



Meeting by text or video-chat: Effects on confidence and performance

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ABSTRACT

How does the way people first interact affect communicative effectiveness? Does it matter if you meet someone via video-chat first or via text first? In Study 1, attitudes towards three common communication media were surveyed. In general, respondents preferred face-to-face interactions and messaging platforms over phone calls. In Study 2, participants first met via either video-chat or messaging, and then switched to the other modality. Dyads who met first via text performed worse on an anagram task than those who met first via video. However, those who met first via text were more confident in their performance. How people first get to know each other impacts how they feel about their conversations and how effectively they work together.

1. Introduction

In the past, the primary way people would meet each other was in person. Today people might meet by text before they see each other, such as when people message a potential match at a dating site before talking on the phone. With the pandemic of 2020, more people than ever before met via video-chat. Does the way people get to know each other affect their future work performance or their feelings about their addressees? In Study 1, attitudes towards three common communication media were surveyed. In Study 2, participants first met via either video-chat or messaging, and then switched to the other modality. Performance on a collaborative task and feelings about the communication were assessed.

1.1. Media richness theory

According to Media Richness Theory (Daft and Lengel, 1986), each medium — such as text, phone, video-chat, face-to-face — is placed on a continuum and rated from lean to rich. This continuum depends on (1) how many cues the medium provides (e.g. textual, vocal, facial, bodily), (2) how synchronous the medium is (e.g. allowing for immediate feedback, or requiring different amounts of time between conversational messages), and (3) how effective, natural, and personal the communication is (e.g. how well people ground, how well people think the conversation is going, and how intimate the topic is).

Media with more cues, faster feedback, and more personalization — such as traditional face-to-face communication and video-chat modalities — are classified as richer. As cues and personalization get removed and as feedback gets slower, media become leaner. So phone calls are leaner

than face-to-face, and text communication is leaner than phone calls. Communication media that provide both verbal and non-verbal cues, like video-chat and face-to-face, are considered better for socio-emotional conversations. Video-chat and face-to-face communication contain visual and auditory signals that help create connection between conversational partners. Meanwhile text-based media, like messaging, are considered impersonal and are most efficient when used during task-oriented conversations (Walther, 1996).

Media richness can be considered in terms of socio-emotional communication, task communication, and how it might change in an increasingly technological world. We now turn to each of these topics.

1.1.1. Socio-emotional communication

Face-to-face interactions provide the required socio-emotional signals to achieve connection between conversational partners. In support of this, researchers have observed that participants who conversed with their partners face-to-face first reported more positive impressions of their partners than those who interacted over text first in a free conversation task (Okdie et al., 2011). Likewise, when examining social support between friends, researchers found that in-person face-to-face support resulted in higher positive affect and perceived social support than text-based support (Holtzman et al., 2017; Wohn et al., 2017). Such results have been attributed to both the audio-visual cues, such as eye contact and head nods, as well as social cues, such as facial expressions and voice intonation, that are afforded by face-to-face interactions.

Video-chatting is often equated to face-to-face interactions due to the synchronicity, quality of video images (e.g., clear, high-resolution; Olson et al., 1995), and vocal cues afforded by the media. Task performance in

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video-chat and face-to-face interactions often did not differ (Donherly-Sneddon et al., 1997; O'Malley et al., 1996). When there were differences, they mainly pertained to the number and length of turns taken (van der Kleij et al., 2009).

Nonetheless, there are differences between video-chat and face-to-face settings that may affect conversational cues. Consider reciprocal eye contact, body language, and gestures that complement interactions. In face-to-face communication, conversational participants can engage in direct eye contact. In video-chat communication, conversational participants often see each other without direct gaze. This is because they have to either look into the device camera (in which case they can't also simultaneously be looking at the image of their addressee on the device) or they have to look at their addressee (in which case their gaze will be directed to an image on their device, not to the device's camera, which will make them appear to be looking off to the side). Body posture is also not the same. In face-to-face communication people can move freely. But in video-chat communication, people need to keep their bodies still in order to be in frame. Finally, gestures are not the same. All gestures are visible in face-to-face communication. But video-chat media often feature an image from only the chest up, so gestural cues may seldom be in the frame.

There is some evidence that interpersonal communication does vary across face-to-face and video-chat. Video-chat conversations led to more dissatisfaction with the conversation, less confidence in mutual understanding and decisions made, and difficulty in keeping conversations going (Donherly-Sneddon et al., 1997; Hassell and Cotton, 2017; O'Malley et al., 1996). They also provided less opportunities for social-emotional conversations due to lack of cues (e.g. visual, auditory, and bodily; Powell et al., 2004). Video-chat settings had fewer turn exchanges with more said per turn, and overall there was less turn taking (O'Conaill and Whittaker, 1997; van der Kleij et al., 2009).

1.1.2. Task communication

In contrast to socio-emotional communication, text-based media like messaging are thought to be more beneficial during task-oriented communication. Researchers initially demonstrated support for this by noting that the use of messaging was principally used for micro-coordination (the coordination of practical logistics) when two people were unable to meet face-to-face (Ling and Yttri, 2002). Similarly, in group-task settings, the use of text-based media subdued socio-emotional communication and increased work task efficiency and collaboration (Steiner, 1972). Text-based communication also allowed for a record of what was communicated that can be helpful for some tasks (Fox Tree and Clark, 2013).

With regard to collaboration, text-based media allowed for an equal balance of contribution and turn taking (Tan et al., 2010). In contrast, face-to-face communication made it easier for one speaker to assert the role of leader (Tan et al., 2010). Balance can be important to satisfaction with the conversation. In one study, people expressed more enjoyment with a task the more balanced the conversation between the two speakers (Guydish et al., in press).

On the down side, text-based communication had some flaws when it came to what was communicated. Text-based communication was associated with people's production of fewer novel contributions in comparison to spoken communication (Fox Tree and Clark, 2013).

