Body Language Availability
In Videoconferencing

Cameron Teoh (Hon Leng)

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ABSTRACT

Videoconferencing (or video chat) is now a cheap and very widely-available mode of communication. However, despite its convenience, videoconferencing is still underutilized in business settings where it has the potential to save organizations much in terms of productivity and financial costs. Much research has been conducted regarding video-mediated communication for business use. But, to date, the role of the visibility of bodily non-verbal cues on communication and perception is an aspect of videoconferencing research that has had little consideration. This thesis was undertaken with the aim of investigating the effect of body language availability on various factors that may influence usage or uptake of videoconferencing for business-type meetings. Four empirical, quantitative studies emulated the various types of discussions that business-type users would have with remote team members, associates, or other individuals with whom they conduct official meetings (such as in negotiations between companies and co-operative team decision-making tasks.)

The first two studies investigated the participants’ perception of their conversation partners, and the latter two experiments included the participants’ perception of their own ability to project the desired impression of themselves to their conversation partners. In Study 1, participants were asked to discuss a negotiation task and an idea generation task, with body language available or not available depending on the condition. In Study 2, participants watched a video of an actor presenting a business proposal either with honest body language cues or dishonest body language cues, either in an eye-to-eye camera angle or an off-side camera angle, and either with body language available or with body language not available. The findings from the first two studies showed that body language availability interacted with task type, camera angle, and gender to affect ratings on trust and social presence.
In the latter two studies, the mirror component of participant’s perception of others was added: that is, the perception of being perceived. Additionally, following the findings of Study 2 in which gender differences were found, gender was included in the independent variables of the latter two studies. In Study 3, participants in same-sex (m/m or f/f) or mixed-sex (m/f) dyads were asked to discuss an intellective task (decision-making task with an objectively correct answer), either with body language available or not available. In Study 4, this was extended by asking participants to control their own body language availability, and with the addition of a judgment task (decision-making task with no objectively correct answer.) These studies showed that body language availability, task type, participant gender, and (conversation) partner gender affected ratings of trust, social presence, dominance self-efficacy, and impression management self-efficacy.

The implications of the findings are that it is important to consider videoconferencing with body language available as different from when the technology is used without body language available. They suggest that body language availability does not have a simple effect, such as ‘more is good’ and ‘less is bad’. Participants’ perceptions of their interactions with their conversation partner appear more nuanced and complex than that, and body language availability in videoconferencing interacts with other factors such as task type and gender to influence those perceptions. Gender itself was found to have a very strong effect on users’ perceptions of the interactions, technology, and of their conversation partners, and this included both the participants’ own gender as well as the partners’ gender. This may indicate that different groups of users may respond differently to body language information and use body language differently. There are many venues for future studies in examining the role of body language in videoconferencing, including investigating groups of more than two individuals, investigating gender as social construct versus biological sex, and investigating user perceptions of body language availability in videoconferencing in different cultures.
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</tr>
<tr>
<td>ANOVA</td>
<td>Analysis of Variance</td>
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<tr>
<td>AST</td>
<td>Adaptive Structuration Theory</td>
</tr>
<tr>
<td>BLA</td>
<td>Body Language Availability</td>
</tr>
<tr>
<td>CMC</td>
<td>Computer-Mediated Communication</td>
</tr>
<tr>
<td>EAST</td>
<td>Extended Adaptive Structuration Theory</td>
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<tr>
<td>FTF</td>
<td>Face-to-Face</td>
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<td>VC</td>
<td>Video Conferencing</td>
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REFEREEED PUBLICATIONS

Study 1/Chapter 2:

The findings from Study 1 were presented at the OZCHI 2010 conference in Brisbane, Australia, and the paper was subsequently published in the conference proceedings. Chapter 2 is adapted from the publication.

Study 3/Chapter 4:

The findings from Study 3 were presented at the OZCHI 2011 conference in Canberra, Australia, and the paper was subsequently published in the conference proceedings. Chapter 4 is adapted from the publication.

Authorship/Responsibility:
For both publications, I wrote a significant amount of the papers (approx 85%, entire first draft), with editorial and some writing assistance from my supervisors. I also presented the papers at the conference itself.
CHAPTER 1: INTRODUCTION

Our lives are increasingly entwined with technology, and the technologies available are becoming more diverse, complex, and serve many functions in our lives (Dourish, 2004). More and more, technology has allowed us to keep in touch with those far away through voice and video calls over the internet, and more people are using these technologies every day. For instance, Skype, the computer program that allows people to have audio/video-enabled conversations with each other for free over the internet, debuted in 2003. By 2007, the software had over 309 million registered users (Ebay Inc., 2008). By 2010, that number had reached 663 million registered users (Telecompaper, 2011). There are 37.5 million users online concurrently as of March 2012 (Wolff, 2012), and out of the 200,000 hours of calls made every hour through Skype, 34% of them involve video chat (Wolff, 2010). Furthermore, video chat on the desktop is not just for the casual user; 35% of Skype’s users have conducted business through the program (Malik, 2010).

There are many casual, free programs available that allow video chat over the internet (more formally called VoIP – Voice/Video over Internet Protocol). Windows Live Messenger is a text-chat/IM program that allows video calls. Google Talk (formerly just Google Chat or GChat) is a browser-based chat program that now allows video calls. Google+, the media giant’s social networking site, also has a feature called Hangouts, through which users can video-call each other. Apple’s newer iOS products such as the iPhone and iPad have an app or program called FaceTime, which allows free VoIP calls between users. With inexpensive webcams widely available, and front-facing cameras now built-in into many laptops, tablets, and phones, communicating with one another through technology has become easy, cheap, and widely available.
Due to these advancements in technology and how the technologies permeate our lives, there has been much research into our interactions with machines, and interactions with each other through machines. Human-Computer Interaction (HCI, sometimes also referred to as Computer-Human Interaction or CHI) refers to the field of research and interest into how we as individuals and groups use, perceive, and understand computers. The field of HCI draws contributions from previously distinct areas, such as computer science, psychology, sociology, engineering, and design. A subsection of HCI is computer-mediated communication (CMC) where individuals and groups use computers to communicate for various purposes through the aid of computers.

Computer-mediated communication can take many different forms, from e-mail to message boards and teleconferencing. Teleconferencing refers to the live transmission of messages or data between two or more remote parties via a communications system, using text (chatting), audio, and/or video channels. Videoconferencing (VC) is specifically teleconferencing with video-enabled features, allowing the parties involved in the conference to see each other in real time, and can include text-based communication as a complementary feature.

These systems serve a variety of functions, from casual chatting to facilitating business meetings between two or more people who are geographically separated. The use of VC is currently popular in casual home use, as easy-to-use programs like Skype allow video chat between friends, spouses, parents, and other relatives who are remotely located. However, the uptake of VC in business use is less prolific.

To be sure, there are large numbers of business users who utilize VC. Up to 52% of organizations use desktop videoconferencing (SearchUnifiedCommunications.com, 2010), and 51% of executives say they would start using videoconferencing if it was made available (Cisco, 2010). There are elaborate systems designed for corporate and organizational VC made by companies such as Cisco, Tandberg, LifeSize, Polycom, and Sony. These systems
offer far more beyond the traditional desktop VC program such as Skype or Google Talk; often they can take up an entire room (called room systems), with large screens filling one wall. They also sometimes have the capability to show documents on the screen, and facilitate gaze awareness (knowing/seeing where each person’s gaze is being directed) between multiple parties.

*Figure 1.1.* Photograph of videoconferencing room system. © Audio Visual Systems, Inc. 2012. Reprinted with permission.

However, many business users still travel long distances to conduct face-to-face (FTF) business meetings, believing them to be profitable and well-worth the trouble (Oxford Economics USA, 2009). This is despite the many benefits that doing business over VC can convey to the users. Examples of these benefits include increased productivity, time saved, and quicker turnaround times for organizational decisions.

VC is far cheaper to the organizations and employees alike in terms of productivity. For a FTF meeting that may last a few hours, the organization has to lose the employee for up
to several days, depending on the distance between the locations. WorldCom (cited in Wainhouse Research, 2002) found that for a VC meeting that would take 4 hours, travelling even domestically for the same meeting would take 21 hours. Additionally, the organizations are paying for flights, accommodation, and meals for the employees that frequently travel to conduct meetings.

The time lost is not just for the organization; employees pay the time and effort cost as well. Their work piles up into a back-log every time they have to travel, or they have to get ahead of it before they leave. The travel may have them sitting in airplanes for hours (sometimes over 12) and may leave them jetlagged after each trip. If they have spouses and family, the travel is time spent away from them as well and can be stressful for the family (InfoCom, 1999). Depending on the ages of any children and the childcare arrangements, the travel may cause disruption in routines and necessitate changes each time the employee goes away. VC for all but the most delicate or high-stakes correspondences would counter these drawbacks.

Being able to conduct meetings as quickly as possible is also a large benefit to using VC. Meetings using VC can be done without requiring the planning, booking, and travelling of FTF meetings between remote parties. Brief but important meetings can be conducted quickly and often, and allow faster turnaround time and efficiency on organizational decisions. This can impact the ‘bottom line’ of the company and generate profit due to the more efficient decision-making.

One of the major drawbacks to travelling for business meetings is also the high cost to the environment, because of the waste and pollution generated by modes of travel like aeroplanes, trains, and cars or buses. Many organizations now emphasize sustainability and being environmentally-friendly, these costs may be a major concern to them as well.
The costs to the company, business users (also in terms of time with family or time spent in transit), and the environment, can add up. So why do they not use VC programs instead? There are several perceived downsides to using VC over FTF meetings. It can be harder to share or show documents and other visual aids, such as charts that depict a campaign’s success over time. One person would not be able to simply pass sheets of paper to others in the meeting. Instead, the documents have to be distributed prior to the meeting, meaning the documents themselves would also have to be prepared much sooner than with FTF meetings. This adds to the overhead costs of time to set up and prepare for the meeting.

