Effect of communication media on developmental relationships: Self-reported and observed behaviors

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ABSTRACT

This study examined the effect of four communication modes (computer-based video teleconferencing, computer-based electronic chat, telephone, and face-to-face) on developmental interactions between dyads; specifically on the transmission of psychosocial versus instrumental information. The dyads consisted of undergraduates at a southeastern university. One member of the dyad was an incoming first year student; the second member was an upper division student who served as a developmental coach. The study was experimental in design, which controlled the amount of interaction, the frequency of interaction, and prior acquaintanceship of the dyadic pair. The small amount of variance attributable to communication mode suggests that people matter more than the machines. Specifically, in terms of implementing non-face-to-face developmental programs, it might be more useful to focus on reducing the variability in the coaches' behaviors through selection or training, than to focus on communication mode. Additionally, independent observers watched and rated the dyadic interactions to provide a third point of view. There was very little overlap between coach and trainee perceptions, although there was considerable agreement between the raters' and coaches' ratings.

1. Introduction

As Walker (2004) pointed out, "people-development work" in organizations does not have neatly defined categories. Tutoring, training, counseling, coaching, and mentoring all share some commonalities, and none have definitions that clearly differentiate them from each other. Even within categories, there are differences; for example life skills coaching, business coaching and executive coaching are very different from each other (Jackson, 2005).

In terms of one-on-one skills development, mentors are usually defined "as individuals with advanced experience and knowledge who are committed to providing support and upward mobility to their protégés' careers" (Ragins, 1999, p. 349). In contrast, coaching tends to be focused on generalized, non-job specific skills and based on a more egalitarian relationship, while tutoring is assistance that is provided to trainees to help them attain a basic skill (Grant & Cavanagh, 2004).

Higgins and Kram (2001) provided a solution to this definitional dilemma when they noted that their conceptualization of mentoring has changed from a single, long-term, hierarchical relationship, to what they called a "developmental network." that can include peers, coaches, sponsors, networks, support groups, training programs, and role models.

The changing nature of the employment contract, rapid advances in technology, flatter organizational structures, and increasingly diverse organizational membership have led to an increased emphasis on continuous learning in organizations. Some of this learning is the result of one-on-one developmental interactions.

For a number of reasons, including increased knowledge specialization, the globalization of the economy, and the increased use of teams, the degree to which such learning occurs via media rather than in a face-to-face setting is likely to increase. There are many benefits to media-based interactions. As Colky and Young (2006) pointed out, the benefits of virtual mentoring include lowered costs, increased access, and no limitations on space, time, and location.

Current examples of such distance development include: (a) Bpeace, a volunteer organization that helps women entrepreneurs in war-torn regions such as Rwanda develop businesses, in part through distance mentoring in business practices, finance, and marketing (Bidforpeace, 2007); and (b) Covance, one of the world's largest drug development services companies, which uses distance mentoring to promote development for global managers (Darmstadtter, 2006).

When learning moves from face-to-face exchanges to exchanges that are mediated by various forms of technology, it
becomes of interest whether some forms of technology are preferable to others. The choice of technology is of practical interest to the organizations and individuals engaged in the exchanges. The choice is also of theoretical interest because different technology constrains communication in different ways, thus offering a sort of natural laboratory with which to understand the mechanisms responsible for the quality of outcome of interactions.

Telephone, video teleconferencing, and electronic chat are communication modes commonly found in organizations, and thus likely to be used. The main purpose of this study was, therefore, to examine the effect of three different communication modes (telephone, computer-based video teleconferencing, and computer-based electronic chat) on developmental interactions. Face-to-face communication was included to serve as a base-line for comparisons.

Although the content of such interactions may vary by the organizational setting, the support provided typically falls into the two broad categories known as instrumental or psychosocial support. For the population used in this study (college freshmen and upper level student coaches), instrumental support consisted of such behaviors as providing help with assignments, recommending courses or activities that help the trainee meet academic or employment goals, suggesting academic resources that meet trainee needs, and making practical suggestions for coping with the stresses of college. The psychosocial support consisted of displaying behaviors such as good listening skills, the sharing of personal experiences as an alternative perspective to the trainee’s problems, and conveying feelings of respect and liking for the trainee.

In the following sections, we begin by discussing some of the findings regarding the effects of communication mode on communication content in general. We then review the developmental functions, discuss the impact of communication mode on those functions, and propose our hypotheses. In the next section, we describe the experimental method and measures used to test our hypotheses. The paper concludes with our results, a discussion of our findings, and suggestions for future research.

2. Communication mode

It is difficult to make sweeping generalizations about the impact of media on communications, as media vary in their effects. This is to be expected, as different modes vary along the dimensions of sequentiality, audibility, visibility, co-presence, simultaneity, and co-temporality (Clark & Brennan, 1991). These dimensions and their presence or absence in each communication mode are summarized in Table 1.

2.1. Co-temporality, simultaneity, and sequentiality

Co-temporality refers to whether a message is received at the time it is sent. Simultaneity means that communicators can send messages at the same time, and sequentiality means that messages stay in sequence. These three media characteristics regulate the flow and continuity of conversation. Without these attributes, the logical sequence of discussions becomes disjointed, and as a result, the psychological distance between communicators increases (Hambley, O’Neil, & Kline, 2007; Silvester, Anderson, Haddleton, Cunningham-Snell, & Gibb, 2000).

Research on communication processes in electronic chat provides support for the effects of these dimensions on communication. For example, research has found that a lack of simultaneity in message production and reception may cause chat participants to focus on creating their responses, and thus ignoring the messages of other members (Graetz, Boyle, Kimble, Thompson, & Garloch, 1998).

The increased psychological distance is at least partially responsible for the fact that computer-mediated groups, compared to face-to-face groups, tend to make more task-oriented statements and fewer social support statements (Tu, 2000).

