The Transmission of Self: Body Language Availability and Gender in Videoconferencing

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ABSTRACT
Videoconferencing technology is increasingly used for work and personal use. While a lot of research has been done on the perceptual qualities of videoconferencing systems, little research has been done on self-transmission or the ways in which individuals manage and control the impressions received by the communication partner.

In an experimental study with 134 participants, we investigated the influence of the availability of body language and both partners' gender on the ability to transmit oneself in videoconferencing. We found that participant gender and partner gender both had significant effects on perceptions of dominance/persuasion and impression management. We discuss these results in relation to the transmission of self in remote communication and their implications for future design and research.

Author Keywords
impression management, teleconferencing, performance and quality in conferencing, collaboration

ACM Classification Keywords
H5.3. Information interfaces and presentation: Group and Organization Interfaces; H.4.3 [Information Systems Applications]: Communications Applications - Computer Conferencing, Teleconferencing, and Videoconferencing.

INTRODUCTION
Back in the late fifties when Erving Goffman investigated interactions and social behaviour on the basis of managing and interpreting one's presentation videoconferencing (VC) technology was part of science fiction rather than everyday life. These days, many forms of computer-mediated communication permeate our working and private interactions. However, the desire to control the way we appear to others is unchanged in the last 50 years: "...when an individual appears before others he will have many motives for trying to control the impression they receive of the situation" (Goffman, 1959, p.26).

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How is that desire for control understood and supported by today's VC systems? How does the way we are able to *transmit* ourselves in VC affect the way we are using this medium? How does the nature of communication change in VC?

We communicate through a variety of means, such as voice, facial expression, hands, and posture. We also communicate for a variety of reasons: to give information, to give feedback, to scold, to appease, to persuade, and so on. We moderate our channels of communication in order to best serve our purpose of communication at any given time. This sort of impression management has not been given a lot of attention in videoconferencing research, but is important given that our satisfaction with the efficacy with which we are able to moderate our communication channels may affect our usage of videoconferencing technology. There has been a lot of work done on measures of efficiency and productivity of VC, such as performance (Hollingshead, McGrath, & O'Connor, 1993; Suh, 1999; Straus & McGrath, 1994). There has also been work done on the social aspect of VC, such as social presence (Hauber, Regenbrecht, Billinghurst, & Cockburn, 2006), and conversation and turn-taking (Sellen, 1995; van der Kleij, Paashuis, Langefeld, & Schraagen, 2004). Though there is a lot of research on the presence of others, there is little in VC research on the perception of how one is perceived by others.

There have been attempts to make social presence less one-sided: less about the perception of the other, but also about whether one's emotions and thoughts were clearly expressed to the other party. An example of this is para-social presence (Harms & Biocca, 2004). It goes a step further in virtual reality research, where the extent to which participants feel physically transported or experience a remote physical location (tele-presence/embodiment) is investigated (Canny & Paulos, 2000; Benford, Greenhalgh, Reynard, Brown & Koleva, 1998).

However, there seems to be little or no research that directly addresses the perception of one's efficacy at impression management over VC. Feeling effective at transmitting one's self, in the way that one desires to, may have a strong impact on whether or not VC is used or chosen as a medium of communication. If the user feels unable or less able to control what they transmit of

themselves or how they are being transmitted, they may feel insecure, unsure, or frustrated with the communication mode (in this case, VC). Goffman (1959) discusses *unmeant gestures* and *inopportune intrusions* caused by inappropriate timing, social context assumptions, or physical context settings. VC adds a new layer of uncertainty to communication. The presentation of the self is part of everyday life, and if a communication mode makes people uneasy regarding the control of that presentation, they may choose not to use it. So it is important to investigate whether there are factors involved in the medium or as a characteristic of the user that change this perception of the transmission of self.

Based on findings in our and others earlier work, and by means of empirical experimentation, we are addressing two promising factors in *self-transmission*, namely gender and body language: What influence does one's own gender, the partner's gender and hence the group's gender mix have on the perception of self transmission? Does it make any difference if the communication medium supports body language cues by showing more than just the typical head-and-shoulders view?

After a brief review of the related work in the field we are presenting a study with 134 participants communicating over a VC system in a controlled laboratory setting. We present our main findings, discuss them and conclude with how our research might influence the use and design of VC systems.

RELATED WORK

This section discusses previous related research carried out on body language availability and gender.