Another downside is the need to learn how to use the technology and programs well. Almost every organizational employee knows how to print their documents, arrive at a meeting location, and talk to others around a table. Software programs used to accomplish VC need to be learned anew by potential users, which may be a barrier for adoption.

Professional VC suites can also cost a lot of money, into the tens of thousands of dollars. Those in the decision-making seats have to be convinced that these costs, as well as the involvement of training and preparation, and reserving the space for the suites, are going to prove beneficial to the company. This can be reduced by using desktop VC, but the previously described drawbacks are still factors.

The biggest downside to CMC (including VC) is the lack of the physical-social aspects that accompany FTF meetings. In even the most expensive and immersive VC set-ups, one cannot shake the others’ hands, or go out for lunch or drinks after the meeting has concluded. More importantly, it is harder to observe the actions and reactions of the other parties of the conversation, as the typical desktop VC field-of-view is set to display a person’s head and shoulders, obscuring gestures and other vital nonverbal cues.

There has been much research dedicated to understanding how people use and are affected by CMC, in order to then compensate for the perceived drawbacks and boost the
business-oriented uptake of CMC for the aforementioned benefits. Research has examined the differences between different types of CMC and FTF. Examples include e-mail, text chat, audio teleconferencing (phone conferencing), video teleconferencing (VC), as well as complex suites of programs designed to assist and expedite remote collaboration (broadly known as Group Decision Support Systems or GDSS). Some of the research conducted on CMC has been on the purely technical contributions, such as the ‘lag’ in visual or aural feedback created by network speeds (e.g., Gutwin, 2001; Gergle, Kraut, & Fussell, 2006), but the focus of this thesis is on behavioural rather than on purely technical issues.

Theories in Computer-Mediated Communication

Although some of CMC research is atheoretical, the issues at hand are large and complex enough that using an appropriate framework may be beneficial. There are at least a dozen or more theories or frameworks that have been developed that can be used to provide guidelines for CMC research. Schiller and Mandviwalla (2007) conducted a literature review which examined how influential each of the theories was within the field. The four most oft-used theories were media richness theory, social presence theory, social information processing theory, and adaptive structuration theory.

Media Richness Theory (MRT)

One type of theory that is very prevalent and has a number of variations is the task-media fit hypothesis. This type of theory proposes that different kinds of media are best matched with different types of tasks. For example, that e-mail is best for one kind of task or interaction type, and FTF for another type of task or interaction type.

The media richness theory (Daft & Lengel, 1984; Daft & Lengel, 1986) is probably the most well-known of the task-media fit theories. The theory was written regarding organizational processes, and in particular information transfer and exchange within organizations. They suggested that there are two major factors that organizations seek to
reduce: uncertainty, which they define as the absence of information, and equivocality, which is the ambiguity of the information transmitted.

It proposes that there is a scale of richness, whereby richness is determined as the extent to which a communication mode allows a message to be conveyed with as much clarity and understanding as possible through multiple channels. For example, FTF communication allows much clarity because it allows instant feedback, and can convey not just the message but also the tone of the message and the mood of the messenger, through cues such as posture, gesture, and facial expressions. Text-only modes like e-mail can be very ambiguous because only the words are present, and if care is not taken, a message may be interpreted in the wrong way.

That does not mean that only media that can send ‘rich’ messages should be used in all cases. Indeed, Daft and Lengel propose that communication modes that allow little room for ambiguity are best suited for communicating messages that are extremely unambiguous and where uncertainty is very low (the task-to-media fit). When there is little room for ambiguity, and all the information required is present, it is acceptable, even preferable, to use a less rich form of media. As such, the medium is chosen according to its ‘fit’ with the information that needs to be transmitted.

Media richness theory has been widely used in CMC and VC research and is still a popular framework when comparing between different modes of communication (e.g., Panteli & Dawson, 2001; Kahai & Cooper, 2003; Chapman, Uggerslev, & Webster, 2003, Setlock, Quinones, & Fussell, 2007; Wadley, Gibbs, & Duchaneaut, 2009) There has been mixed support for the theory. Some studies find no difference in performance across different types of tasks. Suh (1999) conducted an experiment that compared four different mediums of communication using two types of tasks. The study did not find significant interactions for task and communication medium for task performance or satisfaction. He concluded that the
findings did not support media richness theory. Hollingshead and McGrath's (1995) meta-
analysis using task type revealed no clear, systematic advantages of particular task types over
others, and studies attempting to apply media richness theory find that participants prefer less
rich applications (e.g., Matarazzo & Sellen, 2000). Other studies find support for the theory in
relation to certain tasks but not others (e.g., Hollingshead, McGrath, & O’Connor, 1993).

There have been a number of theories that were developed either to extend media
richness theory or to offer an alternative to its perceived weaknesses. Critics of media richness
theory argue that media richness theory does not take social experiences with technology into
account. For example, channel expansion theory (Carlson & Zmud, 1999) modifies media
richness theory by emphasizing experience. They propose that users’ experience with the
media involved, the topic of the information, as well as the other parties being communicated
with, increases the perceived richness of the communication and by extension, the richness of
the media.

Other theories, like the media naturalness theory (Kock, 2004; Kock, 2005) propose
an evolutionary alternative. The media naturalness theory proposes that human beings have
evolved to consider FTF communication as most natural and comfortable, and that
communication media that best emulate the experience of FTF communication are best,
regardless of task.

**Social Presence Theory**

In an important paper that reviewed the many ways that presence has been described
and conceptualised in the literature, Lombard and Ditton defined presence as the perception
that “a mediated experience is not mediated” (1997, p.1). Though they identified six different
conceptualizations, there are, broadly, two main variations of the concept of presence:
physical presence (also called spatial presence) and social presence.
One of the earliest conceptualizations of physical presence was a phenomenon coined by Minsky (1980) as ‘telepresence’. This was in reference to human operators using machinery through remote technology. Here, an example of telepresence was the perception of direct control of a robotic ‘arm’ even though the actual movement of the machine was mediated through complicated computerised systems.

Another form of physical presence is in virtual reality (immersion in a completely virtual world, e.g., Benford, Bowers, Fahlen, Greenhalgh, & Snowdon, 1995) or augmented reality (immersion in a blended environment that combines ‘real’ and ‘virtual’ elements, e.g.,Billinghurst, Kato, Kiyokawa, Blecher, & Poupyrev, 2002; Regenbrecht, Wagner, & Baratoff, 2002). For example, a person using a virtual reality program who actually feels transported into the ‘virtual world’ means that the technology is sophisticated enough to deliver a high level of physical or spatial presence. The user feels like they are in the presented, mediated environment rather than in the real environment.

The second form of presence is social presence. The Social Presence Theory (Short, Williams, & Christie, 1976) proposes that communication experiences with different synchronous media vary according to how salient the user feels their remote conversation partner(s) are (such as closeness, proximity, awareness), which in turn affects the interpersonal relationship between the users. This salience was termed ‘social presence’ and specifically refers to a property of the medium itself. Social presence refers to the degree to which information or cues about the user’s conversation partner(s) is transferred by the medium.

These are cues or information that informs the user about the message from the conversation partner, like non-verbal language, language, tone, visual appearance (including clothing style), and so on. These cues affect the level of social presence, and thus affect the salience of each of the conversation parties. However, the different mediums are not said to
possess a set social presence; that is, the degree of presence experienced by the users while using any particular medium is subjective and not objective.

Social presence theory has been used to investigate user perceptions of virtual reality and traditional CMC (such as phone conference and VC; e.g., Carlson, George, Burgoon, Adkins, & White, 2004; Hwang & Park, 2007; Savicki & Kelley, 2000; van der Kleij, Paashuis, Langefeld, & Schraagen, 2004; Bradner & Mark, 2001; Yun, Choi, & Lee, 2009; Hauber, Regenbrecht, Hills, Cockburn, & Billinghurst, 2005; Stitzlein & Alem, 2006; Hauber, Regenbrecht, Billinghurst, & Cockburn, 2006; Alem, 2009). Overall there appears to be support for the link between increased social presence and higher levels of interaction and satisfaction (e.g., Garramone, Harris, & Anderson, 1986), as well as improved attitudes towards the media being used (e.g., Hample & Dallinger, 1995). These are important factors for the uptake of VC as the satisfaction with the medium being used depends in part on the perceived social presence quality.

Extending the original social presence theory (SPT) by Short et al. (1976), Kumar and Benbasat (2002) proposed para-social presence theory, which was aimed at examining relationship development over mediated communication. One of the ways they extended SPT was by including asynchronous media like internet forums, e-mail, and asynchronous GDSS. Previously, SPT was only focussed on synchronous media such as live collaborative systems, audio conference/telephone, and VC. Para-social presence is meant to be able to deal with a wider range of media (including asynchronous media), and subsequently broaden the types of interactions and dynamics that can be examined, such as through websites (e.g., Kumar & Benbasat, 2002) and virtual project teams (e.g., Lim & Hung, 2008).

Both media richness theory and social presence theory posit that there is a quality of the medium that alters the perception of non-mediation, and subsequently the perceived advantages of the medium. The difference is that media richness (and its fit to the task) is aimed at effective communication and improving organizational performance. High social
presence, on the other hand, is supposed to lead to the feeling of non-mediation, and a physical immediacy with remote conversation partners. That is, the goal is improving social interactions and user perceptions towards those interactions.

Both these theories have come under fire for over-emphasizing the technology aspect of CMC (Walther, 1992; Schiller & Mandviwalla, 2007; DeSanctis & Poole, 1994). They have been criticised for not taking the human and social aspects into account, as well as being deterministic in that they allow the medium to dictate the level and depth of interaction available. Based on these critiques, theories like Social Information Processing were put forth.

