitate contact-hypothetic dynamics (see Shonfeld et al., 2012.

The course also provided sufficient time and interaction opportunities for the SIP and hyperpersonal models to adhere, as well as the visual anonymity required by SIDE, at least up to a critical point. Interactions took place online among the same groups of students over a long-term period, an entire academic year, consistent with previous research indicating that long-term (rather than short-term) virtual groups develop interpersonal acquaintanceships and positive relationships over time. The course also involved two FtF gatherings among many of the students. The first occurred after the first semester, when a number of the students attended a one-day conference with guest speakers. Although culturally-distinctive codes of dress were apparent, previous research (see Hoter et al., 2009) indicates that, by that point, the relationships that group members developed online became primary, and the physical awareness of members' cultural differences provide interesting facets of their successful collaboration. Amichai-Hamburger and McKenna's (2006) application of SIDE argues for this very kind of transition. An analysis of the posttest measures discussed below revealed no effects on final prejudice level whether one attended or did not attend the mid-year meeting, $F (1, 44) = .11$, nor was there a significant interaction between religious group and meeting attendance, $F (2, 44) = .52$, on posttest prejudice levels. After administration of the posttest, a final FtF meeting took place for students to socialize and present group projects.

2.2. Research design

The dependent variable was prejudice toward each religious/cultural group, measured using a self-report questionnaire. The research model therefore involves assessment of difference in prejudice taking into consideration not only the repeated measurement due to time/experience in the virtual group—the primary hypothesized causal factor—but also taking into account the measurement of participants' prejudicial attitudes repeated across each target group. We also compared participants' prejudice toward each target group with responses to the same measures provided by control subjects, who did not experience the virtual groups, which provided important benchmarks and comparisons discussed below. Finally, we examined potential correlates with prejudice reduction due to social identification or interpersonal/relational communication and interpersonal attraction.

2.2.1. Experimental participants and classification

Although many individuals initially participated in the course and completed at least one questionnaire on a voluntary basis, the final analysis included $N = 71$. Because the analysis requires comparisons of subjects' questionnaire responses at two points in time (pretest and posttest), analysis is limited to individuals who completed both these administrations.[1] Some students dropped the course during the year. Others completed no questionnaires, or declined to provide demographic data that were necessary for the analyses that follow. All students who completed the course participated in the multicultural virtual groups; control subjects (described below) did not, and are not included in the analysis of the first independent variable. This variable is a 2-level within-subjects term representing the experience of participating in the multicultural virtual groups: It represents the repeated measurement of prejudice using pre-test and post-test scores, once before student participants engaged in online multicultural groups, and once at the end of the year when they completed the group experience, and it is repeated again (another within-subjects term) for each participant's ratings of religious Jews, secular Jews, and Arabs.

A 3-level (between-subjects) variable was the participant's religious/cultural group: religious Jew, secular Jew, or Arab. As noted above, there is a recognized differentiation between religious Jews and secular Jews in Israel, although not generally among Arab Muslims despite their potential variation in religiosity (Ravitzky, 2000). In order to subclassify Jewish participants, we used a similar approach to that of the Israeli census (Central Bureau of Statistics, 2010): One question asked for participants' religion, and a second question asked "How religious?" with optional responses scaled as 1 = "very religious," 2 = "religious," 3 = "traditional," 4 = "not religious," and 5 = "not at all religious"; the Israeli census collapses the latter two categories. Jewish subjects were classified as religious Jews who indicated "very religious," "religious," or "traditional"; those indicating "not religious" or "not at all religious" were considered secular Jews for the analyses that follow. Among those who provided sufficient data for analysis, 17 individuals were classified as religious Jews, 23 were secular Jews, and 31 were Arab Muslims. Christian, Druze, and Bedoin identifications were infrequent and were not included in the final N. Twenty percent identified themselves as male, and 80% were female. Ages ranged from 19 to 54, $M = 26.3$, $SD = 6.98$, $MDN = 25$.

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[1] Analyses assessed whether the subset of participants who completed both the pretest and posttest measures (and were therefore included in the present analyses) differed from students who completed only the pretest or students who completed only the posttest. Pairwise t-tests revealed no differences between scores of pretest-only subjects to the pretest scores of participants who completed both measures. Likewise, no differences arose comparing the posttest scores of those who completed the posttest only to those who completed all measures.