Finally, because chat production is laborious, people may omit communications that they would normally include, such as indicating agreement, or understanding (Graetz et al., 1998). Consistent with these findings, computer-mediated groups have been shown to be less satisfied, have a greater difficulty in reaching consensus, and exhibit reduced discussion comprehension (Foster & Coover, 2000; Hughes, Wickersham, Ryan-Jones, & Smith, 2002).

2.2. Visibility and audibility

Both visibility and audibility generate effects on communication through non-verbal cues such as eye contact, hand gestures, facial expression, tone of voice, laughter, and stress patterns. These cues aid in message assessment, production, and comprehension, and provide information, regulate interaction, and express intimacy (Derks, Bos, & Grumbkow, 2007; Driskell & Radtke, 2003; Hidalgo-Barne & Massaro, 2007). As a result, one of the primary functions of non-verbal cues is to reduce psychological distance (Hambley et al., 2007; Short, Williams, & Christie, 1976; Williams, Caplan, & Xiong, 2007).

Research on audio-only communications provides evidence supporting the effects of the lack of visual cues on communication. O’Malley, Langton, Anderson, and Doherty-Sneddon (1996) performed a series of experiments in which pairs of subjects worked on a collaborative task in either an audio-only or audio-visual condition. They found that dyads in the audio-only condition needed to say more in order to achieve the same level of performance as those in the audio-visual condition. Based on the use of gaze and the structure of the interactions, they concluded that speakers in the audio–video condition used visual cues to check for mutual understanding.

Driskell and Radtke (2003) found that that the absence of gestures had negative effects on both speech production and comprehension, in that gesturing helped both the speaker in generating statements, and the listener in comprehending them. In another study, Driskell, Radtke, and Sales (2003) suggest that the lack of visual cues may cause team members to neglect determining if understanding has been established.

One of the primary functions of visual cues is to reduce psychological distance. Short et al. (1976) noted that visual cues are critical for communicating interpersonal attitudes, and if these cues are missing, participants will focus on the cues that are available, namely the task and task information.

A variety of research supports this notion. A study by Grahe and Bernieri (1999) focused on the importance of non-verbal cues in judging rapport. In this study, participants were asked to judge the rapport of 50 interacting dyads, based on transcripts, audio, video, and transcript, or video and audio records of the interactions. Results indicated that participants who had non-verbal, visual information were the most accurate judges of the dyad’s rapport.
In an interesting experiment by Derks et al. (2007), students participated in either task-oriented or socio-emotional electronic chat. Results showed that participants used more emoticons in socio-emotional than in task-oriented social contexts, suggesting that emoticons serve as a replacement for non-verbal displays found in face-to-face communication.

As was the case for visibility, audibility generates effects on communication through the presence or absence of non-verbal cues; specifically, audio cues such as tone of voice, length of responses, laughter, volume, and stress patterns (i.e., prosody). Research done in the area of audio cues has found that the pitch, inflection, and speed of a vocal utterance can affect listeners' perceptions of message content. Audio cues also affect conversational flow. Stephens and Beattie (1986) presented participants with transcripts or recordings of conversational fragments, and asked them to judge when a speaker was finished speaking. Participants were able to do this in the audio condition, but not the transcript condition, indicating that content, syntax, or semantics were not enough to determine the end of turn.

Finally, audio cues impact psychosocial perception. Maxwell, Cook, and Burr (1985) examined the encoding and decoding of behaviors associated with judgments of liking and perceived similarity. Judges were asked to either view or listen to a recording of a dyadic interaction, and rate the participants' degree of liking for each other. Judges in the video conditions were very accurate; however judges in the audio condition, because of an over-reliance on content cues, were not as accurate. Maxwell et al. added that 48% of the variance in judgments was explained by the cues of eye gaze and expressiveness of the face.

2.3. Co-presence

Co-presence simply means that participants are located in the same physical setting: however, the implications of co-presence on communications are complex. One effect of co-presence is to make the dyadic partner more salient, more “real.” As Short et al. (1976) called this quality ‘Social Presence,” and noted that the primary impact of social presence is on psychological closeness.

Matheson (1991) also suggested that the effects of some communications media might result from lack of social presence. As a result of this decreased social presence, Matheson suggested that communicators would have: (a) reduced other-awareness, (b) more uninhibited behavior, (c) less responsiveness to one another’s ideas, and (d) less public self-awareness.

Support for co-presence as a determinant of communications effects comes from research on video teleconferencing (VTC). VTC shares all dimensions with face-to-face communication except co-presence, but VTC does not deliver the same benefits as face-to-face interactions. Conversations in VTC, compared to face-to-face conversations, have been found to have more interruptions, less “back channel” conversation such as signals of agreement and attention, and a more formal style of conversation (Anderson, Newlands, Mullin, & Fleming, 1996; O’Malley et al., 1996). Sellen (1995) compared groups who worked in the same room with groups who worked together via audio-only and audio–video links. Sellen concluded that sharing the same physical space impacted interactions.

Social presence is a critical component of satisfaction with communication; for example, students’ perceptions of social presence in online courses are related to their perceived learning and satisfaction with their instructor. Students participating in online course discussions reduced the psychological distance amongst themselves by employing paralanguage, (emoticons, punctuation, capitalization, exaggerated spellings), self-disclosure, humor, and approval (Richardson & Swan, 2003).

3. Developmental functions

Because the present study focuses on developmental interactions as a form of training, much of the following discussion is drawn from the mentoring literature; readers should bear in mind, however, that the relationships examined here are much too short-term to qualify as mentoring relationships, and that this research has been cited to provide a relevant theoretical basis for a fairly new research area, and not to equate developmental interactions with mentoring.

Within mentoring research, a variety of different terms have been used for the mentoring functions, however, the content typically falls into the two broad categories known as career and psychosocial functions (Kram, 1983). Thus, Schockett and Haring-Hidore (1985) performed a factor analysis of a mentoring scale and found support for psychosocial and career support as functions. Similar results were found by Ochberg, Tischler, and Schultberg (1986), who also demonstrated that these two dimensions could be shown to exist empirically.