Despite missing important non-verbal social cues, texting partners are still able to establish a mutual understanding between each other in conversation through verbal means (Clark and Brennan, 1991). Expertise in a medium facilitates mutual understanding. The more familiar a person was with instant messaging, the more they adapted their language use from formal to informal (Fox Tree et al., 2011). This informality was exemplified in an increase of backchannels and discourse markers, as well as more frequent and shorter messages in the messaging conversations. Additionally, other researchers have noted that when non-verbal cues were unavailable to them, people expressed those meanings verbally, rather than dismissing them entirely (Walther et al., 2015). This

includes adding signals to writing to convey nonliteral meaning, such as using *ums* and ellipses to indicate sarcasm (D'Arcey et al., 2019). This shows that people are able to adapt to the cues available to them.

1.1.3. Media richness in a technological world

When media richness theory was first developed, people did not carry around pocket-sized computers — computers that today can be used to emulate a face-to-face chat, such as with a video phone call. People also had much less experience interacting with virtual worlds or agents (such as communicating through a multi-player role-playing game using avatars) or communicating with artificial addressees (such as virtual booking agents). People didn't regularly use social media to post news blending text commentary, photos, videos, and gifs (images of others that represent the communicator's behavior; Tolins and Samermit, 2016). And people had less experience communicating across multiple communicative methods. Today, we can imagine two people communicating face-to-face while sitting across from each other in a café, while at the same time being in a video-conference on their laptops, and periodically texting friends on their cell phones. Where do video-chat, game chat, social media, and multimedia communication fall on the media richness continuum?

Added to this, there is reason to believe that people's attitudes towards communicative media has changed over the decades. Previous researchers found that people primarily used phone calls for micro-coordination in order to lessen the burden of meeting face-to-face to plan their meetings (Ling and Yttri, 2002). However, this attitude appears to have shifted. Newspaper, magazine, and other internet sites report that telephone use is now perceived as time consuming (Wiest, 2019), disruptive, inefficient, and stressful (Turner, 2019). Others noted that receiving an unexpected phone call can be perceived as inconsiderate given that the caller is prioritizing their own needs before the needs of their conversational partners (Buchanan, 2016).

As phone calls have become less popular, text messaging has become more popular. Unlike phone calls, text-messaging affords an anytime-anyplace connectivity which allows conversational partners to reply at their convenience (Vanden Abele et al., 2017). Text-messaging also allows people to edit their responses before sending to better control how they present themselves, something that is not possible in phone or face-to-face conversations.

To get a handle on the way communicative media is perceived today, we conducted Study 1. We assessed college students' attitudes to face-to-face interaction, phone calls, and text communication.

1.2. Hyperpersonal model

Contrary to Media Richness Theory, the Hyperpersonal Model asserts that because of a lack of non-verbal cues, text-based media may actually cultivate more intimate relationships than face-to-face communication (Walther, 1996). It is precisely the lack of non-verbal cues that allows each interlocutor to over idealize their conversational partner. This over idealization stems from exaggerated perceptions based on one's own ideas and beliefs that are derived from the few cues provided by each interlocutor.

Studies of online dating show support for the hyperpersonal model due to the feelings of disappointment found as a result of over idealizing partners. In a speed dating setting, those who had met their partner over a text-based medium then switched to face-to-face were more disappointed in the perceptions of their partners when compared to those who had met via a video-chat medium (Antheunis et al., 2019). Similarly, the longer two conversational partners interacted over text-based media and then switched to face-to-face interactions, the more disappointed they were upon meeting face-to-face (Ramirez and Wang, 2008).

In Study 2, we contrasted Media Richness with the Hyperpersonal Model by comparing how participants felt about their communications, including their confidence in their task performance, how personal and natural their communication felt, and how anxious or calm they felt

during the communication. Messaging is linked to more freedom of expression and empowerment which leads to more confidence in communication (Muhammad Aslam et al., 2019). Language used during messaging conversations has also been shown to be overall more personal and affective (Holtgraves & Paul, 2013; Walther, 2007). Confidence, feeling more personal, and naturalness may result from the lack of non-verbal cues in messaging, which may lead to subsequent over idealization (Walther, 1996). Relatedly, messaging has been found to be the preferred communication medium for those with social anxiety (Pierce, 2009), which is attributed to the control afforded over self-disclosure and reply time (Vanden Abeele et al., 2017).

1.3. The present studies

Some advocate that richer media cultivate more natural and personal communication (Holtzman et al., 2017; Wohn et al., 2017), and others advocate the opposite (Antheunis et al., 2019; Walther, 1996). But communication is often not unimodal, as people use a mix of communication technologies when they interact with one another (Haythornthwaite, 2005). A possible important factor to communicative effectiveness and judgements of communicative success is the order that communicative modalities were encountered in. We begin by assessing media preferences among college students. We then examined the role modality switching plays in performance of a verbal task, as well as perceptions of interpersonal communication between interlocutors.

1.3.1. Study 1: Medium preference survey

In Study 1 we surveyed people's general attitudes towards three different communication media: face-to-face, phone calls, and messaging. This initial survey was completed to assess how college students today felt about communication methods. According to Media Richness Theory, college students should most prefer the richest medium, face-to-face. The next-rich medium, phone calls, should be preferred next. The least preferred medium should be text. We did not find this expected result. Instead, results suggested that college students felt more positively about texting than predicted by Media Richness Theory. This finding supports the Hyperpersonal Model. As a consequence of these findings we investigated whether people effectively communicated as well as they believe they do in their preferred media.

1.3.2. Study 2: modality switching

In Study 2, we examined performance across video-chat and text messaging on a collaborative anagram task. We chose video-chat instead of face-to-face to better control the wide range of factors that differentiate in-person and computer-mediated communication. Both video-chat and text are computer-mediated channels.

We used a collaborative anagram task to avoid the risk of conversations ending prematurely. An added advantage of the anagram task is that previous researchers found that group performance on anagram tasks do not differ from individual performance (Ammons and Ammons, 1959; Heise and Miller, 1951), which means that the task performance is more likely to be based on the medium rather than the participants doing the task.

We measured nine dependent variables, as follows: (1) the number of correct anagrams, (2) the complexity of the anagrams, (3) confidence in performance, (4) how personal the interaction felt, (5) how natural the conversation was, (6) how anxious the participant was, (7) how calm the participant was, (8) how balanced the conversation was with respect to anagram production, and (9) how balanced the conversation was with respect to the number of words contributed.