Body Language

Though there are scarcely any studies done on body language in remote communication, there is a lot of literature on body language and communication.

In 1974, Ekman and Friesen conducted a study on deception in which they had participants either lie or be honest in their appraisal of a film. Observers were more accurate in detecting deception when shown the deceptive behaviour through the body cues than when shown the facial cues. It was suggested that this may be because people know to control, and are practiced at controlling, leakage of deceptive cues in their facial expressions, but less so at controlling their body language. This indicates that the availability of body language allows more 'leakage' of uncontrolled cues, and may be detrimental in the control of impression management.

In another experiment (Caso, Maricchiolo, Bonaiuto, Vrij, & Mann, 2006), the experimenters asked some of the participants to be dishonest in an interview. During the interview, all participants were accused of lying. They found that when pressed under suspicion, the participants who were asked to lie gestured with their hands in markedly different ways from participants who were asked to be honest. For example, participants who lied used more metaphoric gestures (that is, using the hands to 'draw' meaning in the air). An example of this would be to open both hands, palms up, and raising the hands sharply to indicate 'support'. This study showed that people do change the way they gesture and communicate through their body language depending on the needs of the situation (i.e., when they desire to give an untruthful impression).

Examining body language availability in VC is relatively new, and there are few studies. Nguyen and Canny (2009) examined the effects of framing the video feed such that only the participant's head was visible, and framing the video so that the participant's whole upper body and head were visible. They found that empathy development was significantly different between the head-only video condition and the unrestricted video condition, and also that empathy development was similar in the face-to-face condition and in the unrestricted video condition.

Additionally, a recent study found an interaction between task type and body language availability in videoconferencing (Teoh, Regenbrecht, & O'Hare, 2010). When participants were in a negotiation-type task, they trusted their conversation partner more when body language was not available than when body language was available. This is another indication that body language availability is important in developing relationships between remote partners.

Gender

The different genders are known to react to and perceive technology in different ways. Maurin et al. (2006) found that compared to female paramedics, male paramedics had more favorable attitudes towards collaboration with a remote physician. In another study, Wheeler (2000) found that women had more favorable attitudes towards the VC technology, and also felt less self-conscious and anxious, than men did. He theorized that women were appraising the VC technology as a means to communication and socialization, whereas men were appraising it as a machine or program.

Men and women also react very differently to VC in specific types of tasks. In competitive tasks such as negotiation, women are significantly more aggressive when using CMC, including videoconferencing, than when negotiating face-to-face (Stuhlmacher, Citera, & Willis, 2007). There are several different explanations for this finding. One possible reason is that the female gender role and gender status is diminished over distance, allowing women to feel more comfortable about showing aggression, typically considered a more 'masculine' behaviour (Stuhlmacher et al., 2007; Kray & Thompson, 2005).

Another, related, explanation is that the distance and lack of face-to-face interaction means that domination and posturing related to physical size or gender is not able to be used. In a negotiation study by Wachter (1999), women expressed that they felt more able to dominate their opponents in the VC condition, whereas men felt less able to dominate their opponents. It is possible that women feel that their slighter physical size is a lesser barrier to domination during a videoconference, and also that their opponents are less of a physical threat. Conversely, men cannot use their physicality against their

opponent in VC as well as they might be able to in a face-to-face negotiation.

This is one of the ways in which the different genders may feel differently enabled or hampered in their attempts to transmit themselves due to the parameters of the technology. Additionally, because the different genders also show differences in their skill to transmit and decode body language (Rosenthal, 1979), it would be interesting to extend previous research on body language availability in VC to include an examination of gender.

METHOD

This study was designed to fill the gap in research presented here. Our objective was to investigate users' perceptions of their success at projecting a desired impression of themselves and their efficacy in persuading their partner in a VC task as a function of their own gender, their conversation partner's gender, and whether or not body language cues were available.

Participants

One hundred and thirty-four participants were recruited for this study, of whom 65 were male and 69 were female. Of the total sample, 109 were first- and second-year psychology students at the University of Otago, recruited in exchange for course credit. Twenty-five participants (20 male, 5 female) were students at the University of Otago who were recruited as part of a prize draw. All participants were aged between 18 and 55 years old (M=21.73, SD=5.61).

Materials/Apparatus

The experiment was run in two adjacent rooms that were identical in layout as well as in the placement of the furniture and other equipment. Each room was furnished with a desk and swivel chair, PC computer running Windows XP, and peripherals: mouse, keyboard, Logitech webcam, and headset. The webcams were arranged so that each participant would have the same view of their conversation partner and their surroundings.