**Social Information Processing Theory (SIP)**

Social Information Processing (SIP) theory was developed to explain how users coped with having far fewer cues and information in CMC than in FTF (Walther, 1992). In part, this was a response to media richness theory and social presence theory; the criticism was that these theories held that the fewer cues available in non-visual CMC compared to FTF led to less social closeness or shallower interactions/relationships. Rather, in SIP it was proposed that CMC users compensate for the lack of visual or aural cues by modifying their behaviour to overcome those perceived deficits. One example of compensation might be in the case of synchronous text communication, such as Instant Messaging (IM), where there are no nonverbal cues such as body language or tone of voice. In order to convey that they are joking and that their statement should not be taken seriously, a user may accompany the statement with ;), an ‘emoticon’ that is supposed to graphically represent a winking smile. Such graphical representations of expressions are commonly used in IM/textual chatting, mobile phone text-messaging, and in e-mail.

While social presence theory and media richness theory explain CMC through the features of the technology, SIP leans towards the human/social instead of the
machine/technology side of the spectrum, proposing that the actors respond to the technology and develop relationships over time. Indeed, Walther proposes that even though the relationship development is delayed over CMC compared to FTF, it can progress to the same level as FTF and even exceed it (deemed ‘hyperpersonal’). One of the criticisms levelled at previous theories like media richness and social presence is that they hold FTF up as the ‘gold standard’ to which CMC design should aspire. But that notion ignores the possibilities for CMC to be used in ways that would be limited or impossible in FTF, and the research involving longitudinal studies (presented later in the chapter) has shown that over time, CMC groups can even start to outperform FTF groups.

SIP has been used to compare CMC to FTF, and how relationships develop differently over time across mediated and unmediated modes of communication (e.g., Walther & Bunz, 2005; Utz, 2000).

Based on SIP, Walther later developed the Hyperpersonal Theory (1996). The term ‘hyperpersonal’ was previously used in SIP to describe how relationships developed through CMC can exceed the intimacy and closeness developed through FTF (Walther, 1992). Through Hyperpersonal Theory, he extends SIP to propose that users take advantage of the differences between CMC and FTF to carefully construct their messages, and as such, their self-presentation. Users can control their intended impressions much better, particularly in asynchronous media such as e-mail, text chat, and text messages, where they can take their time in constructing and revising their wording choices. In synchronous media such as audio conference or VC, users don’t have the luxury of time but can remove visual cues entirely (audio-only) or simply remove from sight what they don’t want seen (VC).
Adaptive Structuration Theory (AST)

Adaptive Structuration Theory or AST (DeSanctis & Poole, 1994) was developed based on the idea of ‘structuration’, that is the result of the interaction between the social structures and social processes among organizational employees, and the structures of the advanced information technological (AIT) systems that are in place in said organizations. The term ‘adaptive’ refers to how the human users adapt in this structuration according to the circumstances, contexts, and changes in the social structures and in the technology.

The framework was part of a response to technology-oriented theories (like media richness theory and social presence theory) and social-oriented theories (like social information processing) which they call the ‘institutional school’ of thought. Instead, this was part of a third school of thought, the sociotechnical theories, which married the two approaches. In the sociotechnical approach, one considers both how the technological structures affect human communication and relationships, as well as how the human actors respond and shape their communications through the technology.

DeSanctis and Poole propose that there are two kinds of social structures in AIT. One type regards the ‘structural features’ of the technology, which are the set-in-stone rules that dictate the usage of the technology by the users. For example, a system may require that users enter their employee IDs to mark each message, or conversely, it may require no identifying information at all, allowing for the message writers’ anonymity. Some desktop VC programs, such as Skype, allow users to disable their video feed even if their conversation partners have their video feeds enabled.

The other type regards what they term the ‘spirit’ of the technology, which is how these ‘structural features’ present themselves to be used and how users ‘appropriate’ or respond to those features. For example: if the GDSS program allowed for anonymous input, the social impact may be that employees are less wary of being honest about their opinions
about each other’s ideas or about feedback. Depending on the existing social structures between these employees, this may be a positive consequence (users present constructive and critical feedback they might have otherwise been too intimidated to voice) or a negative consequence (users complain about each other, use rude language, and due to anonymity hostility and suspicion are fostered in the workplace).

Critics of AST say that it is too broad and vague a framework, and that it does not present any guidance or direction for tests and measurements (Schiller & Mandviwalla, 2007). Naik and Kim (2010) proposed the extended adaptive structuration theory (EAST) to improve on the original model. They criticised AST for not including goal-achievement/performance in the model, when much of organizational work revolves around setting and meeting goals. Thus, in their extension of AST, they set out to identify key dimensions of, and provide a set of guidelines for, virtual teams to succeed at their goals.

AST has been used primarily to investigate group development in organizations, and in particular how those group processes change when AIT is introduced (e.g., Chidambaram, Bostrom, & Wynne, 1991; Carroll, 2004; Gopal, Bostrom, & Chin, 1993). For example, Chidambaram et al. (1991) examined how FTF and GDSS groups dealt with conflict management issues and how the group developed over time. They found a longitudinal effect where GDSS groups initially appeared to lag behind the FTF groups, but progressed to match and exceed the performance of the FTF groups after the first two weeks.

**Computer-mediated communication vs. FTF**

FTF communication has long been held up as the ‘gold standard’ to which developers and researchers of computer-mediated communication aspire to achieve in their products and designs (e.g. media richness theory, social presence theory). Most CMC research is conducted with the FTF condition as the control or yardstick to which the CMC condition is compared.
However, this does not take into account that the majority of humans are vastly more experienced at FTF communication than they are to any other form of communication. Longitudinal research, even studies that only last 4 weeks, have found that with practice, users can achieve equal or even better group performance or interactions with CMC.

Hollingshead, McGrath, and O’Connor (1993) conducted a longitudinal study across 13 weeks where they compared computer-mediated groups with FTF groups. They made several changes to the groups over the weeks, making the groups switch media, as well as switching group members. Their findings suggested that group performance improved with more experience with the CMC technology both when starting with CMC and after making the media switch, although they did not exceed the performance of the FTF groups.

Another study by Chidambaram, Bostrom, and Wynne (1991) examined conflict management and feelings of group closeness in teams that used group decision support systems (GDSS) and in teams that met FTF. Both types of groups met once a week for just four weeks, and though both groups were physically in the same room, the GDSS team used computer software to generate and evaluate ideas as well as to make and formalize their decisions. They found that over time, the GDSS group achieved better conflict management and group cohesiveness than the FTF group. Performance scores on the measures were lower in the computer-supported group than in the FTF groups for the first 2 weeks, but this pattern was reversed in the latter 2 weeks.

Cornelius and Boos (2003) trained participants in conversation management techniques that made explicit the person(s) being addressed by the speaker as well as the topic of their message. They found that trained CMC participants had higher conversational coherence (“the joint product of participants’ abilities and motivation to refer to each other and to develop topics” (Cornelius & Boos, 2003, p.150)), mutual understanding, and dyadic exchanges and references (exchanges using implicit references that context allows the
participants of the conversation to understand; for example, “what about that one?” and having the other participants understand the reference without detailed, explicit information) than CMC participants not trained in conversation management techniques.

Other studies showed that the gap between CMC and FTF in conversational processes such as turn-taking, interrupting, and formality closed over time as users got more experienced with the mediated form of communication (van der Kleij, Paashuis, Langefeld, & Schraagen, 2004; van der Kleij, Schraagen, Werkhoven, & De Dreu, 2009). The results show that the difference in conversational processes between CMC and FTF may be due to inexperience and that using CMC has an adaptation phase.

These findings may indicate that the gulf between CMC and FTF in many studies that compare the two may be accounted for in large part by the experience participants have with the two forms of communication. Training and experience with CMC appears to rapidly improve performance and interactions in remote communication to reach the standard of FTF, and sometimes even to exceed it. They are also examples of how an initial comparison between CMC and FTF indicates the superiority of FTF, and then over time the participants became more experienced with CMC and began to successfully utilise it to exceed performance in FTF. This is supportive of SIP theory (Walther, 1992) which proposes that relationships over CMC, while slower than FTF initially, over time develop to a degree that exceeds FTF relationships.

Another property that a lot of CMC research shares, particularly in cross-modality studies where researchers compare different types of media (like text-only CMC to VC to FTF), is that there is little consideration for what is being shown in the video conditions. The VC mode in these studies shows the typical head-and-shoulders framing, and that is presumed to be The Video Mode. However, we should consider what is being shown and what is not being shown in the VC condition, and how that affects the various communication perceptions like trust, performance, social presence, and so on.
**Body Language in VC**

We communicate through various channels, whether in person or otherwise. We use word choice, tone and emphasis, facial expressions, head movements, posture, and hand gestures and positions. Modifying one or more of these channels can dramatically change the message we send or perceive.

For example, take the phrase, “Would you mind keeping it down, please?” If an individual were to say that with a gentle smile and tone, and relaxed posture, hands open or down by their sides, we may interpret that as a friendly request. However, if the individual were to increase the volume of their voice and speak each word sharply, while having both hands on their hips and a frown on their face, the same words might be interpreted as an angry rebuke.

Non-verbal cues are a very important communication channel and one that can be observed even in animals and insects (Argyle, 1975). They are popularly believed to convey our ‘real’ meanings. It has been shown that when a verbal message is incongruent with the body language being displayed, people are more likely to believe the body language is sending the more ‘honest’ message (Pease & Pease, 2004). This may be because we believe that our facial expressions and vocal messages are better controlled than our body language.

There is some literature examining deception in both verbal and nonverbal cues that discuss how people who are lying display different cues than people who are not lying (e.g., Ekman & Friesen, 1969; Buller & Aune, 1987; Burgoon & Buller, 1994; DePaulo et al., 2003; Caso, Maricchiolo, Bonaiuto, Vrij & Mann, 2006). 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 supports the detection of non-trustworthy behaviour.