We made predictions for each dependent variable collapsed across video-first and video-second, and text-first and text-second. According to both Media Richness Theory and the Hyperpersonal Model, people will perform better on the anagram task when interacting via video-chat

compared to text-based communication. Both models predict more anagrams produced in video-chat. Similar findings have been observed by others; for example, in a decision making task, audiovisual cues have been found to result in higher perceived performance than purely textual cues (Sallnäs, 2005). Both models also predict more complex anagrams produced in video-chat. Here too similar findings have been observed by others; for example, in a referential communication task, the richer communicative medium allowed for more novel contributions (Fox Tree and Clark, 2013).

Media Richness Theory and the Hyperpersonal Model make different predictions about how participants feel about their communications. Media Richness Theory predicts greater confidence in performance during video-chat interactions. Media Richness Theory also predicts that people will feel their interactions were more personal and natural in video-chat. In addition, people will feel less anxious and more calm over video-chat. In contrast, the Hyperpersonal Model predicts that people will feel more confident in their performance during messaging interactions. Also in contrast, the Hyperpersonal Model predicts that people will feel their interactions were more personal and natural in text messaging. As a third contrast, the Hyperpersonal Model predicts that people will feel less anxious and more calm over messaging.

With respect to balance, we interpret Media Richness Theory and the Hyperpersonal Model as making similar predictions. Balance was not specifically considered by either model in prior literature. We interpret both models as predicting there would be more imbalances during video-chat interactions than in messaging. The imbalances would be in both the number of anagrams produced and the number of words used. These predictions stem from a study of two people engaged in a series of English homework assignments (Tan et al., 2010). Those who interacted face-to-face exhibited an expert/novice relationship where one person dominated the conversation while the second person played a passive role (Tan et al., 2010). Those who interacted over messaging exhibited a more collaborative relationship (Tan et al., 2010).

We also made predictions for each dependent variable depending on what was the first medium encountered. That is, we collapsed across video-chat first and text messaging second, and text first and video-chat second. Media Richness Theory does not predict differences based on which medium is first encountered. In Media Richness Theory, the key is what cues the medium contains, not whether the medium follows another medium or not. Like Media Richness Theory, the Hyperpersonal Model also does not make different predictions for some dependent measures based on which medium is first encountered: Task performance is still expected to be better in video-chat and text-chat is still expected to be more balanced. But the Hyperpersonal Model does predict that people will feel differently about their communication depending on which medium is first encountered.

According to the Hyperpersonal Model, participants are predicted to rate themselves as more confident, personal, and natural when communicating by text first. People have been found to form closer relationships when they meet over a text-based communication medium first (Antheunis et al., 2019). Close relationships are more easily formed via text messaging due to higher feelings of intimacy, informality, and social orientation through the medium (Ramirez et al., 2015). The Hyperpersonal Model also predicts that participants will be less anxious and more calm with text messaging. Texting first allows for some anonymity which people use to cultivate more positive versions of themselves to their conversational partners (Bargh et al., 2002).

2. Study 1: Medium preference survey

We compared preferences across three communication media: face-to-face, phone calls, and messaging. We assessed which of the three media people felt was most efficient, which they felt more confident using, and which they felt was more personal and natural.

2.1. Method

2.1.1. Participants

In exchange for course credit, 63 UC Santa Cruz students, 16 males and 47 females with a mean age of 20.22, completed Study 1. Demographic data was not collected for this study or for Study 2, but demographic information was available for the participant pool as a whole. In the UC Santa Cruz Psychology Department, women make up 70% of the participant pool population. In addition, 31.1% of participants identify as White, 25.3% as Latinx, 4.3% as African American, 27.6% as Asian, and 11.7% as Other. Academic year of the participant pool consisted of 33% first years, 17% second years, 26% third years, 22% fourth years, and 2% fifth year students.

2.1.2. Materials and procedure

A 27-item questionnaire was created in order to assess attitudes on communication media. The communication media surveyed were phone calls, messaging, and face-to-face interactions. The questionnaire was divided into three sections. The first section assessed which communication media participants preferred under different circumstances, such as “I believe it is more efficient to communicate with someone by” followed by four answer choices: “phone call, messaging, face-to-face, or depends on the situation.” If participants chose “depends on the situation,” they were provided with a text box to explain their answer.

In the second section participants described what they liked or disliked about each communication medium.

In the third section participants filled out two items from the Ten-Item Personality Inventory (TIPI) regarding how “anxious, easily upset” or “calm, emotionally stable” they felt on a 7-point scale (1 – disagree strongly to 7 – strongly agree). Participants completed and submitted the questionnaire via Google Forms. The questionnaire took 30 min to complete.

2.2. Results

2.2.1. Preferred medium

By a ten-fold magnitude, participants chose face-to-face communication as more efficient than both phone calls and texts (see Table 1).

When they selected the *depends on the situation* option, participants were asked to report under what circumstances it depended for each media. A content analysis was then conducted with responses being coded into themes. Two independent coders coded responses under *depends on the situation*. There was a strong agreement between the two coders, $\kappa = 0.85, p < .001$. We found that participants felt phone calls were more efficient during urgent situations, while messaging and face-to-face interactions were more efficient for casual conversations.

2.2.2. Confidence, personalness, and naturalness

One-way repeated measures ANOVAs were conducted to determine how confident, (2) how personal, and (3) how natural they felt using each medium on a 7-point scale (1 – not at all [confident, personal, or natural] to 7 – very [confident, personal, or natural]).

Overall, there were differences in how confident people felt when using each medium, $F(2, 124) = 9.95, p < .001$, see Fig. 1. There were also differences in how personal people felt each medium was, $F(2, 124) = 92.09, p < .001$ (see Fig. 2), as well as in how natural people felt each

Table 1

How often a communicative method was selected when answering the question “I believe it is most efficient to communicate by:” in Study 1.