The webcams used were by Logitech (model C500), and the videoconference sessions were conducted using the Skype 4.2 program. During the videoconference sessions, the video feed was set to full screen. The Logitech webcam software had a setting to 'follow' the participant, and enabling this would cause the webcam to zoom in on the participant until only the head and shoulders were visible. If the participant moved, the webcam would 'follow' the participant so that this head and shoulders view was maintained. This setting was used for the restricted view conditions. For the unrestricted view conditions, the zoom was set to the widest/furthest setting possible. This enabled the participant to see their conversation partner's head, shoulders, and torso, as well as any hand gestures, postures, or body language above the waist.

Task.

To select the task for the experiment, we used McGrath's (1984, cited in Straus, 1999) Group Task Circumplex. The circumplex divides task types into 4 quadrants (Choose, Generate, Negotiate, Execute) and varies by physicality horizontally, and by level of interaction and conflict vertically. The vertical axis of the circumplex was empirically tested and supported by Straus (1999). For this experiment, we selected the Choose quadrant, which describes tasks that require users to choose a solution to a presented problem. This quadrant was selected as it represented a very common business-type need: to discuss a problem at hand and arrive at an agreement as to how to handle the problem. This quadrant consists of two task types: Judgment tasks and Intellective tasks. The Judgment task requires users to come to an agreement about the solution to a problem that has no objectively correct answer. In the Intellective task type, users must come to an agreement about the solution to a problem that has an objectively correct answer.

It might seem that to maximise the need for persuasion, the Judgment task type would have been better suited for the study. Because there is no right or wrong answer, users cannot appeal to factual accuracy for their arguments and must otherwise persuade the other party that they have the best idea. However, we also needed to consider the needs and motivations of our experimental sample. The majority of experiment recruitment here is done in exchange for course credit, and the student population here is notoriously impatient, motivated primarily by one thing: time. Many experiments here use time delays as reinforcement, punishment, and motivation because of that, and we had to consider time as a motivation here as well. In a Judgment task with no correct answer, the students were likely to give in to their conversation partner without much discussion in order to end the experiment quickly.

With an Intellective task, however, we were able to set a standard which students could attempt to reach. Also, it allowed us to present a potential punishment. In this case, we told participants that failure to arrive at an answer close enough to the correct answer might result in having to do up to two more tasks.

In this task, called Lost at Sea, participants were given a written description of a scenario where they and their partner had been stranded at sea. They were given a list of 15 items that had supposedly been salvaged on the ship, and were instructed to choose and rank the top 7 items to keep, in order of importance to rescue and survival. On the sheet of 15 items were two blank columns – one for the participants to rank the 15 items on their own prior to discussing the task with their partner, and another for participants to write down the final ranking for the top 7 items as agreed upon with their partner. The private rating was done so that participants would arrive at the discussion with pre-conceived notions of which items were the most important, as well as reasons for and against the items on the list. This was meant to increase the amount of persuasion during the discussion as well as to increase the length of the discussion.

Questionnaires.

Participants were asked to answer a series of questionnaires using the MediaLab (2006) software, entering their responses using the mouse and keyboard. They were first asked a series of demographic questions: their age and gender, what experience they had sailing,

and how well-acquainted they were with their conversation partner. Then, they were asked a series of questions regarding how much or how well they felt they had dominated the conversation or persuaded their conversation partner. E.g.: "I was successful in persuading (my partner)". There were 12 items in this Domination/Persuasion scale. They were also asked questions regarding how well the technological set-up allowed impression management. E.g.: "The technological set-up easily allowed me to project the image or impression that I desired, to (my partner)." There were also 12 items in this Impression Management scale. Both scales were 7-point Likert scales, and on each item the anchors were 'Agree' or 'Disagree'. These scales were constructed by the experimenters because there was no available measure that specifically examined the factors of interest. Most impression management questionnaires ask if the responder engages in macro behaviours like trying to impress the superior or co-workers. In this case, we were looking at a feeling of efficacy: how well do you think you are 'getting across' to the other person in the manner you wish to be perceived?