However, most research into CMC that investigate differences in modality do not take into account what is being shown in the video mode (e.g., Chapanis, 1971; Suh, 1999; Chapman, Uggerslev, & Webster, 2003; Setlock, Quinones, & Fussell, 2007; Bos, Gergle, Olson, & Olson, 2001; Bos, Olson, Gergle, Olson, & Wright, 2002; Riegelsberger, Sasse, & McCarthy, 2005). Video is just ‘video’, vs. text-only or audio-only modes. There are many ways to conduct VC chat, from smartphones and tablets to desktop VC and large room suites. The amount of body language availability supported varies greatly between these mediums, but is it even necessary? Does it add any value to the interaction? There has been almost no research that takes into account body language availability and what its role is in communication. While there has been interest in the CMC research community regarding nonverbal cues, generally this is in reference to non-visual CMC like text/instant-messaging and e-mail and how nonverbal cues may be conveyed, such as ‘emoticons’ (e.g., Carter, 2003; Hancock, Gee, Ciacco, & Lin, 2008; Lo, 2008; Dresner & Herring, 2010).

In virtual reality software where a full-length avatar (showing a person from head to toe) is presented, there have been efforts to improve and integrate non-verbal cues such as body language (e.g., Guye-Vuilleme, Capin, Pandzic, Thalmann, & Thalmann, 1999). This makes sense because users see a ‘whole person’ or rather the digital representation of one. Research in collaboration via augmented reality (where there is a blend between virtual and actual representations of people and objects) has also investigated methods for introducing hand- and gesture-tracking to complement regular VC systems (John, Regenbrecht, & Schwanecke, 2010). Some software such as Second Life also present a desktop virtual reality in which users can move around, explore the ‘worlds’, and interact with each other. Nonverbal communication has been examined in programs such as this as well (e.g., Antonijevic, 2008).
Research on body language availability in desktop VC, however, has been scarce. One exception has been a study by Nguyen and Canny (2009), which was not even published at the time this thesis was initiated in 2007. They examined the effects of framing the video feed such that only the participant’s head was visible, and of 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 FTF condition and in the unrestricted video condition. This is another indication that body language availability is important in developing relationships between remote partners.

Given the absolute paucity of research into body language availability (or framing, as it is referred to by Nguyen and Canny, 2009), there exists a large gap in the research of body language in VC. It is this gap that will be addressed through the studies in this thesis.

**The Gap**

To recap: Despite the many benefits of using VC instead of travelling frequently for business meetings, many organizations and potential users prefer to travel for meetings rather than use VC (e.g., Oxford Economics 2009; Wainhouse Research, 2002). There has been little to no research done on the effect of body language on interactions and perceptions in VC. Most CMC research that compares different media, use video that shows the traditional head-and-shoulders VC field-of-view. There is much potential for body language availability (BLA) to be a major factor in VC uptake and why it has not been used extensively. The studies in this thesis were designed to investigate body language in VC to address this gap in the literature.

First, a pilot end-user study will be conducted to ascertain the relevance of the topic with actual potential users. Based on the literature available, and on the feedback from the
study, 4 empirical studies will be conducted on the effects of body language availability in VC. In the first study, body language availability and task type are examined. A description of the pilot end-user study follows.

**Pilot End-User Study**

The goal was to interview a group of potential actual VC end-users, to examine the relevance of body language availability and VC for their needs. That is, business-end users who travelled frequently for meetings. Three respondents were selected and interviewed: a dean at the University of Otago, an MP in Dunedin, and a technical advisor at a private company. All three were frequent flyers who travelled both around and out of New Zealand.

In each interview, I was accompanied and supervised by Dr. Regenbrecht. He had contacted each of the interviewees and arranged the meetings. The interviews were all conducted at the subjects’ places of work, and they were recorded on a digital recorder to be transcribed later.

A structured interview was used, in that there was a list of 20 questions (see Appendix A) that covered their patterns of travel, the nature of the meetings they conducted that they had to travel for, the personal costs of the travel on their lives, and what sorts of factors influenced their decisions to use or forego CMC. The questionnaire was not so strict that it could not be deviated from like a script, and if one of the interviewees said something that seemed interesting, follow-up questions were asked.

Two recurring and interconnected patterns that emerged from these interviews were “trust” and “non-verbal communication”. One of the key points of the interviews was that they were dissatisfied with VC because it did not provide enough visual information about the people they were conferencing with. That is, they felt that being able to see each others’ body language was an essential aspect of FTF meetings that was absent in traditional VC programs.
The interviewees said that the lack of visual information made it hard to ‘read’ the other party, and they felt uncomfortable because of this lack of information. They also said that this was especially important in negotiation meetings, because of the mixed-motive nature of negotiations. It was indicated that it was a trust issue; it was hard to trust the other party in a negotiation, and harder still because their non-verbal cues were unavailable to be ‘read.’

Interviewees placed emphasis on being able to see much more of their conversation partners in FTF conversations than in traditional VC environments. This allowed them to see body language, and these cues informed them of how to behave and how their meetings were progressing. This seemed to tie in to the trust factor for interviewees; they preferred to use VC to facilitate already-established relationships, and being able to see their conversation partners’ body language was particularly important in low-trust situations such as negotiations.

Bos and colleagues (Bos et al., 2002) empirically investigated trust in different communication media and found that perceptions of trust in video and audio conferencing groups were nearly as good as in FTF and significantly better than in text chat, even if there was some evidence for slower progress in co-operation and some opportunistic behavior. This indicates that there is at least the potential that users would find VC systems as satisfactory as FTF conditions in terms of trust.

Availability of cues and comfort with the mediated situation is also subject of a review of 18 studies on a comparison of Computer-Mediated Communication (CMC) and FTF (FTF) communication. Bordia (1997) concluded that “[i]n general, discussions on CMC take longer, produce more ideas, and have greater equality of participation. There is reduced normative pressure and poorer comprehension of the discussion in CMC.” (p. 99).
Nguyen and Canny (2007) showed that in group conferencing situations, the spatial arrangement of the conferencing environment (camera placements and visualisations within the conferencing environment) affected trust in VC. With their research they reported on gaze support and awareness as main influencing factors on trust. Bekkering and Shim (2006) reported that there is a significant effect of eye-to-eye contact on trust in comparison to standard VC (off-centre video).

Based on these interviews and the available literature, I decided to explore the link between trust, social presence, and non-verbal communication. An empirical study was designed which manipulated the amount of visual information (and thus non-verbal information) participants received about their conversation partners, as well as the task participants performed through the video link. Idea generation tasks (e.g., brainstorming) are collaboration tasks, which are high-trust situations because participants are working towards the same end, whereas negotiation tasks are mixed-motive, and are low-trust situations as each participant is trying to maximize their own payoff/obtain the best result for themselves (McGrath, 1984).

**Overall framework for thesis**

The overall framework for the current thesis was based on a combination of factors from the theories discussed above. AST is a framework for explaining organizational change when AIT is involved. So in the strict sense, it is not an appropriate framework when considering user’s perceptions in VC. However, increasing usability, positive perceptions, and uptake of VC is absolutely part of organizational change. Also, AST provides several key ideas that would be useful to consider in the thesis.

An important, overarching, factor derived from AST is the social-technical approach of considering both the social interaction between users as well as the technical capabilities of
the technology. DeSanctis’ and Poole’s (1994) proposal of the ‘sociotechnical’ approach is an important construct for the current research, as a lot of previous research has approached CMC from either a purely technological or purely social point of view. There is increasing support for considering the people, context/environment/task, as well as the technological systems together. For example, there is the cognitive engineering field (Norman, 1986; Endsley, Hoffman, Kaber, & Roth, 2007), which is used more in human-computer research rather than in CMC. One of the proposals of cognitive engineering is that changes can be made on both sides for a better fit: the human side (e.g., training, instruction) and the technological side (e.g., intuitive designs).

There is also sociotechnical theory, which was developed for industrial work and was originally developed through research in coal mines and textile mills. Trist and Bamforth (1951) proposed that the social structures of the workers (for example, enabling better socialization and communication) should fit the technological constraints of the coal-mining process. For example, the authors identified that though the ‘cycle’ of processes involved in coal-mining were heavily integrated, the individuals that trained for each segment of the process were very socially segregated. This could then lead to breakdowns in the cycle and safety hazards because the groups were not communicating with each other. These types of considerations for both the social interaction as well as the technical aspects (in the case of the present studies, body language availability) are major factors in this thesis. In this sense, body language availability (the technical aspect), as well as how users feel differently enabled to communicate and interact with one another (the social aspect) are examined together.

Strictly speaking, SIP was developed to examine the differences between non-visual CMC and FTF (Walther, 1992). As FTF is not being used as a control or comparison in this thesis, and because the CMC used in the studies here is audio/visual-capable, it may seem that SIP does not present a good fit for a framework for the thesis. However, its key proposal, that
users compensate for the deficits of CMC by modifying their behaviour, is valuable for this research. VC may seem to closely resemble FTF, in that there is a live visual and aural representation of another person available to interact with in real time, there are still major differences between the two conditions. For example, gaze fidelity (allowing the users to project or interpret where the eye gaze is being directed) is poor in most desktop VC systems. Eye contact, or the impression of eye contact, is not available in most systems because it would require the camera to be mounted exactly where users are looking, which is the screen; the conundrum is that mounting the camera there would obstruct users’ view. However, users in dyadic conversations may compensate for this shortcoming by occasionally glancing at and smiling at the camera to imply eye-contact. In a remote conversation between 3 or more users, they may make explicit who they are speaking to, and when they have finished their turn and are turning over the floor to someone else.

Based on SIP theory, the supporting research on longitudinal CMC studies, as well as the experience factor of FTF, the studies will only compare CMC-to-CMC (specifically VC-to-VC) conditions instead of comparing VC-to-FTF. The VC-to-VC conditions will still vary in that the body language channel will be available in some conditions and not in others.