The career functions include such activities as sponsorship, exposure, visibility, coaching, protection, and providing challenging assignments. As modified for the population used in this study, career support by the coach consists of such behaviors as providing help with assignments, recommending courses or activities that help the trainee meet academic or employment goals, suggesting academic resources that meet trainee needs, and making practical suggestions for coping with the stresses of college.

The psychosocial functions include role modeling, acceptance, confirmation, counseling, and friendship. As modified for the population used in this study, psychosocial support consists of the coach displaying behaviors such as good listening skills, the sharing of personal experiences as an alternative perspective to the trainee’s problems, and conveying feelings of respect and liking for the trainee.

The outcomes of developmental relationships cover a wide range: improved satisfaction, higher student retention, higher self-esteem, and lower turnover. In an educational setting, which may have the closest relationship to the training aspect of developmental interactions, there is an extensive body of literature that shows that mentoring in an educational setting has benefits for protégés as well as mentors (Allen, Lentz, & Day, 2006; Atkinson & Colby, 2006; Campbell & Campbell, 2007; Zalaquett & Lopez, 2006), and that peer mentoring can be an effective way of providing mentoring support (Salinitri, 2005; Sanchez, Bauer, & Paronto, 2006; Thomas, Hu, Gewin, Bingham, & Yanchus, 2005).

In an organizational setting, Riggins and Cotton (1999) examined the relations among gender, formal and informal mentoring, mentoring functions, and career outcomes. They found that protégé gender interacted with the formal/informal nature of the relationships to impact mentoring functions. Melnyk (2007), in a review of 42 mentoring articles, found that mentoring increased protégés’ self-confidence and provided resources and support for their activities. Mentoring for female academics has been linked to increased grant income and higher level of promotion (Gardiner, Tiggesmann, Kearns, & Marshall, 2007).

Although developmental interactions are not mentoring relationships, this existing research provided a foundation for developing the trainee outcomes in this study. For the purposes of this study, in which the population was college students, the outcomes of interest were school-related stress, satisfaction with the relationship, and learning.

With regards to stress, Allen, McManus, and Russell (1999) investigated stress and peer mentoring in an academic setting. Although the authors did not find a direct link for stress and mentoring, the amount of perceived mentoring functions protégés
received (both career and psychosocial) was related to protégés' beliefs that their mentors had helped them deal with stress. In addition, Allen et al. found that mentoring was related to socialization, and socialization was related to decreased stress.

Sosik and Godshalk (2000) investigated the link between mentor leadership behavior, protégé perceptions of mentoring functions received, and job-related stress, and found that protégés who perceived receiving greater amounts of psychosocial and career functions reported less job-related stress. Littrell, Billingsley, and Cross (1994) found that teachers who felt they received both emotional support and informational support from their principals were more satisfied and less stressed than teachers who received only informational support.

Previous research has also linked both functions to protégé satisfaction with the relationship (Allen, Russell, & Maetzke, 1997; Ensher, Thomas, & Murphy, 2001). As was mentioned previously, Littrell et al. (1994) found that teachers who felt they received both emotional support and informational support from their principals were more satisfied and less stressed than teachers who received only informational support. Young and Perrewe (2000) found that the level of psychosocial support provided by a mentor predicted protégé's perceptions of the relationship's effectiveness, as well as their trust in the mentor.

Although it has been suggested that mentoring provides a valuable learning relationship for both the mentor and the protégé (only a few studies have looked at mentoring and learning. For example, Ostroff and Kozlowski (1993) looked at the role of mentoring on the information gathering and learning processes of organizational newcomers, and found that newcomers with mentors were able to learn more about organizational issues and practices. Evertson and Smitley (2000) found that student teachers mentored by experienced teachers who had undergone formal mentor training were more effective in organizing and managing instruction, and could establish more workable classroom routines, than student teachers who were not mentored.

4. Hypotheses

A number of hypotheses were developed regarding the effect of communication mode on psychosocial and instrumental support, based on the presence or absence of the communication dimensions. These hypotheses are presented in the following sections.

4.1. Psychosocial support

Psychosocial support, which consists of such behaviors as acceptance, counseling, and friendship, requires some degree of emotional and psychological closeness. As was discussed, all of the communication dimensions impact psychological distance and social support. Since FTF is the only medium with all of the attributes conducive to closeness, the first hypothesis stated:

**Hypothesis 1.** Coaches in the face-to-face condition will exhibit more behaviors consistent with psychosocial support than coaches in the remaining conditions as a group.

Although VTC does not have co-presence, if does have all the other dimensions, including visibility. Thus, the second hypothesis stated:

**Hypothesis 2.** Coaches in the VTC condition will exhibit more behaviors consistent with psychosocial support than coaches in the telephone or chat conditions as a group.

Of the remaining two conditions, telephone communication possessed simultaneity, sequentiality, and audibility, which electronic chat did not. As a result, the third hypothesis stated:

**Hypothesis 3.** Coaches in the telephone condition will exhibit more behaviors consistent with psychosocial support than coaches in the chat condition.

4.2. Career functions

In this study, career support consisted primarily of information exchange, thus the coach and trainee did not have to have the psychological closeness necessary for the psychosocial functions, thus the lack of co-presence in VTC should be less of an issue than in the psychosocial dimensions. As a result, no difference was expected in the level of career support provided in the VTC and face-to-face conditions. However, as was discussed earlier, a lack of sequentiality, simultaneity, and non-verbal cues has negative effects on discussion comprehension, which would negatively impact the career functions in the telephone and chat conditions Therefore, the following hypothesis was stated:

**Hypothesis 4.** Coaches in the face-to-face and VTC conditions as a group will exhibit more behaviors consistent with career support than will coaches in the telephone and chat conditions as a group.