Procedure

When both participants of a session arrived, they were introduced to one another, and then asked to read the information sheet and sign the consent form. They were told that there were two phases to the experiment: the first in which they would privately rank the 15 items on the Lost at Sea task, and the second in which they would discuss the task with their partner and rank the top 7 items. They were told to memorize their top 7, and that the ranking sheet and scenario description would be removed for the duration of the conversation phase. This was done so that participants would look at one another rather than at the sheets of paper. They were also told that if the group ranking was not close enough to the correct answer, they would have to do up to two more tasks. This was designed to motivate participants to discuss the ranking at length and to actually arrive at the correct solution.

Each participant was escorted to an experimental booth. Participants were allowed 10 minutes to privately rank all the items on the task. When they had both completed this phase, the sheets of paper were removed, and participants were given instructions for the second phase of the experiment. They were asked to wear the headsets that would facilitate the conversation, and told that they had 20 minutes to discuss the task with their partner and agree on what the top 7 items should be and how the 7 items should be ranked.

Once the participants had agreed upon the ranking of the top 7 items together, the ranking sheets were returned to them so they could write down the group's answers. They were then told that the experimenter would compare the group's ranking to the correct ranking, and to fill out the Medialab questionnaire on the computer in the meantime.

When they had both finished the questionnaire, the participants were invited back out of the experimental booths. Regardless of the actual score obtained, they were told that they had done very well and that further tasks were not required. They were then debriefed about the purpose of the study and dismissed.

RESULTS

For each participant, scores were recorded for the Dominance/Persuasion scale, and the Impression Management scale. For each item, participants recorded their response on a 7-point Likert scale. A high score on each scale indicated that they felt like the more dominant partner in the conversation (Dominance/Persuasion scale), and felt that they were successful at projecting the image of themselves that they desired (Impression Management scale).

Principal components analyses (PCA) were conducted for the Dominance/Persuasion and Impression Management scales, and reliability analyses were conducted for all scales. For the PCA, components were extracted with varimax rotation for the Dominance/Persuasion and Impression Management scales; each scale had 12 items, and extraction was set at an eigenvalue of 1. The Dominance/Persuasion scale had 4 components accounting for 75.6% of variance, whereas the Impression Management scale had 2 components accounting for 53.6% of data variance. For Dominance/Persuasion, the first component accounted for 31% of variance, followed by 20%, 14%, and then 10% for the other components. For Impression Management, the first component accounted for 38% of the variance, and the second accounted for 15% of the variance. Both scales were found to be reliable: Dominance/Persuasion scale (12 items, α=.75), Impression Management scale (12 items, α=.85).

Two MANOVAs were done; once for Body Language Availability X Gender Group (male/male, female/female, and male/female groups), and once for Body Language Availability X Gender X Partner Gender. There was a significant main effect of Gender Group on the combined dependent variables: $F(16,242)=1.77$, $p<.05$; Wilks' Lambda=.80. There was also a significant interaction effect between Body Language Availability and Gender Group on the combined dependent variables: $F(26,242)=1.78$, $p<.05$; Wilks' Lambda=.80.

There was a significant main effect of Partner Gender on the combined dependent variables: $F(8,119)=2.26$, $p<.05$; Wilks' Lambda=.87. There was also a marginally significant interaction effect between Body Language Availability, Gender, and Partner Gender on the combined dependent variables: $F(8,119)=1.94$, $p=.06$; Wilks' Lambda=.86.

Impression Management

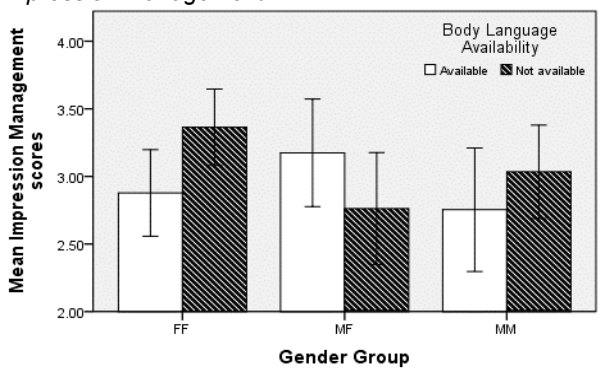

Figure 1. Mean ratings on the Impression Management scale, for each of the gender groups when body language was available or unavailable.