Communicative Method	Number of Respondents	Percentage of Total
Phone Calls	4	6.3
Messaging	4	6.3
Face-to-Face	42	66.7
Depends on the Situation	13	20.6

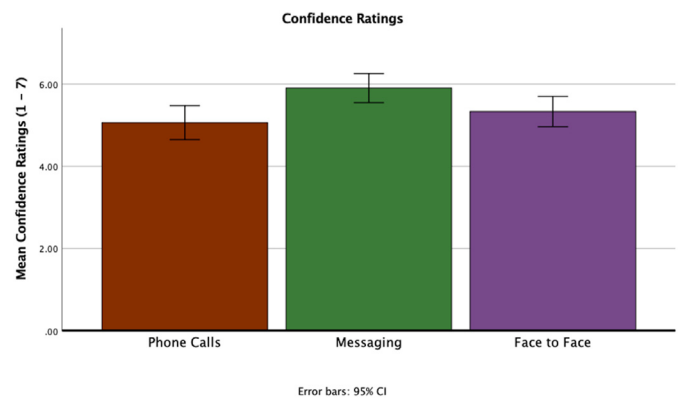


Fig. 1. Ratings on how confident participants felt using each communication media in Study 1.

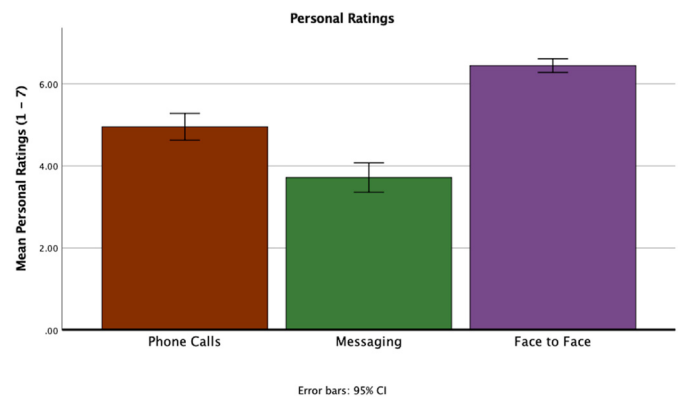


Fig. 2. Ratings on how personal participants felt each communication media in Study 1.

medium was, $F(2, 124) = 13.58, p < .001$, see Fig. 3. Post hoc analyses with a Bonferroni adjustment across communication media can be found in Table 2.

2.2.3. Preferences by personality traits

Most people preferred face-to-face communication ($N = 42$), followed by messaging ($N = 4$) and phone calls ($N = 4$).

We initially thought that personality traits might vary across preferences. We thought that anxious people would avoid the phone, but found that people who preferred the phone were more anxious than those who preferred other methods. When surveyed about their anxiety, those who

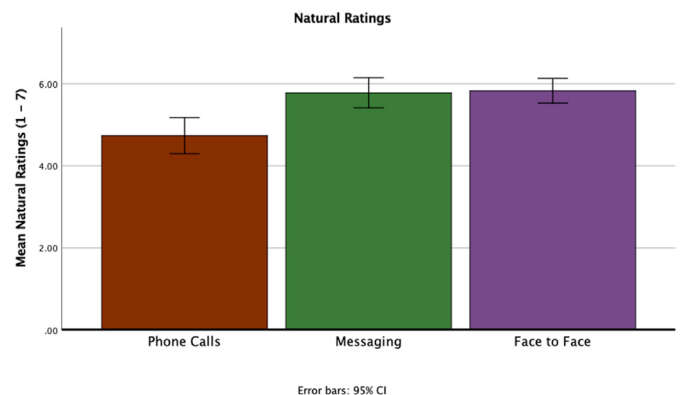


Fig. 3. Ratings on how natural participants felt each communication media in Study 1.

Table 2
Study 1 post hoc analyses with Bonferroni adjustment across communication media.

	Messaging <i>M(SED)</i>	Face-to-Face <i>M(SED)</i>	Test Statistics
Confidence	5.90(.17)	5.33(.18)	$p = .028$, 95% CI [.04, 1.09]
Personal	3.71(.17)	6.44(.66)	$p < .001$, 95% CI [2.27, 3.18]
Naturalness	5.77(.18)	5.82(.15)	$p = 1.00$, 95% CI [-.63, .54]
	Face-to-Face <i>M(SED)</i>	Phone Calls <i>M(SED)</i>	Test Statistics
Confidence	5.33(.18)	5.06(.20)	$p = .253$, 95% CI [-.10, .64]
Personal	6.44(.66)	4.95(.16)	$p < .001$, 95% CI [1.08, 1.89]
Naturalness	5.77(.18)	4.73(.22)	$p < .001$, 95% CI [.56, 1.62]
	Messaging <i>M(SED)</i>	Phone Calls <i>M(SED)</i>	Test Statistics
Confidence	5.90(.17)	5.06(.20)	$p < .001$, 95% CI [.33, 1.34]
Personal	3.71(.17)	4.95(.16)	$p < .001$, 95% CI [.63, 1.84]
Naturalness	5.77(.18)	4.73(.22)	$p < .001$, 95% CI [.41, 1.67]

preferred phone calls agreed most strongly with the self-description of being “anxious, easily upset” ($M = 6.25$, $SD = 0.50$). Those who preferred face-to-face communication agreed less with the description ($M = 4.40$, $SD = 1.60$). Those who preferred messaging agreed the least ($M = 3.75$, $SD = 1.50$). We did not run statistics on these results however because there were too few people who selected phone or text messaging as their preferred means of communication. While fully understanding this pattern will require more study, one possibility may be that anxious people need a response right away from their conversational partners, rather than waiting for a reply via text messaging or meeting face-to-face.

A similar pattern was observed for calmness ratings where a preference for phone calls resulted in the least agreement with the self-description of being “calm, emotionally stable” ($M = 3.25$, $SD = 1.89$). Those who preferred face-to-face communication agreed more with the description ($M = 4.76$, $SD = 1.39$). Those who preferred messaging agreed the most ($M = 5.75$, $SD = 0.50$).

The few people who selected *depends on the situation* ($N = 13$) reported among the lowest agreement with the “anxious, easily upset” self-description ($M = 3.76$, $SD = 1.53$) and among the highest agreement with the “calm, emotionally stable” self-description ($M = 5.23$, $SD = 1.16$).