Telephone communications, which have audibility, sequentiality, and simultaneity, should therefore be superior to text-based chat. As a result, the following hypothesis was stated:

**Hypothesis 5.** Coaches in the telephone condition will exhibit more behaviors consistent with career support than coaches in the chat condition.

5. Method

5.1. Participants

Freshman recruited from supplemental instruction (SI) classes at a university in the southeastern United States were the trainees. SI classes are supplemental classes for courses that historically had high failure and dropout rates. There were 72 participants in the trainee sample, with a mean grade point average (GPA) of 3.29, and scores ranging from 1.4 to 4.0. Of the 72 trainees, approximately 43% were male (n = 31) and 57% were female (n = 41). Their ages ranged from 18 to 20, with a mean of 18.32 and a standard deviation of .55.

Coaches were juniors or seniors with at least a 3.0 cumulative grade point average. There were 18 participants in the coach sample. Four of the coaches were juniors (22%) and 14 were seniors (78%). Of the 18 coaches, approximately 33% were male (n = 6) and 67% were female (n = 12). Their ages ranged from 19 to 28, with a mean of 21.56 and a standard deviation of 2.36. The mean GPA was 3.55, with scores ranging from 3.2 to 3.98.

5.2. Procedure

Trainees were randomly assigned to both coaches and communication condition. Each coach had four trainees, one in each communication conditions. Each dyad communicated for 15 min once a week for three weeks, using the same medium for all their sessions. The order in which coaches were exposed to the various conditions was counterbalanced.

Both coaches and trainees were required to attend separate orientations prior to beginning the experiment. For both groups, informed consent and demographic data were collected during the orientation. A computer attitudes measure, a typing test, and several other measures were administered as well.

For coaches, the orientation focused on using the VTC and chat technologies, and on the content of the developmental
interactions; i.e., the declarative knowledge that coaches should have, such as university policies, dormitory living, other sources of information, and local entertainment. This information was provided to the coaches in a handbook, and the orientation also involved familiarizing them with the handbook.

For trainees, the orientation focused on using the VTC and chat technologies, as well as on the sort of information and support they should be able to get from their coaches. Some of the topics suggested to trainees included student organizations, school policy, stress management, time management, class scheduling/advising, personal issues, and general health and well-being.

At the end of each dyad’s three sessions, both coach and trainee were given another set of measures for assessing the developmental functions, and debriefed.

5.3. Experimental conditions

The laboratory was configured to allow coaches and trainees to arrive for their sessions without meeting. The details for each of the four conditions are described below.

5.3.1. Face-to-face

In the face-to-face condition, the coach and trainee were physically in the same room. Both the coach and the trainee wore small lapel microphones connected to a tape recorder in the experimenter’s room, in order to record their conversations.

5.3.2. Video teleconferencing

In the VTC condition, the participants were in separate rooms. Each computer had a video camera, which allowed the partners to both see and hear each other. In addition, the video screens were set up so that participants only had a view of their dyadic partner, not of themselves. The desktop VTC system automatically recorded both sides of the conversation.

5.3.3. Telephone

In the telephone condition, the participants were in separate rooms. Each room contained a telephone connection, which was the dyad’s only means of communication. Their conversations were recorded through an audio taping system.

5.3.4. Chat

In the chat condition, the partners were in separate rooms. Each room contained a computer with real-time virtual chat room capabilities. The computer was programmed for a private chat room for the coach and trainee, which was the dyad’s only means of communication. Their interactions were automatically recorded by the software, which provided transcripts of their sessions.

5.4. Measures

5.4.1. Typing test

Because there was reason to believe that typing ability might restrict information exchange in the chat condition, and thus might be a co-variate, all participants were given a typing test prior to starting the experiment. For trainees, the mean word per minute score was 33.5, with a standard deviation of 13.35. For coaches, the mean score was 34.17, with a standard deviation of 12.25.

5.4.2. Computer attitude

As with typing ability, it seemed likely that computer attitudes might have an effect on how favorably participants viewed the chat condition. Therefore, all participants were asked to answer a questionnaire regarding their computer attitudes prior to the start of the experiment. The questionnaire included such items as “I get anxious each time I need to learn something new about computers” and “I use the computer when I have nothing else to do.” The questions represented a subset of questions taken from a scale previously developed by Levine and Donitsa-Schmidt (1998).

Levine and Donitsa-Schmidt’s factor analysis of the entire scale indicated that there were seven factors (Levine & Donitsa-Schmidt, 1998). In this study, only the questions from Factors 1 (computer self-confidence) and 4 (computer enjoyment) were used. The response format ranged from 1 (strongly disagree) to 6 (strongly agree). Higher scores represented greater agreement with the statement, and negative attitudes were reversed for scoring purposes. The reliability of the scale was \( \alpha = .91 \) for trainees and \( \alpha = .93 \) for coaches. On this six-point scale, the mean score was 4.37 for trainees, with a standard deviation of .92. For coaches, the mean score was 4.56, with a standard deviation of .85.

5.4.3. Developmental functions

Developmental functions were assessed in two ways: paper-and-pencil perceptual self-reports, and rater observation. The pencil-and-paper scale was adapted from the scale used by Allen et al. (1999). The adaptations included changing items to: (1) reflect expectations rather than experiences in Time 1 (1 expect my mentor to encourage me to try new ways of behaving in school), and (2) to address the mentor’s perspective as well as the protégé’s.

For the observations, raters observed recordings that most closely replicated the experimental condition under which the coach/trainee met. Thus, for the face-to-face and VTC conditions, the raters used videotapes of the sessions to do their ratings, audiotapes for the telephone condition, and transcripts for the chat condition. A total of five raters were used in the study. Two different raters separately rated each interaction as to the level of psychosocial and career support exhibited, and the pairs were randomly assigned interactions. The two raters who observed a particular interaction then met and compared their ratings, discussing and reaching consensus on any differences. The resulting data were continuous, Likert-scale scores.