2.2.2. Dependent measures and pretest–posttest research design

The primary dependent measure with which to assess prejudicial attitudes toward different respective religious/cultural groups was adapted from previous research by Mollov and Lavie (2001). Their questionnaire was originally developed for Israeli Jews and Palestinians (rather than Arab Israelis), and items focused only on respondents' respective outgroup. Moreover, many questionnaire items made specific reference to "territories" and geopolitical borders that are not relevant to the populations involved in the present study. Therefore, a subset of 3 items from Mollov and Lavie's scales were employed. Questionnaires measured participants' attitudes in regard to each of the three major religious/cultural groups, including their own. Therefore, each participant completed each rating three times, once for each religious/educational sector. The items were presented as 5-interval scales, and scored in such a way that lower scores indicated less prejudice. Samples of specific items include "To what extent are you willing to meet… (Arabs, religious Jews, secular Jews)?" "Would you be willing to visit…?" and "Are you willing to help…?". Reliability assessments were conducted for the attitudes toward each sector, using all subjects' pretest scores and, separately, posttest scores. The results indicated acceptable reliability for both pretest and posttest administrations, targeting Arabs (pretest $\alpha = .79$, posttest $\alpha = .83$), religious Jews ($\alpha = .86$, .88), and secular Jews ($\alpha = .81$, .83). Demographic data (and other measures to be reported elsewhere) were also collected. A mid-term questionnaire was also presented although that instrument did not assess the variables analyzed in this report.

The comparison of posttest to pretest prejudice scores facilitates what Campbell and Stanley (1966) described as a *one-group pretest–posttest design*. This type of design is useful for detecting changes on some characteristic due to an intervening experimental treatment, although it is also prone to a number of threats to validity, among which are threats from non-random sampling and non-random assignment of treatment subjects to experimental conditions. This raises the possibility that participants may differ in some respect from the general populations to which they are expected to generalize, which may be likely when subjects volunteer as they did in the current study. Additionally, the effect of the experimental treatment (the multicultural virtual group experience) may also be confounded with potential effects of history or other threats to internal validity associated with this design. To address these issues, dependent measures were also administered to two additional groups of control subjects.

2.3. Control subjects and quasi-experimental research design

In addition to the subjects' pretest and posttest measures, the dependent measures were completed by two independent samples of control subjects, once coinciding with the pretest and another with the posttest. Because these control groups were not comprised of the same individuals both times (obviating a pretest–posttest control group design), their functions in the analyses are limited but nevertheless quite important. The first control group provided baseline comparisons with course participants about attitudes toward the three different religious affiliations. These comparisons provide guidance about the degree of self-selection bias among student participants in the experimental course.

The second group of control subjects allows statistical analyses representing a *static-group comparison* research design: When comparing the posttest control subjects' scores to the posttest scores of the students who participated in the experimental course, differences can be attributed to the effect of the experimental treatment rather than to history or most other threats to internal validity, providing greater confidence in causal inferences about

the effects of course participation on prejudicial attitudes (Campbell & Stanley, 1966).

Control subjects attended one of three colleges that participated in the course, from each of the three religious sectors (the Jewish/secular *Kibbutzim* College, the Jewish/religious *Talpiot* College, and the Arab *Al Qasemi* College). However, these individuals were not currently or formerly enrolled in the Advanced Educational Environments course (in which the experimental online groups were conducted). They were recruited using a pedestrian intercept approach, that is, volunteers were solicited from passersby and students at computer labs where the measures were administered online. No incentives were provided and no personal identifiers were collected (obviating contacting these volunteers for potential pretest/posttest administrations). Pretest control subjects' mean age was 28.3, $SD = 11.1$, $MDN = 21$. Posttest subjects' age was $M = 25.6$, $SD = 7.8$, $MDN = 22.5$. Like the experimental student subjects, they were predominantly (95%) female.

2.4. Process variables

Participants completed a measure of social identification with their group, which is the activating force of relationships according to SIDE theory, and the focus of H2a. The score represents one's attraction to a small, interacting virtual group as a whole, not to be mistaken with identification with one's large social category, nor with the individuals who make up the group. Fifteen items developed and used in SIDE research were employed that comprised a reliable, unidimensional scale (see Wang, 2007). Participants completed the set of items only once rather than repeatedly for each other individual in the group (which was the strategy for the interpersonal communication measures, below). Sample items included "I feel attracted to the group," "This group was unique," "I see myself as a member of this group," and "A feeling of unity existed in this group." The measure achieved Chronbach's α reliability of .93.