2.3. Discussion

Most participants chose face-to-face communication over phone and text when evaluating the efficiency of a communicative medium, with face-to-face and text being preferred for casual communication and phone calls for emergencies. Phone calls were considered the least natural in our participant population of college students, with face-to-face interactions and text messaging rated as equally natural. This may be because the participants had less experience with phone calls; participants reported that while they use a mix of media to interact with one another, they relied on face-to-face interactions and messaging the most.

Text communication revealed some distinct benefits: Participants rated themselves as most confident in their ability to communicate with anyone — friend or stranger — when messaging as opposed to calling or talking face-to-face.

3. Study 2: Modality switching

Because we found that people relied on face-to-face interactions and messaging over phone calls in Study 1, we chose to use audiovisual and text communication as the communicative media for Study 2. However, rather than use face-to-face interactions, we chose video-chat in order to compare leaner forms of media (i.e. video-chat and text messaging). We then investigated the effect of modality switching on performance in a collaborative anagram task and perceptions of interpersonal communication. We assessed feelings of confidence, personalness, naturalness, and calmness. We also assessed contribution balance across conditions.

3.1. Method

3.1.1. Participants

In exchange for course credit, 92 UC Santa Cruz students, 19 males and 73 females aged 18–29 with a mean age of 19.35, completed Study 2. Participants in this study were generally strangers, on a scale of 1–7 addressing how well participants knew each other, the mean was 1.73 (3 being the highest score rated out of 7). Two people (from one dyad) were removed because the communicators were familiar with each other, with ratings of 6 or 7, respectively, when asked how well they knew each other. Familiarity with one another could cause more casual communicative styles since people are likely already comfortable talking with each other.

3.1.2. Materials

Six word anagrams were chosen for this experiment, *abolished*, *courtesan*, *educators*, *neurotics*, *secondary*, and *universal*. Word anagrams were chosen as previous researchers found them to be more difficult than non-word anagrams (Ekstrand and Dominowski, 1965; Heise and Miller, 1951; Watson, 1928). The word anagrams were displayed on a Google Form in two sets of three, one for each condition. Under each displayed anagram was a text box where participants noted their answers.

3.1.3. Procedure

Participants were run in pairs. Each pair was assigned to communicate with either video-chat or messaging first. Pairs were given 5 min to introduce themselves to their partner via Skype. If they were assigned to the video-chat first, they interacted over video-chat for these 5 min. If they were assigned to messaging first, they interacted over messaging for these 5 min.

After the 5 min had passed, three word anagrams were displayed on a Google Form. Participants had 20 min to work with their partner to create as many new words as they could by using the letters in each word anagram. New anagrams were noted in a text box directly under the word anagrams displayed on the screen.

Participants then ended their video call or chat conversation and completed a 5-item questionnaire: (1) how confident they felt that they created all possible new words, (2) how personal they found their interaction with their partner, (3) how natural they found their interaction with their partner, (4) how anxious they were, and (5) how calm they were. See Dependent Measures below for details on the questions asked.

The procedure was then repeated, but switched their communication media. So if participants interacted with their partner via video-chat first they then switched to interacting with their partner using the messaging option and vice versa.

Chat history was saved into separate Google Docs documents. Auditory responses were recorded using Apple QuickTime player.

3.1.4. Dependent measures

The following nine dependent measures were collected:

- (1) Correct Anagrams. The number of correct anagrams created was assessed by research assistants who reviewed and identified all

possible correct anagrams created from each word displayed on the screen. A list of all possible correct anagrams based on each word was provided. During video-chat interactions, participants spelled out homophones verbally. Anagrams were considered correct if they were: (a) possible combinations based on the words on the screen, (b) valid words from the English language (as opposed to non-English and pseudowords), and (c) spelled correctly.

- (2) Anagram Complexity. Anagram complexity was determined by the number of letters each anagram created contained. For example, anagrams with less than four letters were worth one point, five letter word anagrams were worth two points, six letter word anagrams were worth three points, etc.
- (3) Confidence. Confidence was measured by answers to the question “How confident are you that you created all possible new words?” on a 7-point scale from 1 – *not at all confident* to 7 – *very confident*.
- (4) Personal. Personal was measured by answers to the question “How personal did you feel the interaction with your partner was?” on a 7-point scale from 1 – *not at all personal* to 7 – *very personal*.
- (5) Natural. Natural was measured by answers to the question “How natural did you feel the interaction with your partner was?” on a 7-point scale from 1 – *not at all natural* to 7 – *very natural*.
- (6) Anxiety. Anxiety was measured by ratings provided to the following: “Here are a number of personality traits that may or may not apply to you. Please select a number under each statement to indicate the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.” Participants rated the phrase “anxious, easily upset” on a 7-point scale from 1 – *disagree strongly* to 7 – *strongly agree*.
- (7) Calmness. Calmness was measured by ratings provided to the following: “Here are a number of personality traits that may or may not apply to you. Please select a number under each statement to indicate the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.” Participants rated the phrase “calm, emotionally stable” on a 7-point scale from 1 – *disagree strongly* to 7 – *strongly agree*.
- (8) Anagram Balance. Anagram balance was measured as the absolute value of the difference in the number of anagrams produced by the dyad. For example, if speaker A contributed 30 anagrams and speaker B contributed 12, then the anagram balance score would be 18. An anagram balance score of zero indicates the two participants contributed the same number of anagrams. The further from zero the anagram balance score, the less balanced the participants’ contributions.
- (9) Word Balance. The number of words produced by each member of the dyad was counted. During video-chat interactions, participant’s audio was recorded. Each audio recording was transcribed word for word for each member of the dyad independently. During messaging interactions, participant’s written text was used. Each participant was assigned a unique username which indicated who was entering what text.

Word balance was measured as the absolute value of the difference in the number words produced by the dyad. For example, if speaker A contributed 300 words, and speaker B contributed 180, their word balance score would be 120. A word balance score of zero would indicate that the two participants wrote or spoke exactly the same amount. The further from zero the word balance score, the more one participant wrote or spoke over the other.