The coding scheme was developed based on the hypotheses and the relevant literature, as well as the paper-and-pencil measure developed by Allen et al. (1999). All of the raters were trained simultaneously to insure consistency across the training. The experimenter, while carefully avoiding any mention of the hypotheses in order to prevent biasing the raters, began by providing the raters with background and context for the study. Then the experimenter and raters discussed each item on the rating scale, making sure that the raters understood every item. All raters, together with the experimenter, then watched or listened to an interaction in each communication mode, and discussed and agreed on the ratings for that interaction. The raters were then shown a second series of interactions, and asked to rate them independently. The raters and experimenter then jointly discussed the rating each had given to the interaction, going through the rating scale item-by-item. At this point, the ratings provided by the experimenter and the raters were very consistent, and what few discrepancies existed were clarified during the consensus rating.

In the following four sections, the reliabilities for the developmental functions were computed by function (psychosocial or career support) and measure (pencil-and-paper or rater).

5.4.3.1. Psychosocial/perceptual. At the end of the experiment, trainees were asked to evaluate the amount of psychosocial support they had received. Reliability ranged from \( \alpha = .85 \) for face-to-face and \( \alpha = .88 \) for phone. Coaches were asked to evaluate the amount of psychosocial support they had provided. The reliability of this scale ranged from \( \alpha = .76 \) in the chat condition to \( \alpha = .87 \) in the face-to-face condition.
5.4.3.2. Psychosocial/rater. The psychosocial functions provided by the coaches were also evaluated by raters. Because the average scores between raters was used in the analyses that follow; the Spearman–Brown Prophecy Formula (Nunnally & Bernstein, 1994) was applied to the observed correlation between Coder 1 and Coder 2. Reliability ranged from $\alpha = .51$ for the chat condition, to $\alpha = .88$ for face-to-face.

5.4.3.3. Career development/perceptual. At the end of the experiment, trainees were asked to evaluate the amount of career support they had received. The reliability ranged from $\alpha = .93$ in the chat condition to $\alpha = .78$ in the face-to-face condition. Coaches were asked to evaluate the amount of career development support they had provided to each trainee. The reliability of this scale ranged from $\alpha = .88$ in the face-to-face condition to $\alpha = .94$ in the chat condition.

Some of the rater reliabilities are rather low, due in part to the lack of variance for several of the items, while other items, particularly in the career development functions, exhibited floor effects. However, as Nunnally and Bernstein (1994) noted, for research purposes, having instruments described by ‘modest reliability’ (they give the example of .70 as a modest estimate) is practical, and that developing instruments with reliabilities “… much beyond .80 in basic research is often wasteful of time and money (p. 265).” For making decisions about people, of course, much more reliable measures are needed (Nunnally & Bernstein, 1994).

6. Results

In the following sections, four sets of analyses are presented. The first section examines relations among the perceptual measures of the functions. The second section focuses on the relationship between the observed and the perceived measures of the psychosocial functions, the third presents the analyses used to test the experimental hypotheses, and the final section examines the impact of computer attitudes as a moderator.

6.1. Perceptual measures of developmental functions

Table 2 shows the mean scores for the psychosocial and career functions in each condition for both the coaches and trainees.

For both coaches and trainees, evaluations of career functions were positively correlated with evaluations of psychosocial support. For coaches, the functions they felt they had provided were significantly correlated at $p < .05$ for all conditions except face-to-face. The correlation and 95% confidence interval for each condition was: face-to-face, $r = .43$, CI = -.06 to .75; in VTC, $r = .69$, CI = .31–.88; in telephone, $r = .57$, CI = .12–.82, and for chat, $r = .58$, CI = .14–.83.

For trainees, the functions were significantly correlated at $p < .05$ for all conditions. For face-to-face, $r = .49$, CI = .01–.79; for VTC, $r = .63$, CI = .21–.85; for telephne, $r = .71$, CI = .35–.89, and for chat, $r = .64$, CI = .23–.86.

The trainees’ perceptions of the functions they received and the coaches’ perceptions of the functions provided showed very little overlap; only the correlation between the career development functions in the phone condition reached significance ($r = .51$, 95% CI = .04–.80, p < .05).

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A multi-method (coach versus trainee) multi-trait (psychosocial versus career) analysis showed the same patterns in all four conditions; in all matrices, the highest correlations are between the psychosocial and career development functions within methods (heterotrait monomethod), indicating a strong method effect, or that that the functions are not entirely distinct. As shown in Tables 3–6, the pattern was similar across all conditions, indicating that these effects were not associated with communication mode.

6.2. Perceptual and observed measures of developmental functions

In order to examine the relationship between the perceptual measures and the ratings of the developmental functions, the average rating was used for the observed functions. Because the raters used a four-point scale and the trainees and coaches used a six-point scale, the rater’s scores have been multiplied by 1.5 for ease of comparison by the reader. Table 7 compares the mean psychosocial and career development function scores for each rating source in each condition.