There was a significant interaction between body language availability and gender group on ratings on the Impression Management scale, as shown in Figure 1; $F(2,133)=3.40$, $p<.05$. There was a similar pattern in scores for the same sex dyads. In female/female dyads, scores were higher when body language was not available (M=3.36, SD=.64) than when body language was available (M=2.88, SD=.79). Similarly, in male/male dyads, scores were higher when body language was not available (M=3.03, SD=.78) than when body language was available (M=2.75, SD=1.03). However, the pattern for the mixed sex dyads was reversed. In male/female dyads, scores were higher when body language was available (M=3.17, SD=.90) than when body language was not available (M=2.76, SD=.88).

There was a marginally significant interaction effect between availability of body language and partner's gender on scores on the Impression Management scale; $F(1,133)=3.619$, $p=.059$. When body language was available, the scores were very similar when the partner was female (M=2.96, SD=.81) and when the partner was male (M=2.90, SD=1.03). However, when body language was not available, participants felt they were more able to dominate the interaction with a female partner (M=3.30, SD=.69) than with a male partner (M=2.83, SD=.84).

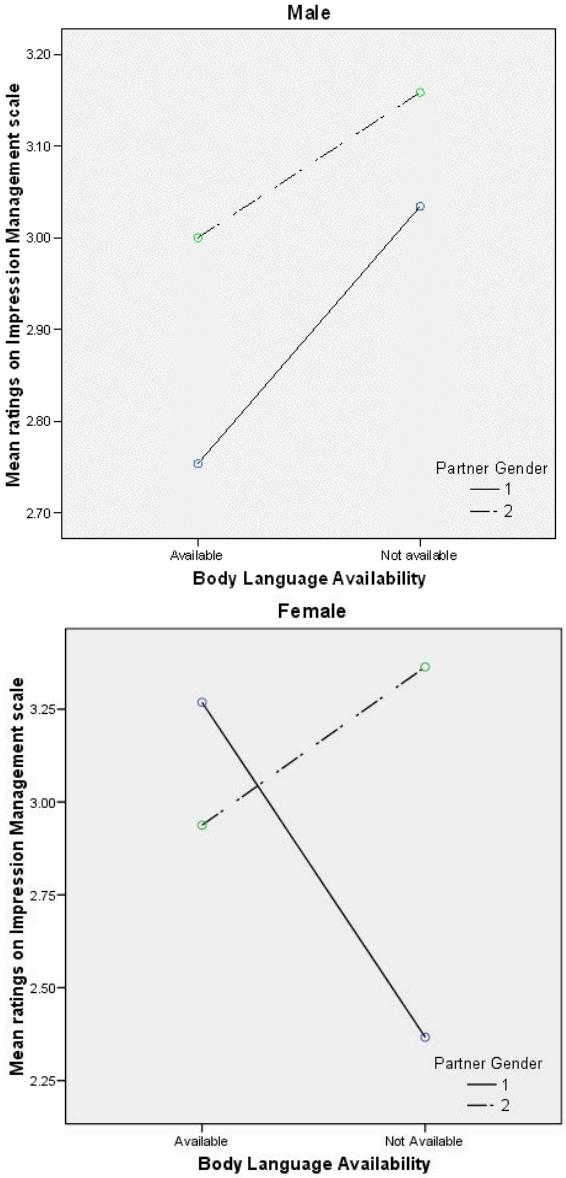

Figure 2. Mean rating scores on the Impression Management scale as a function of gender, partner gender, and body language availability.

Figure 2 shows that there was also a significant three-way interaction between participant gender, partner gender, and body language availability on scores on the Impression Management scale; $F(1,133)=5.231$, $p<.05$. The pattern of scores when the partners were female was the same for both male and female participants. For male participants, scores were higher when body language was not available (M=3.16, SD=.81) than when body language was available (M=3.00, SD=.90). Similarly, for female participants, scores were higher when body language was not available (M=3.36, SD=.64) than when body language was available (M=2.94, SD=.79).

The pattern was different for male and female participants when the partner is male. Male participants showed a similar pattern in their results regardless of participant gender. The ratings were overall lower when their partner was male than when their partner was female, but the pattern was the same. Scores were higher when body language was not available (M=3.03, SD=.78) than when

body language was available (M=2.75, SD=1.03). However, the pattern of scores by female participants when the partner was male was in the opposite direction. Scores were higher when body language was available (M=3.27, SD=.99) than when body language was not available (M=2.37, SD=.80).

Dominance/Persuasion

Gender group was shown to have a significant effect on ratings on the Dominance/Persuasion scale; F(2,133)=4.59, p=.012. Participants in female/female dyads gave the highest ratings (M=4.21, SD=.60), followed by male/female dyads (M=4.08, SD=.57), and male/male dyads gave the lowest ratings (M=4.00, SD=.64).