3.2. Results

We report effects of video-chat versus text messaging first, collapsed across when the medium was encountered. That is, we tested video-chat first and video-chat second against text-first and text-second. We then report effects of the first medium encountered, with data divided by whether participants were in the group that encountered video-chat first or text messaging first. That is, we tested video-chat first and text second against text first and video-chat second.

3.2.1. Effects of video-chat versus text messaging

Overall, participants created more correct and complex anagrams during video-chat conversations. They also felt more confident in their performance and rated their interactions as more personal and natural during video-chat conversations. Finally, they agreed more with the “calm, emotionally stable” self-description in video-chat. Main effects of messaging versus video-chat can be found in Table 3.

3.2.2. Effects of video-chat first versus text messaging first

When grouped by modality first encountered, participants created more correct and complex anagrams when they interacted over video-chat first. However, they felt more confident in their performance and felt they had more personal communication when they interacted over messaging first. They also tended to feel their communications were more natural when they messaged first. Finally, there was a tendency towards more balance in text messaging first over video-chat first. Main effects of messaging-first or video-chat-first can be found in Table 4.

3.3. Discussion

People produced more correct and more complex anagrams, were more confident in their ability to solve anagrams, and felt their interactions were more personal, natural, and calm in video-chat compared to text messaging. Anxiety ratings, anagram balance scores, and word balance scores were similar across interaction media, although there was a tendency towards more balance in text messaging in one analysis (see Table 4).

The order of medium used — messaging first or video-chat first — did not have an effect on performance. But it did have an effect on how people felt. In Study 1, respondents described themselves as more confident in their perceived ability to message anyone with text communication. In Study 2, however, we found that actual confidence in

Table 3
Study 2 results across messaging and video-chat modalities.

	Messaging <i>M(SE)</i>	Video-chat <i>M(SE)</i>	Test Statistics
Correct Anagrams	80.82(3.25)	94.09(3.62)	$F(1, 88) = 28.14, p < .001,$ 95% CI [8.29, 18.24]
Anagram Complexity	106.38(4.93)	123.51(5.65)	$F(1, 88) = 23.20, p < .001,$ 95% CI [10.06, 24.19]
Confidence	3.53(.16)	4.30(.17)	$F(1, 88) = 24.09, p < .001,$ 95% CI [.45, 1.08]
Personal	3.25(.13)	4.37(.15)	$F(1, 88) = 48.40, p < .001,$ 95% CI [.79, 1.43]
Natural	5.32(.14)	5.68(.12)	$F(1, 88) = 6.12, p = .015,$ 95% CI [.07, .65]
Anxiety	3.48(.18)	3.38(.18)	$F(1, 88) = 1.42, p = .236,$ 95% CI [-.26, .06]
Calmness	4.98(.17)	5.25(.13)	$F(1, 88) = 4.35, p = .040,$ 95% CI [.01, .53]
Anagram Balance	16.31(2.52)	23.59(4.29)	$F(1, 40) = 2.54, p = .119,$ 95% CI [-1.95, 16.51]
Word Balance	49.78(6.11)	37.91(7.51)	$F(1, 40) = 1.32, p = .257,$ 95% CI [-8.98, 32.71]

Table 4
Study 2 results across order: Messaging first or video-chat first.

	Messaging First M(SE)	Video-chat First M(SE)	Test Statistics
Correct Anagrams	76.97(4.69)	97.94(4.39)	$F(1, 88) = 10.64, p = .002, 95\% \text{ CI } [8.19, 33.74]$
Anagram Complexity	99.50(7.30)	130.39(6.82)	$F(1, 88) = 9.55, p = .003, 95\% \text{ CI } [11.03, 50.76]$
Confidence	4.29(.21)	3.54(.20)	$F(1, 88) = 6.42, p = .013, 95\% \text{ CI } [.16, 1.34]$
Personal	4.27(.18)	3.35(.17)	$F(1, 88) = 13.65, p < .001, 95\% \text{ CI } [.42, 1.41]$
Natural	5.71(.16)	5.30(.15)	$F(1, 88) = 3.26, p = .074, 95\% \text{ CI } [.04, .86]$
Anxiety	3.50(.26)	3.37(.24)	$F(1, 88) = .12, p = .729, 95\% \text{ CI } [-.59, .84]$
Calmness	5.11(.21)	5.12(.19)	$F(1, 88) = .000, p = .984, 95\% \text{ CI } [-.57, .56]$
Anagram Balance	18.52(3.88)	21.38(3.70)	$F(1, 40) = .28, p = .597, 95\% \text{ CI } [-7.97, 13.69]$
Word Balance	35.81(6.22)	51.87(6.52)	$F(1, 40) = 3.17, p = .083, 95\% \text{ CI } [-2.16, 34.27]$

their ability to solve anagrams was only higher for texting when participants hadn't yet experienced video-chat. That is, when their first interaction was via texting, participants were more confident in their performance than when their first interaction was via video-chat. Likewise, we found that messaging was rated as more personal and natural during initial messaging interactions.

4. General Discussion

People feel differently about different communicative media. They prefer face-to-face or phone calls for casual conversation, phone calls for emergencies, and text messaging for conveying information to a broad audience including friends and strangers. They felt most confident in their communication by text, even though their performance didn't back up that confidence.

As a quick summary, some results supported the Hyperpersonal Model: When people text-messaged before video-chatting, they felt more positively about their communication, although participants who video-chatted first were actually more successful at the task. But other results supported Media Richness: (1) video-chat interactions resulted in better performance on the anagram task, (2) people felt more personal and natural in video-chat, and (3) people agreed more with the calmness descriptors. We found little evidence that modality affected the balance of contributions across the participant pair (see Table 4 for one trending effect).

In this General Discussion, we begin by discussing how video-chat and text-messaging — regardless of order encountered — affected performance and ratings. We then discuss how engaging in video-chat first or text-messaging first affected performance and ratings. We then turn to discussion of balance across conversational participants. We end with final thoughts in a Conclusion.

4.1. Video-Chat versus text messaging

Both Media Richness and the Hyperpersonal Model predicted people will perform better on the anagram task when interacting via video-chat compared to text-based communication, and this is what we found: There were more anagrams and more complex anagrams produced in video-chat.