Both media richness theory and social presence theory propose that different forms of media are best suited to different types of tasks. There have been studies that found support for participants performing better in some tasks than others when using CMC and FTF. Based on this, the studies in this thesis will also take task type into account, and investigate whether body language availability interacts with task type on the measured variables. A scale adapted from Short et al. (1976), as appears in Regenbrecht et al. (2005) is used in the studies to measure social presence in each task.
General Considerations for the Empirical Studies

Task Classification

One other point the interviewees brought up was how the lack of visual information about the other VC parties may affect different types of meetings in different ways. This is consistent with the task-media fit proposals of media richness theory (Daft & Lengel, 1984; Daft & Lengel, 1986) and social presence theory (Short et al., 1976). The interviewees suggested that VC may be more useful when participants have already been acquainted with each other and have existing relationships; one explicitly noted the link between existing relationships and a reduced need to observe nonverbal cues.

This could indicate that when there is a higher level of trust and familiarity, the need for non-verbal cues is reduced. Thus, the current lack of support for these cues (in VC) is less important in situations where all participants are familiar with each other than in situations where there is little familiarity, and in situations where participants are performing a collaborative task than in situations where participants may be engaged in a more competitive task.

When examining interactions between our users, it is necessary to distinguish between the different types of group tasks that they can be asked to perform in order to derive meaning from the interactions. Feelings of trust, satisfaction, and needs for social processes differ depending on the context of the interaction, those we are interacting with, and the goals of the interaction. Several studies have shown support for task type and performance interactions.

One such study that found a significant task type and performance interaction was done by Straus and McGrath (1994). They examined performance on three different types of tasks (idea generation, intellective, and judgment) over two different communication media (FTF, and text chat remote communication). Their results showed that performance did not differ over the two types of communication media for some tasks, but in other tasks
performance was better for FTF than for the CMC medium. In a longitudinal study of the differences in performance between FTF communication and CMC, Hollingshead et al. (1993) also found an advantage for FTF over CMC for some tasks, and that there was no difference for other tasks.

Other research has also found a task type and performance interaction using a different task scheme than Straus and McGrath (1994), and Hollingshead et al. (1993), who both used McGrath’s (1984) Group Task Circumplex, described in further detail below. Lam (2001) examined decision quality for additive, conjunctive, and disjunctive tasks in FTF communication and in a group decision support system (GDSS) that was developed in part by Lam himself. Additive tasks refer to those where every group member's role is similar, and results depend on the cumulative effort of the each group member. Disjunctive tasks are those that have objectively optimal solutions, and results depend on the strongest member of the group. Finally, conjunctive tasks are those where group members each have information that other group members do not, and in which group members must collaborate fully to obtain optimal results. The GDSS system allowed the participants to communicate through text messages and audio.

There was no difference in decision quality between the FTF mode and the GDSS mode for the additive task, but performance was significantly improved in the GDSS medium for the conjunctive and disjunctive tasks. Once again, this indicates that task type is an important factor to consider when studying GDSS and CMC, and designing the technology to support them. Knowing how different tasks may be more productive using different media would be beneficial, not least to manage and dedicate company resources so that the most appropriate venues or methods are used.

We also need to consider the needs and abilities of our participants (Mennecke & Wheeler, 1993). For example, asking first year university students to engage in a team-based architectural blueprint-drawing task would be confusing, and would likely not yield anything
fruitful due to the participants not having the skillset or the understanding to perform the task well. Likewise, if we were to examine the interactions between real employees of an organization like a law firm, the task should match or be analogous with tasks that they have some knowledge or expertise in.

All research on group or dyadic CMC must administer a task to their participants to perform, in order for there to be interactions to examine. But how do researchers select the tasks and why? Many studies use one of several types of task classifications in order to select and compare different types of tasks.

Task classification allows us to examine different types of interactions in CMC. It is also useful in making decisions about what type of task to administer in research, so that the concept of the task and its aims are clear. In designing experiments, there should be a reason for choosing the parameters of the task as well as the measures administered and the overall set-up. There are several different types of task categorization.

McGrath (1984) developed a task classification system after reviewing previous literature on taxonomies. His aim was to provide taxonomy for group communication/process research, and that would clearly delineate a range of tasks that would describe the types of activities and discussions involved in business use. The taxonomy is laid out in a circle divided into 4 sections and is called the Task Circumplex, illustrated as follows:
The circumplex is divided into four sections, each divided into 2 further subsections, for a total of 8 task types. The tasks vary on the vertical axis ranging from co-operative (at the top) to combative (at the bottom), and vary on the horizontal axis from cognitive (i.e., discussion tasks) to behavioural (performing/acting out tasks).

Quadrant I (Generate) describes tasks that involve creativity by the participants and little debate or focused problem-solving. A classic example of the Creativity task type in this
quadrant is brainstorming: the participants all come up with as many ideas as possible, sometimes verging into the outlandish. Each idea by the participants contributes to the completion of the task, and the task itself is entirely co-operative because there is no arguing against each other. The Planning task type is similar in that it is a very co-operative task, but is slightly more structured and oriented towards taking action (generating plans).

Quadrant II (Choose) describes tasks that involve problem-solving and choosing a solution or solutions for the problem. In the Intellective task type, there is an objectively correct answer. Examples of the Intellective task type include survival scenarios, for example the Moon Base Landing or Lost at Sea, where participants have to rank a list of items in order of priority to survive the scenario. In the Judgment task type, there is no objectively correct answer, and instead the answer is the group consensus on the solution. An example of the Judgment task type is the jury system, where groups of people debate the arguments and ‘facts’ presented to them and together decide what the verdict about the case shall be.

Quadrant III (Negotiate) describes tasks that involve resolving differing points of view. In the Mixed-motive task, participants try to come to a solution by resolving differences in opinion/position, but are not invested in the outcome one way or another. In the Negotiation task, however, it is more combative and participants are invested in one outcome more-so than the other(s). Usually in these tasks, one party’s gain comes at detriment to the other party, so there is debate over resource allocation.

The first three quadrants involve discussion-based tasks that can be easily adapted for VC studies. Quadrant IV (Execute) however is action-oriented and would not at all be suitable for VC research. The two task types in this quadrant are Contests/Battles where participants compete against each other to win (such as in tug-of-war or capture the flag), and Performances which involve physical activity to which there is a level of objective excellence (for example, weight-lifting or gymnastics).
The vertical axis of the cognitive side of the circumplex was empirically tested and validated by Straus (1999). The circumplex has also been widely used in group research (e.g., Ward, Marshall, & Novick, 1995; Rao & Jarvenpaa, 1991; Hollingshead et al., 1993; Straus & McGrath, 1994; Shinnawy, Vinze, & Mortagy, 2006; Alel, Kwan, & Miles, 2010) and so selecting the McGrath Group Task Circumplex (1984) as the basis for task selection was a confident decision.

*Group Size*

Meetings can take place between two or more people. They can be between a superior and subordinate, or between members of a project team. In the non-casual use context, CMC research has looked at group or dyadic processes, and the studies involve task types that are used in or resemble business-type tasks. Dyadic interactions are those that involve just two participants (a dyad), which are the type of groups examined in the current thesis.

Dyadic meetings comprise a significant proportion of all business meetings conducted. Panko and Kinney (1995) examined professional and managerial meeting features like group size, meeting location, and how long meetings lasted. They found that dyadic meetings were the most prolific, making up almost 70 percent of all meetings conducted. They also found that people spend almost 40 percent of their FTF communication time in dyadic meetings. This shows that the dyad is an important communication unit for research into improving CMC/VC uptake.

Another reason for choosing dyads is that the interaction between the involved parties is the simplest. Once a third has been added to the mix, it introduces issues such as gaze-directing/perception, turn-taking indication, and holding and directing the floor. When a conversation occurs between just two people, there is little confusion as to whom the messages and gestures are being directed. Since research into body language availability in VC is fairly unexplored, it is prudent to start with the simplest group configuration before extending research to groups of 3 or more.
Body Language Availability

For the purposes of this thesis and for brevity, the term ‘body language’ is used to indicate the non-verbal gestures and cues from the shoulders down to the waist. This includes posture, lean, and hand/arm gestures and movements. The reason for this is that in a typical FTF meeting, one might see the other parties from their heads down to the waist (at which point the desk would obscure the rest of the body). Additionally, in a typical VC program, the video is set to display the head and shoulders; ‘body language availability’ refers to whether the information available in an FTF meeting but not in a typical VC set-up is visible.

The term ‘body language availability’ is used to refer to the different conditions in the studies. Body language available (also referred to as ‘unrestricted’ for brevity) means that each participant sees the full torso view of their conversation partner, including head, shoulders, and torso (including arms/hands) down to the waist or desk. Body language unavailable (also referred to as ‘restricted’ for brevity) means that each participant sees only the head and shoulders view of their conversation partner.

Chapter Summary and Forward

The current theories and research in CMC and VC have been outlined, and a significant gap identified in the literature. Even though there have been many advances in technology, and video chat is widely available and casual use is high, videoconferencing as a business tool has not been adopted at a widespread level. This has been despite the many potential benefits to organization and employee alike, including productivity savings, time and financial benefits, and competitiveness in the market. Much research has been dedicated to examining the differences in group processes/tasks between FTF and VC conditions to improve uptake of VC in business. However, there is very little research on how body
language and its availability in VC affects users’ perceptions of interactions, the medium, and of each other.

Body language is an important channel for cues, and can transmit much information during the conversations/meetings that could change the message and understanding of observers. This could be an important factor in VC uptake for business use if users (and potential users) feel that they are not getting ‘the whole picture.’ Through the current studies here, I will attempt to address this gap in the following chapters, which describe the four studies undertaken to examine body language in VC. The first study, described in the next chapter, examines the effect of body language availability and task type on perceptions of trust, social presence, and performance.
CHAPTER 2: STUDY 1
BODY LANGUAGE AVAILABILITY AND TASK TYPE

Chapter Overview

Based on the available literature on videoconferencing (VC) and body language availability, the first empirical study was designed to examine the effects of body language availability and task type on factors that may affect use/uptake of videoconferencing, including: performance, trust, social presence, and satisfaction. The most significant finding of this experiment was that in a negotiation task, participants trusted their conversation partner less when body language was available than when body language was not available. This chapter was adapted from the paper presented at the Australian Computer-Human Interaction conference in 2010 (OzCHI 2010) and published in the OzCHI 2010 ACM proceedings. ¹

Method

The framework and methods used for the experiment, including descriptions of participants, materials, design, and procedure are described in the following section.