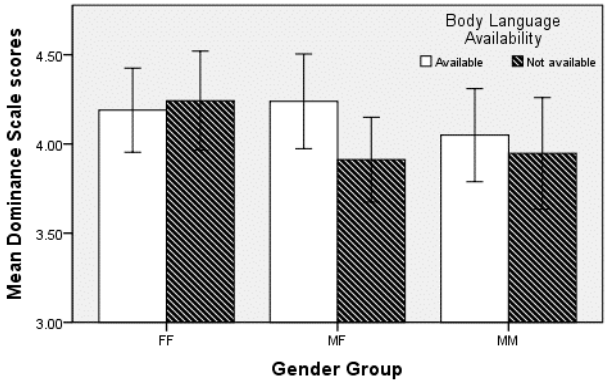

Figure 3. Mean ratings on the Dominance scale for each of the gender groups as a function of body language availability.

Figure 3 shows that there was a marginally significant interaction effect for gender group and body language availability on ratings on the Dominance/Persuasion scale; F(2,133)=2.72, p=.07. Ratings for when body language was available and not available were similar for the male/male dyads and the mixed-gender dyads, but not in the female/female dyads. Participants in male/female dyads gave higher ratings on the Dominance scale when body language was available (M=4.24, SD=.60) than when body language was not available (M=3.91, SD=.51).

Likewise, in male/male dyads, participants gave slightly higher ratings when body language was available (M=4.05, SD=.59) and when body language was not available (M=3.95, SD=.71).

In female/female dyads, participants gave very similar ratings when body language was available (M=4.19, SD=.58) and when body language was not available (M=4.24, SD=63).

Partner gender was shown to have a significant effect on the Dominance/Persuasion scale; F(1,133)=6.669, p=.011. Participants were more likely to rate themselves as the more dominant partner when their conversation partner was female (M=4.22, SD=.56) than when their conversation partner was male (M=3.97, SD=.63). This effect held regardless of the participant's own gender.

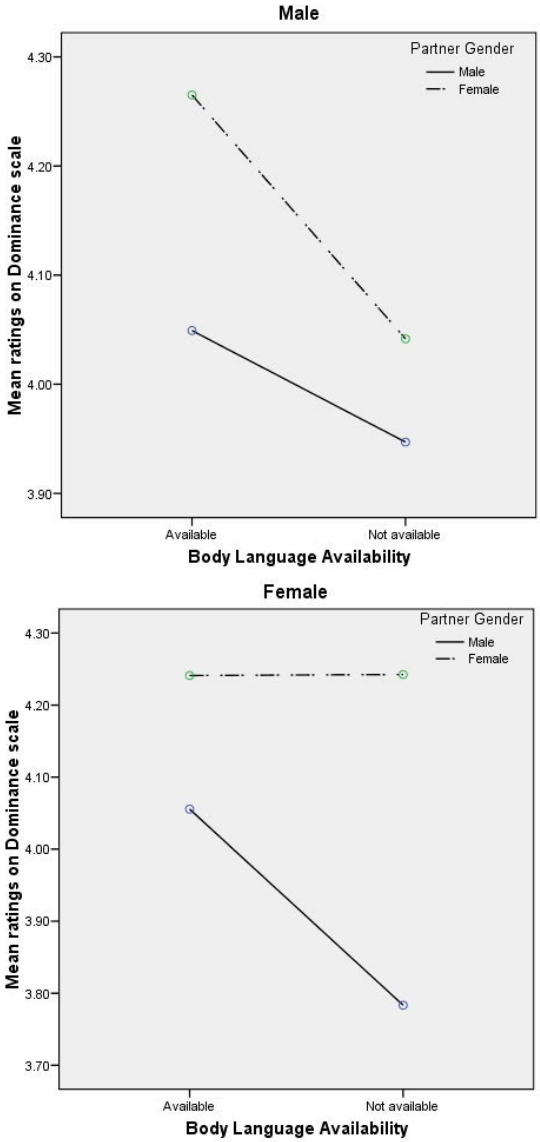

Figure 4. Mean ratings on the Dominance scale for male and female participants as a function of partner gender, when body language was available and not available.