With respect to feelings about the communication media, Media Richness Theory predicted greater confidence in performance during video-chat interactions, and that video-chat interactions would be more personal and natural, as well as feel less anxious and more calm. In contrast, the Hyperpersonal Model predicted that people will feel greater

confidence in performance during messaging interactions, and that messaging interactions would be more personal and natural, and less anxious and more calm. Results supported Media Richness Theory over the Hyperpersonal Model. Participants were more confident in their performance and rated their interactions as more personal and natural during video-chat. They also agreed more with the “calm, emotionally stable” self-description in video-chat.

Participants may have felt more personal and natural in video-chat interactions due to the availability of verbal and non-verbal cues. In social contexts, we often rely on a mix of verbal and non-verbal cues to regulate turn taking and to express ourselves fully (Levinson and Torreira, 2015; van der Kleij et al., 2009). Face-to-face interactions also increase focus on conversational partners, which creates more positive feelings between interlocutors (Okdie et al., 2011).

Participants may have agreed more with the “calm, emotionally stable” self-description in video-chat because of underlying opinions held towards messaging platforms. In Study 1, participants reported that they disliked messaging platforms because it was too easy to misinterpret things. Because messaging lacks verbal and non-verbal cues, the tone of a message is up to the interpretation of the reader. Video-chat, on the other hand, provides at least some cues which could contribute to participants feeling “calm, emotionally stable.”

4.2. Video-chat First versus text messaging first

With respect to which medium was encountered first, Media Richness Theory does not predict differences, but the Hyperpersonal Model does. With the Hyperpersonal Model, participants are predicted to rate themselves as more confident, personal, and natural when communicating by text first, and to be less anxious and more calm with text messaging.

When comparing participants who first texted with those who first video-chatted, we found some support for the Hyperpersonal Model. Participants who had text-messaged first felt more confident in their performance. They also felt they had more personal communication and tended to feel they had more natural communication. But there were no differences in agreement with “anxious, easily upset” or “calm, emotionally stable” self-descriptions depending on which medium of communication participants first encountered.

4.3. Balance in Video-Chat versus text messaging

In addition to task performance and feelings about the communication, we also tested how the communicative medium affected conversational balance. We interpreted Media Richness Theory and the Hyperpersonal Model as making similar predictions about balance, with more balance in text communication where it would be harder for a leader to emerge. There was a tendency towards more word balance in text messaging first over video-chat first. This can be thought of as in the predicted direction because balance was expected to be greater in text messaging, and it could be possible that the balance achieved by texting first could carry over to the video-chat second experience. But this was the only balance trend; we did not find other balance effects. We did not detect a difference in anagram balance across video-chat and text messaging, for example.

Though we did not find evidence for the expert/novice relationship, where one person dominates the conversation while the second person plays a more passive role, this may be evidence that video-chat interactions are not as rich as Media Richness Theory portrays them to be. As noted earlier, although video-chat may offer some cues, the full range of verbal and non-verbal cues of face-to-face interactions are not available. As another explanation for our lack of effect, the establishment of expert/novice roles may require more relationship building between individuals than our anagram task afforded, or that the medium afforded. Video interactions are often viewed as more formal, with longer and less frequent turns. Having longer and less frequent turns may make relationship building difficult.

4.4. Conclusion

In conclusion, the availability of audiovisual cues affords richer interactions. Although a lack of audiovisual cues in initial meetings appears to cause an over idealization at first, once audiovisual cues are introduced, people rely on those cues to make judgments about their performance on a task and about the quality of their interpersonal communication. That is, despite their confidence in their performance when communicating by text (Study 1), in an experimental test, college students in fact performed better and rated the conversational quality higher with video-chat (Study 2). Although audiovisual cues in video-chat are still insufficient for certain types of relationship building in comparison to face-to-face communication (Tan et al., 2010), we found that for at least the activity we looked at here, having some audiovisual cues available is better than having none at all. Understanding how different media impact communicative effectiveness and how people feel about the communication can help make interactions with limited cues more positive and fruitful.