Study Framework

Based on the past research into trust, performance, and task type in videoconferencing, two different tasks were used in this study to see if task type would interact with availability of body language on perceptions and performance. This study differs from Straus and McGrath (1994), Hollingshead et al. (1993), and Lam (2001) in that two different computer-

¹ This work is based on an earlier work: Investigating factors influencing trust in video-mediated communication, in Proc. OZCHI 2010. © ACM, 2010. http://doi.acm.org/10.1145/1952222.1952289
mediated conditions are compared rather than comparing a computer-mediated condition with a face-to-face condition. The reason for this is to remove the confounding factor of experience. FTF is a communication mode that everyone inevitably has extensive experience and practice in using, whereas experience with videoconferencing or even video-enabled chat is much more limited. Furthermore, the foremost interest was in examining the effect of varying the availability of visual information of each participant in computer-mediated communication, and to see if task types would interact with these variations.

The task schema used was adapted from McGrath’s (1984, cited in Straus, 1999) Group Task Circumplex. The circumplex has 4 quadrants (Generate, Execute, Negotiate, and Choose), which vary on the vertical axis in terms of how collaborative tasks are versus tasks where motives and goals may be more conflicting, and on the horizontal axis in terms of how cognitive versus how behavioural the tasks are. The vertical axis of this circumplex (addressing coordination) was empirically tested and validated by Straus (1999).

Because one end of the vertical axis involves collaboration and the opposite end negotiation, motives may be more mixed in negotiation tasks than in collaboration tasks. In collaboration tasks such as idea generating tasks or intellective tasks, all meeting participants’ goals are in agreement; they want the best possible answer for the group. In a judgment task, however, because the “right” answer cannot be decided by factual points, participants need to persuade others that their opinions are the right ones.

There is even more persuasion in negotiation tasks, as there may be different ‘sides’ or different parties in the meeting, who may want to achieve the best or most favourable result they can obtain. As motives become more mixed, the need to accurately (or even satisfactorily) gauge other participants’ reactions by observing things like body language may increase. And as this need increases, we may expect that media that facilitate observation of the full range of feedback, nonverbal cues, and body language would be preferred over media
(such as traditional videoconferencing settings that only show the head and shoulders of each party) that hinder observations of this nature.

For this experiment, participants were assigned to one partner for the duration of two sessions. In each session, they performed two tasks (one idea generation task and one negotiation task) over a video/audio link in adjacent rooms. The idea generation task required them to discuss a proposed problem and work together to generate as many solutions to the problem as possible. For the negotiation task, each participant received a list of 8 items with set payoffs (or priorities), and the partners received lists that had the opposite payoff or priority order; their task was to agree with each other on which 3 items to discard, and to achieve the highest payoff possible for themselves. In one session, they received the traditional head-and-shoulders videoconferencing view of each other (Restricted), and in another, they received a wider view that showed that partner from the head to waist (Unrestricted). After each task, they were asked to fill in a set of questionnaires: the Individualised Trust Scale, the Performance Perception Questionnaire, and the Presence Scale. The hypotheses for the experiment were as follows:

1. Participants would trust their partners more in the Creative tasks than in the Negotiation tasks.
2. In the Negotiation tasks, participants would trust each other more in the Unrestricted view than in the Restricted View.
3. The Unrestricted view would receive higher ratings of Social Presence than the Restricted view.
4. Participant satisfaction with the task process and performance would be higher in the Creative tasks than in the Negotiation tasks.
5. Participant satisfaction with the task process and performance would be higher in the Unrestricted view than in the Restricted view.

6. Performance in the Creative tasks would not significantly differ between the Unrestricted view and the Restricted view.

7. Session length in the Negotiation tasks would be shorter in the Unrestricted view than in the Restricted view.

8. Payoff difference in the Negotiation tasks would be higher in the Unrestricted view than in the Restricted view.

Participants

Sixty-four students at the University of Otago were recruited for this experiment. There were 28 males and 36 females, ranging in age from 18 to 28 years old (M = 19.78, SD = 1.79). Forty-two participated in exchange for course credit, and 22 participated in exchange for monetary payment. Those who participated for course credit were 1st and 2nd year psychology students recruited through the department’s online experimental sign-up website, and those who participated for money were students recruited through the university’s Student Job Search company.

It was not possible to control for participant familiarity with their partners for those who participated for course credit. However, since only 4 pairs of students who participated for course credit knew each other, those who were recruited through Student Job Search were required to be unfamiliar with their partner. The data of all the participants were analysed and then compared it to an analysis that excluded the 4 pairs. There was no difference in the results, so the final analysis did not exclude the 4 pairs of participants that knew each other.

Apparatus and Materials

Two Apple e-Mac Power PC G4s were used to run the experiment. Both computers were using G4 700Mhz processors, and 1GB RAM. They were running the Mac OSX 10.4.5
platform, had display resolutions of 1152 X 864 pixels, and had screen refresh rates of 80Hz. Both computers were networked to each other. The experiment was run in two adjacent, similar rooms; each room was set up so that both rooms’ monitors, desks, and chairs were at the same height.

The experiment also utilised a HandyCam (handheld video camera, mounted on tripod) in each room, set up with the e-Macs in both rooms to be situated directly to the top left of the computer monitors. The cameras were directed at the participants, and set at the widest angle as to capture the participant from the waist up. The cameras were similarly positioned in both rooms; this was meant to give both participants similar views of each other. The cameras were used to transmit video and audio to the participant in the adjacent room. These cameras were used instead of the webcams the department had available, as those webcams (for the e-Macs) were designed to attach by magnetic force, which cast a colourful distortion over the computer screen.

The videoconference between participants was facilitated through the iChat 3.1.1 V429 software. This is a standard audio/video chat program on Apple computers. The program was set to full-screen mode on both computers, and both iChat windows had their picture-in-picture window removed through the Ecamm Conference Recorder 2.0.2 add-on for iChat (www.ecamm.com/mac/).

Tasks. Task selection was based on McGrath’s (1984, as cited in Straus, 1999) Group Task Circumplex, and tasks were selected from different quadrants in this circumplex to compare performance. One task (idea generation) was used to represent the Generate quadrant and the other (negotiation) was used to represent the Negotiate quadrant. These tasks were selected to represent tasks at the opposite ends of the vertical axis in the Group Task Circumplex.
Idea generation is a collaborative task in which participants all aim for the same goal, whereas negotiation is mixed-motive and one where participants are more likely to want the best for themselves. The idea generation task was based on McGrath (1993), and Straus and McGrath (1994). In this task, participants were presented with a simple scenario for which they needed to suggest and list as many solutions as possible for the problem (for example, suggesting solutions for reducing littering around the campus area; see Appendix C). No consensus for the ideas is required, and each idea presented is considered a positive contribution towards the completion of the task.

The negotiation task was based on Short (1967) and Suh (1999); in this task, participants were presented with a list of 8 items, and were asked to agree with each other on selecting 3 out of the 8 items to be discarded (see Appendix C). For example, participants were told that the Psychology Department was planning a new building, but that as a result of budget cuts, 3 of the 8 planned facilities would have to be slashed considerably; their task was to agree on which 3 facilities should suffer the burden of the budget cuts. Each item had a numerical payoff indicating its value to the participant, and each participant’s payoff lists were in the opposite order to that of their conversation partner’s. The values of the items ranged from 30 to 100, and this was a constant-sum task; the total loss of points from the two participants always added up to 390 points.

Questionnaires. At the beginning of the experiment, participants were asked to fill in a demographic questionnaire involving general questions about the participants (such as age and gender), and their attitudes towards and experience with computers (see Appendix B). Examples of questionnaire items were “Have you used video communication programs, such as Skype, Netmeeting, or webcams?”, “How do you feel about computers in general?”, and “How do you feel about computer-mediated communication?”

A set of questionnaires were administered after the completion of each task: a performance and process satisfaction questionnaire from Suh (1999) called the Performance
Perception Questionnaire, a Presence Questionnaire measuring social presence and co-presence as described in Hauber et al. (2006), and a trustworthiness questionnaire (rating the trustworthiness of their conversation partner) as described in Wheeless and Grotz (1997) called the Individualised Trust Scale (see Appendices D-F). For each item on these 3 questionnaires, a 7-point Likert scale ("1" represented "disagree" and "7" represented "agree") was used to record responses. Participants placed a mark on the scale corresponding with how much they agreed or disagreed with the item.

**Experimental Design**

There were two manipulated variables: task type and amount of visual information. Task type was a within-subject variable and had two levels: an idea generation task, and a negotiation task. Amount of visual information was also a within-subject variable and had two levels: minimum visual information about one’s partner (head-and-shoulders view or Restricted View), and maximum visual information about one’s partner (Unrestricted View from head to waist). This experiment had a 2x2-design.

Both variables were counterbalanced, so that some participants received the idea generation task first and the negotiation task second, and some received the tasks in the opposite order, in each session. Participants also received the Unrestricted and Restricted views of their partner a counterbalanced session order.

**Procedure**

At the beginning of the experiment, both participants signed consent forms and filled in the demographic questionnaire. They were then informed of their first task (either negotiation or idea generation) and were given instructions verbally as well as on a sheet of paper that had the full details of the scenario and instructions, and told that they had a time limit of 15 minutes to complete the task.
For the idea generation task, they were told that the task was like a brainstorming session, where they were to generate as many solutions as possible for the problem presented. For the negotiation task, they were told that they had two goals: to agree with each other on which 3 of the 8 items to discard, and to maximise their own payoff. They were each provided with a printed list of the 8 items, and a pencil to write with and to check off items. Each participant’s list had the opposite order of priorities as their partner’s (i.e., they had reversed payoff scales and priorities).