There was a marginally significant effect of participant gender, partner gender, and body language availability on ratings on the Dominance/Persuasion scale, as seen in Figure 4; F(1,133)=3.26, p=.073. For male participants with male and female conversation partners, and female participants with male conversation partners, the pattern of ratings was similar. Scores on the Dominance/Persuasion scale were higher when body language was available than when it was not available.

Male participants with male conversation partners gave higher ratings on the Dominance/Persuasion scale when body language was available (M=4.05, SD=.59) than when body language was not available (M=3.95, SD=.71). Similarly, when their conversation partners were female, male participants gave higher ratings on the Dominance/Persuasion scale when body language was available (M=4.27, SD=.43) than when body language was not available (M=4.04, SD=.51).

Female participants with male conversation partners showed the same pattern. They gave higher ratings on the

Dominance scale when body language was available (M=4.06, SD=.75) than when body language was not available (M=3.78, SD=.50). However, there was no difference between conditions where body language was available and not available, when the conversation partner was female. Female participants with female conversation partners gave very similar ratings on the Dominance scale when body language was available (M=4.24, SD=.59) and when body language was not available (M=4.24, SD=.60).

DISCUSSION

An unexpected effect was how strongly the gender of the participant's partner affected ratings of Dominance/Persuasion as well as of Impression Management. This should not be a complete surprise, however, as we often moderate our behavior differently according to our audience and our role in a particular moment. People's behavior, and as such, the impression they present, differs depending on whether they are acting in the capacity of a very close friend, a partner, a parent, a child or offspring, a colleague, or a patron of a business.

Impression Management

Overall, there was a very strong gender effect, that also interacted with body language availability, on participants' perceptions of their dominance over their conversation partner, and how successful they felt they were at projecting the image or presence of themselves that they desired to project to the conversation partner. The gender of the participants' partners also had a very strong effect on these variables.

It appears that if the partner was female and body language was not available, participants felt more able to project themselves or give the impression of themselves that they wished to. One reason for this may be that people generally believe that women are better at decoding and transmitting body language. This is supported in the literature both as a belief and as actual ability (Rosip & Hall, 2004; Tilley, George, & Marett, 2005). When one takes into account that 'leaky' cues are more likely to be seen in the body than in the face, it explains why men and women feel better at impression management when their body language is not available to a female conversation partner. However, women feel more able to manage impressions of themselves when body language is available if the partner is male. This indicates that people actively try to manage their impressions, not just by hiding cues they don't want to 'leak' but also by deploying cues to influence the impression that their partners perceive.

Dominance/Persuasion

Unsurprisingly, when the conversation partner was female, the participant felt like the more dominant partner. This finding held even when the participant was also female. Also, in almost all cases, participants perceived themselves as the more dominant partner of the pair when body language was available than when it was not. This suggests that body language is utilized in attempting to dominate a conversation, and that participants feel less effectual when their body language is not displayed.

However, Figure 3 and Figure 4 both show that body language availability has no effect when both the participant and the partner are female. This indicates that women do not see body language as necessary or helpful in domination or persuasion attempts with other women. A possible explanation is that in conversations with other women, female participants communicate more with facial expressions and other non-verbal cues that are available even when body cues are not, such as the tone of voice and word choice. Another explanation, consistent with the belief that women are better at decoding body language, is that deploying body language against another woman may be considered ineffective.

CONCLUSIONS

It is clear that men and women approach technology, and specifically videoconferencing, in very different ways. They also perceive their own efficacy at managing others' impressions of themselves very differently depending on whether their partner is male or female, and whether their bodily nonverbal cues are available or not.

What does this mean for developers and users of videoconferencing technology? Users have been reluctant to embrace videoconferencing on a widespread level, and it is essential to understand the reasons behind this reluctance. The results indicate that some of that reluctance might be explained by the different genders' level of comfort with the amount of body language available, which may be mitigated by the gender of who they are speaking to as well as other factors like task type.

We should extend our views on VC use and systems development in two ways: (1) In addition to how a communication partner is seen, more attention should be paid to how a person is transmitted, i.e. balancing out the *two* sides of a VC system. (2) We also should consider VC systems beyond directly perceivable communication (expression the person *gives*, mainly verbal) and paying attention to more subtle cues (expression the person *gives off*, rather non-verbal) (cf. Goffman, 1959).

With the push for universal user interfaces, this may present a challenge to accommodate the needs and satisfaction of the different genders, or to make the availability of the relevant settings (like zoom) more salient to the user. More broadly, we should consider (more) modes for control of impression management and perception in VC systems.

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