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References

- Ammons, R. B., & Ammons, C. H. (1959). A standard anagram task. *Psychol. Rep.*, *5*, 654–656.
- Antheunis, M. L., Schouten, A. P., & Walther, J. B. (2019). The Hyperpersonal Effect in Online Dating: Effects of Text-Based CMC vs. Videoconferencing before Meeting Face-To-Face. *Media Psychol.*, 1–20.
- Bargh, J. A., McKenna, K. Y., & Fitzsimmons, G. M. (2002). Can you see the real me? Activation and expression of the “true self” on the internet. *J. Soc. Issues*, *58*(1), 33–48.
- Buchanan, D. (2016, August 26). *Wondering why that millennial won't take your phone call? Here's why*. The Guardian. <https://www.theguardian.com/commentisfree/2016/aug/26/whatsapp-phone-calls-smartp-one-messaging-millennials>.
- Clark, H. H., & Brennan, S. E. (1991). Grounding in communication. *Perspectives on socially shared cognition*, *13*, 127–149.
- Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Manag. Sci.*, *32*, 554–571.
- D'Arcey, J. T., Oraby, S., & Fox Tree, J. E. (2019). Wait signals predict sarcasm in online debates. *Dialogue & Discourse*, *10*(2), 56–78.
- Doherty-Sneddon, G., O'Malley, C., Garrod, S., Anderson, A., Langton, S., & Bruce, V. (1997). Face-to-face and video-mediated communication: a comparison of dialogue structure and task performance. *J. Exp. Psychol. Appl.*, *3*(2), 105–125.
- Ekstrand, B. R., & Dominowski, R. L. (1965). Solving words as anagrams. *Psychonomic Sci.*, *2*(8), 239–240.
- Fox Tree, J. E., & Clark, N. B. (2013). Communicative effectiveness of written versus spoken feedback. *Discourse Process*, *50*(5), 339–359.
- Fox Tree, J. E., Mayer, S. A., & Betts, T. E. (2011). Grounding in instant messaging. *J. Educ. Comput. Res.*, *45*(4), 455–475.
- Guydish, A. J., D'Arcey, J. T., & Fox Tree, J. E. (2021). *Reciprocity in Conversation. Language and Speech* (in press), 0023830920972742.
- Hassell, M. D., & Cotton, J. L. (2017). Some things are better left unseen: toward more effective communication and team performance in video-mediated interactions. *Comput. Hum. Behav.*, *73*, 200–208.
- Haythornthwaite, C. (2005). Social networks and internet connectivity effects. *Inf. Commun. Soc.*, *8*(2), 125–147.
- Heise, G. A., & Miller, G. A. (1951). Problem solving by small groups using various communication nets. *J. Abnorm. Soc. Psychol.*, *46*(3), 327–335.
- Holtgraves, T., & Paul, K. (2013). Talking versus texting: an exploration in telecommunication language. *Telematics Inf.*, *30*(4), 289–295.
- Holtzman, S., DeClerck, D., Turcotte, K., Lisi, D., & Woodworth, M. (2017). Emotional support during times of stress: can text messaging compete with in person interactions? *Comput. Hum. Behav.*, *71*, 130–139.
- Levinson, S. C., & Torreira, F. (2015). Timing in turn-taking and its implications for processing models of language. *Front. Psychol.*, *6*, 1–17.
- Ling, R., & Yttri, B. (2002). Hyper-coordination via mobile phones in Norway. In K. Katz, & M. Aakhus (Eds.), *Perceptual Contact: Mobile Communication, Private Talk, Public Performance*. Cambridge: Cambridge University Press.
- Muhammad-Aslam, R. F., Rehman, O., Hafeez, M. R., & Ahmad, A. (2019). Role of texting in communicative confidence boosting: a comparative inter-gender study. *Orient Research Journal of Social Sciences*, *4*(1), 61–80.
- O'Connell, B., & Whittaker, S. (1997). Characterizing, predicting, and measuring videomediated communication: a conversational approach. In K. Finn, A. Sellen, & S. Wilbur (Eds.), *Video-mediated Communication* (pp. 107–131). Mahwah, NJ: Lawrence Erlbaum.
- Okdie, B. M., Guadagno, R. E., Bernieri, F. J., Geers, A. L., & McLaren-Vesotski, A. R. (2011). Getting to know you: face-to-face versus online interactions. *Comput. Hum. Behav.*, *27*, 153–159.
- Olson, J. S., Olson, G. M., & Meader, D. K. (1995). What mix of video and audio is useful for remote real-time work. In *Proceedings of the Conference on Human Factors in Computing Systems* (pp. 33–45). Denver, CO: Academic Press.
- O'Malley, C., Langton, S., Anderson, A., Doherty-Sneddon, G., & Bruce, V. (1996). Comparison of face-to-face and video-mediated interaction. *Interact. Comput.*, *8*(2), 177–192.
- Pierce, T. (2009). Social anxiety and technology: face-to-face communication versus technological communication among teens. *Comput. Hum. Behav.*, *25*(6), 1367–1372.
- Powell, A., Piccoli, G., & Ives, B. (2004). Virtual teams: a review of current literature and directions for future research. *The DATA BASE for Advances in Information Systems*, *35*(1), 1–31.
- Ramirez, A., Jr., Sumner, E. M., Fleuriet, C., & Cole, M. (2014). When online dating partners meet offline: the effect of modality switching on relational communication between online daters. *J. Computer-Mediated Commun.*, *20*(1), 99–114.
- Ramirez, A., Jr., & Wang, Z. (2008). When online meets offline: an expectancy violations theory perspective on modality switching. *J. Commun.*, *58*, 20–39.
- Sallnäs, E. L. (2005). Effects of communication mode on social presence, virtual presence, and performance in collaborative virtual environments. *Presence*, *14*(4), 434–449.
- Steiner, I. D. (1972). *Group Process and Productivity*. New York: Academic.
- Tan, L. L., Wigglesworth, G., & Storch, N. (2010). Pair interactions and mode of communication. *Aust. Rev. Appl. Ling.*, *33*(3), 27.1–27.24.
- Tolins, J., & Samermit, P. (2016). GIFs as embodied enactments in text-mediated conversation. *Res. Lang. Soc. Interact.*, *49*(2), 75–91.
- Turner, A. (2019, June 7). *Why millennials hate talking on the phone*. *Bankmycell*. <https://www.bankmycell.com/blog/why-millennials-ignore-calls#data>.
- Vanden Abeele, M., Schouten, A. P., & Antheunis, M. L. (2017). Personal, editable, and always accessible: an affordance approach to the relationship between adolescents' mobile messaging behavior and their friendship quality. *J. Soc. Pers. Relat.*, *34*(6), 875–893.
- van der Kleij, R., Maarten Schraagen, J., Werkhoven, P., & De Dreu, C. K. W. (2009). How conversations change over time in face-to-face and video-mediated communication. *Small Group Res.*, *40*(4), 355–381.
- Walther, J. B. (1996). Computer-mediated communication: impersonal, interpersonal, and hyperpersonal. *Commun. Res.*, *23*(1), 3–43.
- Walther, J. B. (2007). Selective self-presentation in computer-mediated communication: Hyperpersonal dimensions of technology, language, and cognition. *Computers in Human Behavior*, *23*, 2538–2557.
- Walther, J. B., Van Der Heide, B., Ramirez, A., Jr., Burgoon, J. K., & Peña, J. (2015). Interpersonal and hyperpersonal dimensions of computer-mediated communication. *The Handbook of The Psychology of Communication Technology*, *1*, 3–23.
- Watson, G. B. (1928). Do groups think more efficiently than individuals? *J. Abnorm. Soc. Psychol.*, *23*(3), 328–336.
- Wiest, B. (2019, November 4). *Millennials Hate Phone Calls, and They Have a Point*. *Forbes*. <https://www.forbes.com/sites/briannawiest/2019/11/04/millennials-hate-phone-calls-they-have-a-point/?sh=55d5c4e1517e>.
- Wohn, D. Y., Peng, W., & Zytka, D. (2017). Face to face matters: communication modality, perceived social support, and psychological wellbeing. *CHIPS*, 3019–3026.