For all three sources, scores for the psychosocial functions were larger than those for the career functions in all conditions, and, with the exception of the psychosocial function score in the chat condition, the coaches’ scores were consistently larger than the trainees’ scores, which in turn were larger than the raters’ scores, indicating apparent effects of viewpoint on mean levels of functions during the interactions (viewpoint effects cannot, of course,}

### Table 2

<table>
<thead>
<tr>
<th>Rater</th>
<th>Condition</th>
<th>PSF</th>
<th>CDF</th>
<th>Phone</th>
<th>Chat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FTF</td>
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<tr>
<td>Coach</td>
<td>PSF</td>
<td>4.35</td>
<td>2.96</td>
<td>4.33</td>
<td>3.05</td>
</tr>
<tr>
<td></td>
<td>CDF</td>
<td>4.35</td>
<td>3.03</td>
<td>4.13</td>
<td>2.68</td>
</tr>
<tr>
<td>Trainee</td>
<td>PSF</td>
<td>4.27</td>
<td>2.56</td>
<td>4.19</td>
<td>2.64</td>
</tr>
<tr>
<td></td>
<td>CDF</td>
<td>4.13</td>
<td>2.68</td>
<td>4.18</td>
<td>2.44</td>
</tr>
</tbody>
</table>

**Note:** PSF, psychosocial functions; CDF, career development functions.

### Table 3

**Correlations among scores in FTF condition**

<table>
<thead>
<tr>
<th>Rater</th>
<th>Trainee</th>
<th>Coach</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PSF</td>
<td>CDF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trainee</td>
<td>PSF</td>
<td>.85</td>
</tr>
<tr>
<td></td>
<td>CDF</td>
<td>.78</td>
</tr>
<tr>
<td>Coach</td>
<td>PSF</td>
<td>.87</td>
</tr>
<tr>
<td></td>
<td>CDF</td>
<td>.88</td>
</tr>
</tbody>
</table>

**Note:** $n = 17$. PSF, psychosocial functions; CDF, career development functions. Reliability estimate shown in main diagonal. Test is two-tailed. $p < .05$. 
be distinguished from differences in the simple use of the scale in this design).

6.3. Effect of communication mode on developmental functions

The series of planned comparisons in Hypotheses 1–5 focused on the amount of psychosocial and career support provided by coaches in the various communication conditions. For Hypotheses 1–3, the dependent variable was the amount of psychosocial support provided, and for Hypotheses 4–5 the dependent variable was the amount of career support provided. These hypotheses were tested using: (1) the coach's perceptions of the support provided; (2) the trainee's perceptions of the support received; and (3) the frequency of the objectively coded behaviors exhibited by the coach.

6.3.1. Hypothesis 1

Hypothesis 1 suggested that coaches in the face-to-face condition would exhibit more behaviors consistent with psychosocial support than coaches in the remaining conditions as a group. As shown in Table 8, this hypothesis was not supported. None of the three raters (trainees, coaches, or independent raters) perceived any significant differences in the amount of psychosocial support provided.

6.3.2. Hypothesis 2

Hypothesis 2 suggested that coaches in the VTC condition would exhibit more behaviors consistent with psychosocial support than coaches in the telephone or chat conditions as a group. As shown in Table 9, this hypothesis was not supported. None of the three raters (trainees, coaches, or independent raters) perceived any significant differences in the amount of psychosocial support provided.

6.3.3. Hypothesis 3

Hypothesis 3 suggested that coaches in the telephone condition would exhibit more behaviors consistent with psychosocial support than coaches in the chat condition. As shown in Table 10, this hypothesis was not supported. None of the three raters (trainees, coaches, or independent raters) perceived any significant differences in the amount of psychosocial support provided.

6.3.4. Hypothesis 4

Hypothesis 4 suggested that coaches in the face-to-face and VTC conditions as a group would exhibit more behaviors consistent with career support than coaches in the telephone and chat conditions as a group. As shown in Table 11, this hypothesis was not supported. None of the three raters (trainees, coaches, or independent raters) perceived any significant differences in the amount of career support provided.

6.3.5. Hypothesis 5

Hypothesis 5 suggested that coaches in the telephone condition would exhibit more behaviors consistent with career support than coaches in the chat condition. As shown in Table 12, this hypothesis was not supported. Neither trainees, coaches, nor independent raters perceived any significant differences in the amount of career support provided.

6.4. Effect of computer attitudes as a moderator

The sample was highly computer literate, with a mean computer attitude score of 4.26 on a six-point scale. In order to
Table 9
Mean score, variance, and sample size for testing Hypothesis 2

<table>
<thead>
<tr>
<th>Source</th>
<th>Trainee</th>
<th>Coach</th>
<th>Rater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparison</td>
<td>VTC</td>
<td>C + P</td>
<td>VTC</td>
</tr>
<tr>
<td>N</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Mean</td>
<td>4.19</td>
<td>4.17</td>
<td>4.33</td>
</tr>
<tr>
<td>Variance</td>
<td>.49</td>
<td>.65</td>
<td>.42</td>
</tr>
<tr>
<td>t</td>
<td>.09</td>
<td>.52</td>
<td>–1.05</td>
</tr>
<tr>
<td>Significance</td>
<td>Ns</td>
<td>Ns</td>
<td>Ns</td>
</tr>
</tbody>
</table>

Note: VTC is video teleconferencing. C is chat. P is telephone.

Table 10
Mean score, variance, and sample size for testing Hypothesis 3

<table>
<thead>
<tr>
<th>Source</th>
<th>Trainee</th>
<th>Coach</th>
<th>Rater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparison</td>
<td>Phone</td>
<td>Chat</td>
<td>Phone</td>
</tr>
<tr>
<td>N</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Mean</td>
<td>4.16</td>
<td>4.18</td>
<td>4.35</td>
</tr>
<tr>
<td>Variance</td>
<td>.64</td>
<td>.69</td>
<td>.46</td>
</tr>
<tr>
<td>t</td>
<td>.07</td>
<td>–1.07</td>
<td></td>
</tr>
<tr>
<td>Significance</td>
<td>Ns</td>
<td>Ns</td>
<td>Ns</td>
</tr>
</tbody>
</table>

Table 11
Mean score, variance, and sample size for testing Hypothesis 4

<table>
<thead>
<tr>
<th>Source</th>
<th>Trainee</th>
<th>Coach</th>
<th>Rater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparison</td>
<td>F + V</td>
<td>P + C</td>
<td>F + V</td>
</tr>
<tr>
<td>N</td>
<td>36</td>
<td>36</td>
<td>18</td>
</tr>
<tr>
<td>Mean</td>
<td>2.58</td>
<td>2.59</td>
<td>3.01</td>
</tr>
<tr>
<td>Variance</td>
<td>.53</td>
<td>1.25</td>
<td>.91</td>
</tr>
<tr>
<td>t</td>
<td>.05</td>
<td>.301</td>
<td>0</td>
</tr>
<tr>
<td>Significance</td>
<td>Ns</td>
<td>Ns</td>
<td>Ns</td>
</tr>
</tbody>
</table>