Several variables related to SIP theory, in order to test H2b. The first measured relational communication, specifically, the immediacy/affection subscale from Burgoon and Hale's (1987) relational communication questionnaire, adapted to communication in the online forum. This measure assessed members' interpersonal communication with each other member of their virtual group, individually. Instructions asked participants to consider one particular member of their group and then to complete the items measuring the relational communication for that individual. Next, the instructions directed the participant to think of the second member of the group and complete the items again, and so on, until each participant rated all his or her partners' relational communication. Items included "The student shows interest in interaction with other members," "The student shows a desire to listen to other members," and "The student shows coldness and not friendliness" (reverse coded). Reliability analysis involved data from each subject regarding one other member of the group, $\alpha = .91$. Subsequent analyses of these scores used demographic data to cross-reference each target member's religious sector. In that way analysis could identify the scores as a participant's rating of relational communication by religious Jewish group members, secular Jewish group members, or Arab group members. This procedure was also used for the following variables.

Two types of interpersonal attraction were measured: social attraction and task attraction. These measures, too, were administered by each participant regarding each partner, and should be considered to reflect interpersonal rather than ingroup attraction. Social attraction signifies a desire to be friends with another person, using items such as "I would like to have a friendly talk with him," and "He is not very friendly" (reverse coded), $\alpha = .65$. Finally, task attraction signifies the desire to work with someone, with

items such as "I would like to do other projects with him," and "You can trust him," α = .97.

Data collection for the pretest took place in early November, 2008, and the posttest was administered in June of 2009. The web-based questionnaire appeared in both Hebrew and Arabic. Missing data were obtained, when possible, by email or telephone contact with participants.

3. Results

Student participants' and control subjects' mean scores reflecting their attitudes toward all three religious/cultural groups are presented in Table 1.

3.1. Pretest comparisons

The first comparisons inspected whether participants who took the course differed in their initial attitudes from their counterparts in the control groups within each religious sector. For any sector, if there was greater favorability toward an outgroup by student participants than by control subjects, and these patterns appeared in both pretests and posttests, it would then cast doubt on the potential prejudice-reducing effects of the multicultural virtual groups course and the intergroup contact it facilitated. A perfect control condition would have no differences between participants and control subjects in the same religious groups on pretest attitudes toward the same respective outgroups. Three independent samples t-tests compared pretest scores from participants in each sector to those of control subjects in order to detect differences between the two groups.

Among Muslims and religious Jews, no significant differences emerged between participants' and control subjects' pretest attitude scores. It appears, however, that secular Jewish students who were preparing to take the course (at pre-test) were more accepting of Arabs than were the secular Jewish control subjects, t (35) = 3.22, p = .003. Some self-selection among secular Jewish students cannot be ruled out. Throughout the data, there are no apparent changes between pretest and posttest scores in secular Jewish students' attitudes toward either religious Jews or toward Muslims (although, anomalously, secular Jewish control subjects' attitudes did change). It should be noted, however, that secular Jewish students' (and control secular Jews') attitudes toward each of the other groups were relatively positive over time, that is, their posttest attitudes toward other religious/cultural groups were, on

average, no different than the attitudes those groups' members held about themselves. For all these reasons, the secular Jews' scores lend little to the primary analyses.

Another function of the pretest scores was to benchmark that attitudes toward one's respective outgroup were less favorable than attitudes toward one's ingroup, which scores among all religious groups made clear. Specifically, pairwise comparisons indicated that religious Jews and secular Jews felt more negatively about Arabs, and Arabs felt more negatively about both secular and religious Jews, than these respondents felt about people from their own religious groups, before the CMC-based experience.

3.2. Hypothesis tests

3.2.1. Hypothesis 1

The first hypothesis test analyzed the scores only of those who participated in the multicultural virtual groups, in order to detect changes between pretest and posttest attitudes, taking into account the respective religious groups of the participants. That is, results were interpreted with respect to the hypothesis on the basis of whether the attitudes from participants belonging to one religious sector changed with regard to other religious sectors. Since the study theoretically concerns intergroup attitude change, we wish to draw readers' attention primarily to the initially most polarized groups: religious Jews' attitudes toward Arabs, and Arabs' attitudes toward religious Jews.