Participants were each moved into an experimental booth and the task began once the cameras were started and both booths were shut. After participants had completed the task, they exited the booths and completed the satisfaction, social presence, and trust questionnaires. They were informed that they should complete the questionnaire in relation to the task they had just completed.

Once they had completed all the questionnaires, they were given instructions for their second task (either negotiation or idea generation), and informed that they again had 15 minutes to complete the task. After participants had completed the second task and completed the questionnaires a second time (again told that they should complete the questionnaires in relation to the task they had just completed), both participants selected a time and date for their second session together, approximately one week from the date of the first session.

In the second session, the procedure was repeated with these changes: they did not have to fill in the consent forms and demographic questionnaire, they experienced a different view of their conversation partner than they did in the first session (i.e., if they had experienced the Unrestricted view in the first session, they experienced the Restricted view in the second session), and the experiment ended after the completion of the second set of questionnaires for that session. Participants were then debriefed about the purpose of the experiment, and dismissed.
Results

Participant responses on the Likert scales were recorded for the Individualised Trust Scale, the Presence Questionnaire, and the Performance Perception Questionnaire. Some items (#2 on the Presence Questionnaire, and #6, #8, and #9 on the Performance Perception Questionnaire) were reverse-scored to make the direction of the ratings consistent. On the Individualised Trust Scale, a higher number response indicated more distrust of the participant’s partner, and a lower response indicated less distrust of the participant’s partner. For the Presence Questionnaire and the Performance Perception Questionnaire, higher responses indicated better social presence and better performance satisfaction respectively.

Means of each participant’s scores on the Individualised Trust Scale were averaged across all participants, for each of the 4 conditions: Creative/Restricted, Creative/Unrestricted, Negotiation/Restricted, and Negotiation/Unrestricted. This was repeated for the Presence Questionnaire and Performance Perception Questionnaire after reverse-scoring.

To measure performance in the Creative tasks, the number of ideas generated by each pair of participants was recorded and averaged across all pairs for the Unrestricted and Restricted views. Performance in the Negotiation tasks was measured in two ways: the session length (or time it took the participants to agree with their partners on a resolution) and the difference in payoff between the participants of each pair. These were averaged across all pairs for the Unrestricted and Restricted views.

These data are presented in Figures 2.1, 2.2, and 2.3 as follows.
As shown in Figure 2.1, participants trusted their partners more in the Creative tasks (M = 2.00, SD = 0.81) than in the Negotiation tasks (M = 2.32, SD = 1.03), for both the Restricted and Unrestricted views. There was very little difference in trust ratings for the Creative tasks between the Restricted and Unrestricted views, but in the Negotiation tasks, participants trusted their partners slightly more in the Restricted condition (M = 2.26, SD = 1.00) than in the Unrestricted condition (M = 2.37, SD = 1.06). A 2x2 repeated-measures analysis of variance showed that there was a significant main effect of task, $F(1, 63) = 18.307, p < .001$. There was also a marginally significant interaction between the task and body language availability factors, $F(1, 63) = 3.604, p = .06$. There was no significant main effect of body language availability, $F(1, 63) = .567, p > .05$. 

*Figure 2.1. Individualised Trust Scale scores for task type and body language availability.*
Figure 2.2. Presence Scale scores for task type and body language availability.

Figure 2.2 shows that in both the Creative and Negotiation tasks, participants gave higher social presence ratings in the Unrestricted condition (M = 4.44, SD = 0.78) than in the Restricted condition (M = 4.06, SD = 0.90). A 2x2 repeated-measures ANOVA showed that there was a significant main effect of body language availability, $F(1, 63) = 21.418, p < .001$. There was no significant main effect for task, $F(1, 63) = .768, p > .05$. There was also no significant interaction between the task and body language availability factors, $F(1, 63) = .534, p > .05$. 
Figure 2.3. Performance Perception Questionnaire scores for task type and body language availability.

Figure 2.3 shows that in both the Restricted and Unrestricted conditions, participants had higher performance satisfaction in the Creative tasks (M = 5.42, SD = 0.79) than in the Negotiation tasks (M = 5.06, SD = 1.03). In the Creative task, participants were more satisfied when they were using the Unrestricted condition (M = 5.49, SD = 0.76) than when they were using the Restricted condition (M = 5.34, SD = 0.81). In the Negotiation task, this pattern was reversed; participants were more satisfied when they were using the Restricted condition (M = 5.10, SD = 1.03) than when they were using the Unrestricted condition (M = 5.03, SD = 1.04). A 2x2 repeated-measures ANOVA showed that there was a significant main effect of task, \( F(1, 63) = 11.640, p = .001 \). There was no significant main effect of body language availability, \( F(1, 63) = .226, p > .05 \). There was also no significant interaction between the task and body language availability factors, \( F(1, 63) = 1.796, p > .05 \).
On average, participants came up with slightly more ideas in the Unrestricted condition (M = 7.56, SD = 2.27) than in the Restricted condition (M = 7.47, SD = 2.41). A t-test showed that this difference was not significant, $t(31) = -.220, p > .05$.

There was a slightly higher payoff difference between participants when using the Restricted condition (M = 32.50, SD = 27.71) than when using the Unrestricted condition (M = 31.88, SD = 29.78). This difference was not significant, $t(31) = .158, p > .05$. Comparisons of payoff differences between the first session and second session showed no significant order effect.

On average, participants took longer to reach a resolution to the Negotiation tasks in the Unrestricted condition (M = 6.82mins, SD = 3.41) than in the Restricted condition (M = 6.13mins, SD = 3.05). A t-test showed that the difference was not significant, $t(31) = -.831, p > .05$. However, when session times were compared between the participants’ first Negotiation session and the second Negotiation session (regardless of body language availability), an order effect emerged. Participants took significantly longer to reach a resolution to the Negotiation task in their first session (M = 7.88mins, SD = 3.00) than in their second session (M = 5.08mins, SD = 2.85), $t(31) = 4.19, p < .01$.

**Discussion**

*Hypothesis 1 and 2:* The findings showed that, consistent with Hypothesis 1, participants trusted their partners significantly more in the Creative tasks than in the Negotiation tasks, regardless of the view condition. However, in the Negotiation tasks, participants trusted their partners more in the Restricted View than in the Unrestricted View, which is the opposite of our prediction. There was a significant interaction for trust between the view and task factors, which suggests that task type does mediate the relationship between the amount of visual information available and trust.
Interestingly, in the Negotiation tasks, participants trusted each other significantly less when they had more visual information about their partners than when they had less visual information. As discussed in the Introduction, several interviews were conducted with frequently-travelling business users. The interviewees felt strongly about needing non-verbal cues in meetings; that the lack of such was a large drawback to conventional videoconferencing, and that this was particularly important for negotiation meetings because of their mixed-motive nature. It was reasoned that with few non-verbal cues, ‘reading’ one’s partner would be difficult and their trustworthiness hard to ascertain; thus, being able to see their partner’s non-verbal cues should make it easier and the negotiation more comfortable. However, the results were contrary to this expectation.

This desire for more cues about their meeting/conversation partners and the decrease in trust when they do get this information can be reconciled. Presumably, each party in a negotiation has the objective of securing a resolution that is most to their advantage. To that end, they may be behaving uncooperatively, and cues into this behaviour may be more obvious or perceivable when body language is available. This would be consistent with the undifferentiated trust scores for the Creative task in the Unrestricted View and Restricted view conditions; since the task is collaborative, neither participant has motive to persuade their partner to accept a less profitable end or to be combative.

_Hypothesis 3 and 4:_ Participants’ satisfaction with the task process and their performance was significantly higher in the Creative tasks than in Negotiation tasks, regardless of view condition. This result supports Hypothesis 3. View had no effect on satisfaction, which is contrary to Hypothesis 4, which predicted that participants would be more satisfied with the Unrestricted view than with the Restricted view. There was no significant interaction for satisfaction between the view and task factors, but participants were more satisfied in the Creative tasks with the Unrestricted View than in the Restricted view, and this pattern was reversed for the Negotiation tasks.
This is consistent with the pattern in trust scores. So, participants trusted their partners less and felt less satisfied about the Negotiation task process and outcome in the Unrestricted condition, than in the Restricted condition. This may indicate that the Unrestricted condition is a poor fit for the Negotiation task, despite the apparent demand for body language/non-verbal cues to be available. Another possibility is that despite the decreased trust and satisfaction with task process and outcome, users regard having that information (to make those trust and satisfaction decisions) necessary for peace of mind.

Hypothesis 5, 6, and 7: For the Creative tasks performance was measured by the number of ideas each pair of participants generated for each task. No significant difference was found for the number of ideas generated in the Unrestricted and Restricted views. Removing all unfeasible ideas did not change the findings; this was because pairs that generated unfeasible ideas for one view were likely to generate unfeasible ideas for the other view as well. This finding supports Hypothesis 5, which predicted little difference in performance in the Creative tasks between the Unrestricted and Restricted views.

For the Negotiation tasks, performance was measured by the time it took for participants to reach a resolution (bargaining time) and by the difference in payoffs between participants and their partners (co-operation or joint profit). There were no significant differences in session length or payoff points between the Unrestricted and Restricted conditions. These findings contradict Hypotheses 6 and 7, which predicted better performance for the Negotiation tasks in the Unrestricted view than in the Restricted view. However, there was a significant order effect for session length. Regardless of body language availability and the order in which they received each condition, participants took significantly less time to reach a resolution in their second session than in their first.

There could be several reasons for this: participants may have become more familiar and more comfortable with videoconferencing, their partners, or the tasks. It appears unlikely
that increased familiarity and comfort with their partners accounted for the difference in session length, as an analysis for order effects showed no significant differences in trust scores between first session tasks and second session tasks. There was also no order effect for the Restricted and Unrestricted views. If the decrease in session length was due to increased familiarity with CMC/VMC or the task, the current findings would support previous findings that experience with/entrainment for CMC increased performance (Cornelius & Boos, 2003; Chidambaram, Bostrom, & Wynne, 1991; van der Kleij, Paashuis, Langefeld, & Schraagen, 2004; Hollingshead, McGrath, & O’Connor, 1993). It was also possible that participants, having undergone the session once already, were simply unmotivated to continue and desired to end the second session as quickly as possible.