Table 12
Mean score, variance, and sample size for testing Hypothesis 5

<table>
<thead>
<tr>
<th>Source</th>
<th>Trainee</th>
<th>Coach</th>
<th>Rater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparison</td>
<td>Phone</td>
<td>Chat</td>
<td>Phone</td>
</tr>
<tr>
<td>N</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Mean</td>
<td>2.73</td>
<td>2.44</td>
<td>3.03</td>
</tr>
<tr>
<td>Variance</td>
<td>1.08</td>
<td>1.24</td>
<td>1.01</td>
</tr>
<tr>
<td>t</td>
<td>.81</td>
<td>.61</td>
<td>0</td>
</tr>
<tr>
<td>Significance</td>
<td>Ns</td>
<td>Ns</td>
<td>Ns</td>
</tr>
</tbody>
</table>

investigate the effect of computer attitudes as a moderator, the sample was split into two groups; those with mean scores equal to or less than three, and those with scores above three. Because the sample of those who scored less than three was very small, Levene's test for equality of variances was performed to check that the variances were not significantly different from each other. The results of the equal variance independent sample t-tests are shown in Table 13. There were no significant differences between the two groups for any of the dependent variables.

7. Discussion

The degree to which developmental interactions will occur without participants meeting face-to-face is likely to increase. When these interactions become mediated by various forms of technology, it becomes of interest whether some forms of technology are preferable to others. Telephone, video teleconferencing, and electronic chat are communication modes commonly found in organizations, and thus likely to be used in distance development. The main purpose of this study was, therefore, to examine the effect of four different communication modes (face-to-face, telephone, video teleconferencing, and electronic chat) on the developmental functions.

We found that coaches exhibited similar amounts and kinds of developmental behaviors across conditions. The small amount of variance attributable to communication mode (partial $r^2$ values ranged from .01 to .03), was negligible compared to the amount of variability attributable to coaches (.39 for the career development functions and .15 for the psychosocial functions).

Although this result was disappointing from the perspective of hypothesis testing, from an applied perspective it is encouraging to note that the developmental interactions were robust enough to have a positive effect regardless of the medium.

Unfortunately, as Murphey and Myors (1998) pointed out:

In traditional null hypothesis testing, the idea of accepting the null hypothesis is sometimes treated as a sort of heresy. Rather than allowing someone to accept the hypothesis that treatments have no effect, the traditional framework usually leaves two options: deciding there is sufficient evidence to reject the null (i.e., a significant outcome) and deciding there is not yet enough evidence to reject the null (i.e., a non-significant result) (p. 82).

In this case, the search for additional evidence that would allow rejection of the null explored whether the lack of effect might be attributable to the specific sample used in the experiment. The sample was highly computer literate, with a mean computer attitude score of 4.26 on a six-point scale. In order to investigate this possibility further, the sample was split into two groups; those with mean scores equal to or less than three, and those with scores above three. The results of the equal variance independent sample t-tests showed no significant differences between the two groups for any of the dependent variables, suggesting that the lack of difference across conditions was not due to the sample’s computer literacy.

Another possibility was that there was simply a lack of power to find an effect. The study did in fact lack power to reject the null, given population effects of the magnitude actually found in the study (observed power was .11 for career development and .07 for psychosocial functions), but power was adequate for a hypothesized medium effect size.

However, the results of the power analyses raised their own issues: given that the null hypothesis is always wrong because even the most trivial effect is not equal to zero, how much of an effect does a treatment need to have in order to (realistically) be classified as an effect? And, concluding that communication mode had a trivial effect on development interactions, presents yet another question: How do we reconcile this finding – or rather lack of finding – with the previous research that clearly shows an effect for communication mode?

Two possible explanations present themselves; the nature of the task or the nature of the relationships. The “task” for these dyads was to communicate about concerns and questions. The dyads did not have to solve a problem imposed by the researcher, reach consensus, or negotiate an outcome.

Yet, these are precisely the types of tasks commonly used in research on the effects of communication mode. For example, studies that have found an effect for computer-mediation used brainstorming tasks, consensus-reaching tasks, or other tasks with criteria such as time to completion or decision quality.

What these tasks have in common are: (a) specific goals, and (b) time constraints. For the dyads in the present study, there was no specific goal other than to build a relationship that was satisfying
and helpful; an objective that allowed the participants a great deal of flexibility in terms of both evaluating the outcome and the designing the process. Without the pressures imposed by a more structured task in the form of time limits, specific outcomes, or evaluative criteria, the limitations of the media may not have been as salient.

With regards to the nature of the relationship, several aspects of the dyadic interactions may have contributed to the lack of an effect; these include the length of the relationships and the type of relationships developed. The dyads met once a week for three weeks for 15 min, for a total of 45 min. Given the limited amount of time that the dyads interacted, the relationships in all communication modes were, by necessity, somewhat superficial.

7.1. Implications

The results of this study indicate that the benefits of developmental interactions are robust enough to overcome the limitations of communication mode; trainees in all communication conditions found the developmental interactions to be satisfying and helpful in reducing stress. The amount of variability attributable to communication mode was negligible, while the amount of variability attributable coaches was .39 for the career development functions and .15 for the psychosocial functions, suggesting that efforts to implement developmental interactions should focus on training coaches, rather than on concerns over communication mode effects. Although this is encouraging from a training perspective, one of the findings in this study may have troublesome implications for practitioners. This is the lack of overlap in the perceptions of the developmental functions by the different sources.