The primary statistical analysis employed a mixed-model analysis of variance (ANOVA) with prejudice level toward each religious/cultural sector constituting the dependent variable. Each participant's attitudes toward all three religious groups was a 3-level within-subjects variable. Pretest vs. posttest prejudice score was also a 2-level within-subjects factor. Religious/cultural group membership of the respondent was a 3-level between-subjects factor. The interaction effect of these three variables was included in the ANOVA, as differences in attitude from pretest to posttest were expected to obtain among different participants with regard to different targets (i.e., Muslims' attitudes should change with regard to religious Jews but not with regard to Arabs, and vice versa for religious Jews' attitudes).

With some minor fluctuations, the results generally indicate that participation in the virtual groups over time exerted a decrease in outgroup prejudice. The ANOVA reflected a significant interaction effect of the virtual groups experience × religious sectors between pretest and posttest, Wilk's $lambda$ = .74, F (6,

Table 1
Pretest and posttest prejudice means (and standard deviations) for student participants and control respondents.

| Attitude source | Attitude target | | | | | |
| | Religious Jews | | Secular Jews | | Arabs | |
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
Religious Jewish Participants n = 17	1.20 (.47)	1.22 (.27)	1.19 (.44)	1.22 (.27)	**2.63 (1.21)**[†]	**1.93 (1.01)**[†***]
Religious Jewish Control n = 11	1.30 (.42)	1.15 (.34)	1.48 (.60)	1.21 (.37)	3.63 (1.24)	**3.24 (1.00)**[**]
Secular Jewish Participants n = 23	1.29 (.44)	1.44 (.19)	1.23 (.38)	1.20 (.12)	**1.58 (.78)**[**]	1.58 (.16)
Secular Jewish Control n = 12	1.44 (.34)	1.47 (.27)	1.17 (.28)	1.17 (.17)	**2.78 (1.11)**[**]	1.22 (.22)
Muslim Participants n = 31	**2.70 (.97)**[†]	**2.08 (1.17)**[†***]	2.02 (.72)	**1.69 (.79)**[***]	1.32 (.41)	1.39 (.65)
Muslim Control n = 15	2.77 (1.13)	**3.82 (1.13)**[***]	2.38 (.99)	**3.04 (.85)**[***]	1.08 (.15)	1.44 (.43)

Note. Lower scores represent less prejudice. Pairs with [*] are different within columns (participant vs. control), p = .045, 2-tailed; [**] p = .003; [***] p < .001. Pairs with [†] are different within rows (participant pretest vs. posttest), p < .05. Only participants' scores were included in the main hypothesis test. Differences noted above comprise pairwise comparisons.

90) = 2.42, $p = .032$, $R^2 = .26$. Overall, participants' attitudes toward their initially most unfavored religious group became less unfavorable after the virtual groups experience, while attitudes toward less different groups remained relatively unchanged or slightly less favorable. Muslims disliked Jews less after the online contact than before it, and religious Jews disliked Arabs less at the end than the beginning.

Subjects' religious/cultural groups also affected attitudes toward each of the other groups in unsurprising ways. Specifically, attitudes about religious Jews remained different due to whether Jews or Muslims were being asked, $F (2, 47) = 14.95$, $p < .001$, $\eta^2 = .39$; this was also the case for attitudes toward secular Jews, $F (2, 47) = 7.99$, $p = .001$, $\eta^2 = .25$, and toward Arabs, $F (2, 27) = 8.00$, $p = .001$, $\eta^2 = .25$. At a superficial level, scores indicate remaining antipathy between the more stereotypically different groups, e.g., Muslim's scores are least favorable toward religious Jews, and vice versa. However, the patterns of means also indicate that the most extreme initial differences in attitudes across religious groups as shown in the pretest became more tempered in the posttest as a result of the virtual group collaborations over time: The pairwise difference between Muslims' pretest and posttest prejudice toward religious Jews was significant, $t (30) = 2.20$, $p = .025$ (1-tailed), and the difference between religious Jews' pretest and posttest prejudice toward Arabs was also significant, $t (16) = 1.76$, $p < .05$ (1-tailed).

Following the static group design, analyses compared only the posttest scores from participants who experienced the multicultural virtual groups to scores from control subjects who did not take the course. Independent samples t-tests indicated that the CMC multicultural virtual groups participants were less prejudiced toward outgroups than were control subjects who did not participate. This was true for religious Jews' attitudes toward Muslims, $t (24) = 3.28$, $p = .003$, Cohen's $d = 1.30$, and for Muslims' attitudes toward both religious Jews, $t (44) = -4.79$, $p < .001$, $d = 1.51$, as well as toward secular Jews, $t (44) = -5.33$, $p < .001$, $d = 1.65$. Secular Jews' posttest scores did not differ between course participants and control subjects.

3.2.2. Hypotheses 2a and 2b

Hypotheses 2a and 2b presented competing predictions. Hypothesis 2a first reflected the appropriation of SIDE theory, suggesting that increases in social identification due to CMC interaction predict less prejudiced attitudes toward the outgroup. Hypothesis 2b suggested an alternative derived from SIP and hyperpersonal approaches, asserting that interpersonal/relational communication and interpersonal attraction predict less prejudiced attitudes toward the outgroup.

In order to obtain a sufficiently powerful and parsimonious measure of attitude, the analyses created a single metric that reflected all participants' final attitude toward their respective outgroup. It collapsed the scores for religious Jews' attitude toward Arabs, and Arabs' final attitude toward religious Jews, into a single composite. As in the previous analyses, a lower score reflects a less prejudiced (more positive) attitude toward the respective outgroup. Analyses subjected this attitude-toward-the-outgroup variable to correlation tests with social identification and interpersonal variables.

Results did not support H2a. That is, there was no significant association of members' level of social identification with their virtual group and their final attitude toward their respective outgroup, $r (41) = -.14$, $p = .38$. In contrast, H2b was supported, with results demonstrating significant correlations with final attitude toward the outgroup and each of the interpersonal measures, relational communication, $r (41) = -.36$, $p = .04$; social attraction, $r (41) = -.45$, $p < .01$; and task attraction, $r (41) = -.35$, $p = .03$.

4. Discussion

4.1. Summary and implications

Research has established that the potential benefits of intergroup contact on the reduction of outgroup prejudice are not automatic or easily obtained. As Amir (1969, p. 178) summarized some time ago, "the assumption that contact always lessens conflicts and stresses between ethnic groups seems naïve," and he recommended that the conditions facilitating the effect of contact on prejudice reduction should be carefully examined. This consideration also applies to recent suggestions for and against the potential of CMC to mediate intergroup contact beneficially. Whereas CMC can remove some of the problems associated with FtF contact and facilitate some of the co-requisite factors promoting positive contact, research has shown that putting people online to discuss their intergroup problems does not by itself lead down a virtual path to peace.

The results of this study suggest that different theories of CMC can provide guidance regarding certain sociotechnical factors that must be addressed in order to promote positive online relationships. Moreover, factors from CMC theory integrate with the contact hypothesis' requirement for intergroup members not merely to experience contact, but to establish interpersonal relationships through contact. The mixed results from previous studies on intergroup contact via CMC among Israeli Jews and Arabs may reflect the inconsistent appropriation in those studies of the temporal and focal qualities that CMC-specific theories such as SIP articulate. When, as in the present study, these factors appear—ample time for acquaintance development and the gradual improvement of relational communication via text-based messages—then greater interpersonal attraction predicted by SIP converges with the reduction of prejudice predicted by the contact hypothesis. Rather than experience short-term exposure to one another, as most experimental intergroup encounters have done (see for review Gallois, 2012; cf. Biton & Salomon, 2006), members of the virtual groups in this study exchanged messages over an entire academic year. Despite the problems due to self-selection that studies such as this may often hide, the pre-test control group showed that self-selection bias was limited to one specific subset of the participants. Moreover, the quasi-experimental design strategies showed selection effects to be minimal, and enhanced causal inferences from the findings by virtue of the post-test control group data.

In addition to the theoretical insights this study generates, it provides evidence of achieving the important practical goal of interethnic prejudice reduction among traditionally polarized populations. The initially most polarized participants who took part in the virtual groups showed significant average reductions in their prejudice toward that outgroup which they had most disliked at the outset of the course. The students who participated in the virtual groups experience had significantly less prejudice toward these respective outgroups at the end of the course compared to control subjects who did not participate. Not only were religious Jewish participants' posttest attitudes toward Arabs significantly more favorable than religious Jewish control subjects' attitudes; religious Jewish participants' attitudes toward Arabs at the end of the course were no different than Arabs' attitudes about their own group. Although Muslim students' posttest prejudice toward religious Jews was greater than it was regarding the other religious groups, those students' attitudes toward religious Jews were nevertheless less prejudiced than those of Muslim control subjects. Generally speaking, participation in the online groups reduced students' prejudicial attitudes toward the relevant Arab and Jewish groups for whom there was the greatest initial enmity. The interaction effect on prejudice reduction yielded an effect size of .25,

which is stronger than the average .05 effect in a meta-analysis of offline contact hypothesis studies (Pettigrew & Tropp, 2006).