7.1.1. Lack of overlap in perceptions

The trainees' perceptions of the functions they received and the coaches' perceptions of the functions provided showed very little overlap; only one correlation reached significance. In addition, although there was considerable agreement between the raters' and coaches' perceptions, there was very little agreement between the raters' and trainees' perceptions, especially in the face-to-face and VTC conditions. This raises some issues with regards to training coaches. The first issue centers on whose perceptions are the most critical with regard to the viability of the developmental interaction, and the second centers on exactly what behaviors those perceptions reflect.

Given that developmental interactions are voluntary, the trainees must want to participate, must feel satisfied, and must want to continue the relationship, so their perceptions are certainly critical. Yet, the same argument can be made for coaches; as well; they have to want to participate, they need to be satisfied, and they must want to continue the relationship. Although the same predictors predicted satisfaction for both coaches and trainees, the interpretation of those predictors was different for both groups, in that what coaches interpreted as psychosocial support was, at least in some conditions, perceived rather negatively; and support that coaches perceived as career oriented, was perceived by trainees as psychosocial support.

If this issue is resolved, as it almost certainly will, by attempting to please both dyadic partners, the second issue still remains; exactly what behaviors those perceptions reflect, i.e., what behaviors to train. As was mentioned earlier, what trainees find satisfactory in developmental relationship may not be what coaches, or those who train coaches, assume is satisfactory. Although perceptions of the developmental interactions appear to be heavily influenced by the psychosocial functions, simply training coaches in behaviors that qualify as psychosocial to the objective observer may backfire, as trainee's perceptions may be quite different from those intended. A case in point is the negative correlation between the observed psychosocial functions and outcomes in the face-to-face and telephone conditions. In the VTC and chat conditions, as the rater's perceptions of psychosocial behavior increased, so did the trainees' satisfaction. However, in the face-to-face and telephone conditions, as the raters' perceptions of psychosocial behavior increased, the trainees' satisfaction decreased. Although it is purely speculative, it could be that the coaches' efforts to demonstrate good listening skills and respect were perceived as artificial in the familiar situations, and in the relatively more unfamiliar situation of chat and VTC, their attempts were appreciated.

7.2. Limitations

The two primary limitations of this study – the experimental design and the relatively novel topic – are, ironically enough, also two of its primary strengths. Because this study was experimental in design, there was control over the amount of interaction, the frequency of interaction, and prior acquaintanceship. In addition, the experimental design allowed independent observers to watch and rate the interactions.

However, in gaining this control, a certain amount of realism was lost; the interactions were very short, the sample was highly computer literate college students, and the participants appeared not to be driven by a specific knowledge needs, resulting in interactions that were primarily psychosocial rather than informational in nature.

The novelty of the topic area, although addressing both a void in the literature and a practical need, also resulted in a study that was different from much of the previous research. This novelty had three consequences. First, although the research question “Can developmental interactions happen in a non-face-to-face setting?” required an unstructured task, this unstructured task makes it difficult to mesh the current research with the existing body of knowledge on communication mode effects. Secondly, the lack of previous research on non-face-to-face developmental interactions, particularly with regard to the use of independent raters, meant that there was a lack of previously developed measures. As a result, the raters' observation scales, which were developed for this study, were not as useful as they could have been due to low reliabilities. Although there was considerable agreement between raters, the reliability estimates suffered, apparently because true variation in dyads was often quite small.
Finally, the lack of previous research has left the researchers in the unenviable position of proving the null hypothesis, or of simply stating that there is insufficient evidence to reject the null hypothesis. The first alternative, proving the null hypothesis, is impossible. The second alternative, simply stating that there is insufficient evidence to reject the null hypothesis, is somewhat anticlimactic. The latter alternative, however, is the alternative chosen. However, the small effect size suggests that even if the study had a much larger sample, the practical significance of the effects of communication mode would still be questionable.

7.3. Future research

Several promising areas for further research are suggested by this study, including task and familiarity with the communication mode as moderators/mediators of communication effects. Although some researchers have looked at the type of task as a moderator or mediator of communication mode effects, the emphasis has been on structured tasks; i.e., generative versus decision-making tasks, or forced choice versus consensus-reaching tasks. The task in this study was much less structured, which seems to have enabled the participants to be flexible in determining, evaluating, and achieving their goals. More research needs to be done on the effect of unstructured tasks as a moderator/mediator of communication mode effects. Another potential moderator suggested by this study is familiarity with communication mode, rather than, or in addition to, computer attitudes. The negative correlations between the observed psychosocial functions and outcomes in the face-to-face and telephone conditions, and the positive correlations for the same variables in the VTC and chat conditions, suggests that the familiarity of the communication mode may moderate perceptions of behaviors in different media. This could have significant implications for training coaches.

The study needs to be replicated in order to determine if the lack of a main effect was due to the absence of a main effect, or insufficient evidence to find an effect. It would also be very useful to replicate the study with samples that have a specific informational need, and who are not college students. This would allow us to investigate if learning can spontaneously take place in developmental interactions, thus avoiding the need to structure the interactions and possibly produce the media effects found in previous research. It would also provide information regarding the generalizability of the findings.

Another interesting possibility for future research would be to replicate one of the earlier studies that used a more structured task. By doing an exact replication, it might be possible to determine if the passage of time and the dramatic changes in communication technology has changed the population significantly, and if the same results would still be found today.

Many of the seminal works on communication technology effects were conducted in the late 1980’s and early 1990’s. Our culture, at least from a communications technology perspective, is now longer the same as it was 10 years ago. Because communications technologies are so ubiquitous, it is easy to underestimate the speed with which these technologies have been integrated into the mainstream of our society.

Although we take them for granted, the Internet is only a decade old, and cellular phones were a novelty eight years ago. It is possible that the population’s attitudes toward communication technologies has changed considerably since the original studies were done, and that the lack of an effect in this study might in fact be generalizable to a broader range of tasks and samples.

References