These results are particularly noteworthy given historical events and societal upheaval that transpired during the data collection period. In December and January during this school year, Israeli military forces conducted air and ground attacks directed at Hamas militants in the Gaza Strip that resulted in over a thousand deaths. Worldwide reactions to the events were dramatic. It is reasonable to be concerned whether these events had an effect on interethnic attitudes in Israel and among participants in this research. These may include potentially antagonistic or sympathetic responses in any direction (e.g., Jews feeling angry toward Arabs or Jews feeling sorry for Arabs, and Arabs likewise toward Jewish targets of Hamas rockets). Nevertheless, the predicted trends in attitude change among student participants (and the results of comparisons with control subjects) do not appear to have been undermined. It may even be said that the observed effects occurred even in spite of these threats. The potential of these events to undermine results makes clear the value of the second control group and the static-group comparison design, which obviates history effects as a rival explanation for the findings.

4.2. Limitations

There are several limitations of the present study. The first is the relatively small samples. Small samples can undermine the detection of effects, although the significant religion-by-time ANOVA results on prejudice indicated no such problem in testing H1. They were not, however, sufficient to power independent analysis of the process variables' effects for each religion regarding H2. Small samples also raise questions about generalization of observed results to larger populations. We have already acknowledged that a specific subset of student participants, secular Jewish course participants, seemed more sympathetic than control subjects toward outgroups even on pretests, so we draw no conclusions about the course's effects on those subjects' attitudes. Finally, while it is beneficial to employ multi-level analysis with a random-effects residuals term in order to rule out the effects of belonging to different groups (Kenny, Kashy, & Bolger, 1998), differences in the numbers of members per group who completed both pretests and posttests precluded such analyses. Future research must endeavor to increase participation in data collection for all these reasons.

More research is needed, however, to discern the communicative mechanisms by which contact operated in this setting. The present study offers a critical first step in establishing the gross effects on prejudiced attitudes and the interpersonal processes that reduce them. It does not focus on the messages within CMC, as did previous anecdotal studies (e.g., Hoter et al., 2009; Oren et al., 2002) and the more systematic work of Ellis and Maoz's (2007) analysis of argumentation in Israeli/Palestinian online dialogues. Analysis of the corpus of more successful and less successful virtual groups may reveal important communication practices, or turning points, within these relationships. Such knowledge may be useful in encouraging virtual groups' communication practices which, as has been shown, can effectively hasten positive relational dynamics and trust (Walther & Bunz, 2005).

4.3. Conclusion

This study advances our understanding of the various theories in the field of CMC research. Researchers have offered strident suggestions that SIDE and SIP approaches are conceptually incommensurate with one another, and have even argued that interpersonal approaches to CMC should be abandoned (Postmes & Baym, 2005). Others suggest that although interpersonal and group-based approaches each have merit, the challenge for CMC research is to identify boundary conditions within which one approach fits and another does not (Walther, 2009b). The present study demonstrates the value of contesting boundaries. The SIDE model assumes that CMC users experience depersonalization; they do not orient themselves to who is who within their virtual group, and visually-anonymous CMC is said to focus members on their group's entitativity (uniqueness), distracting them from their members' cultural and individual differences. Although these processes undoubtedly occur in certain CMC settings, they are a logical anathema to the interpersonal requirements of the contact hypothesis, and as such, the SIDE model has limited prospects in building an Internet contact model of prejudice reduction. In contrast, interpersonal impressions and online relational communication are fundamental processes in SIP theory, and the development of online relationships that are more desirable than those which individuals would form in similar offline encounters is a cornerstone of the hyperpersonal model. Although CMC users are likely to draw on social stereotypes at first acquaintance with one another, over time, online interaction should lead to individualized impressions and personal relations that are at the same time differentiated and potentially positive (see Walther & Carr, 2010). Few studies exist that simultaneously test both SIDE and SIP potentials, one exception being a laboratory experiment that employed ad hoc group identities, or "minimal groups" (Wang, Walther, & Hancock, 2009). In contrast, this quasi-experimental field study used longstanding, organic group memberships. Echoing the results of the lab study, it demonstrated the impact of interpersonal relations in CMC, not only as an explanation of how people relate online in this important setting, but extending the approach through a logical synthesis with other theories of intergroup contact that facilitate the reduction of prejudice using CMC.

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