Several studies have indicated that the effect of different media types on performance are mitigated by task types (Lam, 1997; Hollingshead, McGrath, & O’Connor, 1993; Rico & Cohen, 2005; Straus & McGrath, 1994). The current study failed to support their findings; no difference in performance was found between the different task and view conditions. One possible reason for this is that despite the significant difference in the social presence of the media, they may not differ significantly in richness.

Another possible reason for performance not being affected by the manipulations was that participants were not sufficiently motivated to perform well or achieve higher scores. There was no tangible or significant reward for besting their conversation partner or for coming up with a high number of ideas. Instead, the prospect of ending the sessions sooner through quick agreement and a short list of ideas may have been a stronger motivator to the participants.

Hypothesis 8: For social presence, there was a significant difference in ratings between the Unrestricted condition over the Restricted condition. This is consistent with Hypothesis 8. The different tasks had no effect on social presence scores, and there was no interaction between the body language availability and task factors. The significant increase in
social presence ratings in the Unrestricted condition compared to the Restricted condition across both task types indicated that, as expected, social presence of media can be increased by facilitating transmission of non-verbal language and a more complete view of a person’s partner. This may also help to simulate face-to-face conditions where participants in a conversation see much more of their partners than just their head and shoulders, as is common in traditional video-conferencing.

The present experiment was designed to explore the effect of varying the amount of visual information available about each user or participant on perception and performance in the videoconferencing mode of interaction. This work follows Hauber et al. (2006) in exploring not just the different media forms (face-to-face vs. videoconferencing) but also different forms of videoconferencing. The experiment also looked at the mediating role of task type.

Of the factors examined, only the performance measures did not yield significant results across either the screen view or the task types. Social presence showed a view effect, satisfaction a task effect, and trust showed a task effect and a task X view interaction. The absence of performance differences might be due to a lack of motivation from the participants to perform well at the task, because of a lack of reward or punishment system associated with the end results. In future studies using a mixed-motive type task, the experimental design should include an external motivator so that participants will want to perform well.

The most interesting finding was in the results for trust ratings. For the trust measure in the creative task, as predicted, participants trusted their partners more when body language was available than when it was not. In the negotiation task, however, participants trusted their partners less when body language was available than when it was not, which was contrary to predictions. One would expect that when we can see less of a person that we are currently negotiating over resources with, we would want to see more cues to be more confident in our
perceptions of the interaction, and thus, trust that the other party is being upfront in what they are telling us.

There are two possible reasons for this drop in trust. The first possibility is that, due to the competitive, mixed-motive nature of the negotiation task, people simply expect to see untrustworthy behaviour, and that body language provides additional information that further informs their judgments of trustworthiness. Thus they mistakenly interpret the body language they see to be cues of untrustworthiness due to their expectations.

The second possibility is that again, due to the competitive, mixed-motive nature of the negotiation task, people actually are behaving in an untrustworthy manner. In this case, participants would accurately perceive their partners to be acting in an untrustworthy way, and the body language may actually be accurately informing their judgments. The second possibility seems more plausible, as it has been shown that people are better at controlling their faces than their bodies when attempting to deceive others (Ekman & Friesen, 1974).

The implication of this finding is that the effect of body language availability on interactions is not a simple one. It is not just a matter of more being better, that it is simply ‘body language available is good’ vs. ‘body language not available is bad’. Instead, the effect of body language interacts with other contexts present in the interaction, such as the social structure of the task performed.

What this means is that whether body language availability is ‘better’ or not depends on whether the task is appropriate for it. Even then, whether body language should be available can depend on the motives involved. Should both participants make their body language unavailable during a negotiation so that trust is improved for both sides? What if one party chooses not to reveal body language in order to take advantage of the increased trust while harbouring ulterior motives?
Of course, such a party would already be utilizing other methods to manipulate the perception of trustworthiness. For example, they may control their facial expressions, and what and how they speak. Furthermore, as cues to deception leak more through the body than through the face (Ekman & Friesen, 1974) it would behove them to also remove the transmission of their body language to aid in this manipulation.

One limitation was that participants lacked the motivation to perform the tasks well, as they appeared more concerned with completing the task and leaving as soon as possible. Another possibility is that the issues addressed in the tasks were not accessible or important to participants, so they were not invested in the outcomes. This may have impacted on the performance scores, as well as on the other measures.

Another limitation was the use of the cut-outs used to limit body language availability in some of conditions. Using the cut-outs meant that participants had to stay within a narrow range of movement in order to remain visible to their partners. Participants sometimes leaned downwards to look at or write on their sheets of paper during the interactions, and the movement placed their faces outside the frame of the camera that would transmit to their conversation partner.

Using the cut-outs was meant to control for the quality of the image and the amount of facial information transmitted across all conditions. However, changing the field-of-view of the camera to zoom in on the participants’ head and shoulders, which would increase the size and amount of facial information transmitted in just the restricted body language conditions, may be the more appropriate trade-off. In later studies (chapters 4 & 5), this method was used instead of the cut-outs to correct for this limitation.
Summary of Chapter 2

The most interesting finding of this study was that, in the Negotiation task, participants trusted their conversation partners less when body language was available than when it was not available. This was contrary to expectations; it was expected that in a mixed-motive task, participants would trust their conversation partners more when body language was made available.

There were two possible reasons for this finding. One explanation would be that participants expected to see untrustworthy behaviour, and interpreted body language in a way that confirmed their expectations. The second possibility is that their conversation partners were actually displaying untrustworthy body language due to the mixed-motive nature of the task, and participants correctly interpreted those cues once body language became available.

The findings of the study, and possible interpretations of these findings, directly informed the design of the second study into body language availability in videoconferencing. In the next study, the effects of different types of body language cues on participants’ perceptions were examined. That is, the body language cues that the participants saw was manipulated, to gauge which of the two possibilities presented above was supported. Half the participants saw ‘honest’ body language cues, and the other half of the participants saw ‘deceptive’ body language cues. Half of the participants saw just the head-and-shoulders of the actor presenting the body language cues, and the other participants saw the unrestricted view from the head to the waist, including hand gestures.
CHAPTER 3: STUDY 2

BODY LANGUAGE AVAILABILITY, BODY LANGUAGE CUES, AND GAZE

Chapter Overview

This chapter describes the second study of the thesis. Its design was based on the results of the first study, which found that there was a significant interaction between task type and body language availability on ratings on trust. The aim of this study was to further investigate the effects of body language availability, body language type, and camera angle (gaze) on factors such as trust and social presence. There was an unexpected effect of gender on several of the measured variables, which indicated that men and women may use and experience videoconferencing in very different ways.

Introduction

As described in Chapter 2, the first study examined the effects of availability of body language and task type on various factors including social presence, performance, and trust. The findings showed a significant interaction effect between task type and availability of body language on trust. Participants trusted their conversation partner more when body language was available in a co-operative task (brainstorming), but unexpectedly trusted their conversation partner less when body language was available in a competitive or persuasive task (negotiation).

There are two possible ways to interpret this finding. Participants may have expected to see deceptive or otherwise untrustworthy behaviour in their conversation partners due to the nature of the task. This may have led to the mistaken perception of seeing untrustworthy behaviour, and that the availability of non-verbal cues increased the amount of behaviour available to be perceived. In other words, the expectation of seeing untrustworthy behaviour may have led to the perception of seeing untrustworthy behaviour (e.g., Levine, Asada, &
An alternative explanation is that because the task was competitive, participants actually behaved in ways that were self-serving to the detriment of their conversation partner, and the untrustworthy body language was then easier to perceive when the screen was unrestricted (body language cues available).

I believe it is important to tease out the reason for the drop in trust when body language is available in a persuasive task, so in the present study videos of an actor presenting a business proposal in two different ways were used. In one of the videos, he uses deceptive body language cues, and in the other, he does not. The types of cues used were derived from examining the literature on deception (e.g., DePaulo et al., 2003; Caso et al., 2006).

Why would it be important to examine the accurate perception of deceptive body language in videoconferencing? If perception of body language during videoconferencing communication is inaccurate, this may undermine business-related remote communication. It may also help to advise businesses of the appropriate circumstances under which videoconferencing should be used (e.g., real face-to-face communication for negotiations, while reserving videoconferencing for co-operative tasks without fear of being misperceived).

There has been much interest in deception, accuracy of detecting deception, and using visual cues (e.g., Bond & DePaulo, 2008; Burgoon, Blair, & Strom, 2005; Schweitzer, Brodt, & Croson, 2002; Burgoon, Stoner, Bonito, & Dunbar, 2003). It was also noted in Chapter 1 (Introduction) that Ekman and Friesen (1974) found that observers detected deception better through body cues than through 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 supports the detection of non-trustworthy behaviour.

In another experiment by Caso et al. (2006), they asked some participants to be dishonest in an interview. During the interview, they 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 also supports the need for the availability of body language in VC situations where trust or honesty may be an issue.

Another interesting variable in video communication that has received attention in recent years is camera positioning. Both eye contact and gaze fidelity in videoconferencing technology, and their effects on communication and relationship development, have been of interest. Both gaze and eye contact play important roles in our day-to-day communications (Boyle, Anderson, & Newlands, 1994). We use it to signal interest (or lack thereof), to gauge others’ reactions to ourselves, to indicate conversation turns and whom we are speaking to, and we also fancy that we can gauge another’s honesty by their eye contact patterns.

Eye contact is also considered a marker of integrity and honour even in face-to-face interactions. Various common turns of phrase reference eye contact in this manner (e.g., “look him in the eye”, “say that to my face”). Avoiding eye contact is also popularly seen as an indication of untruthfulness. It is no surprise, then, that it has emerged as an important factor in developing and maintaining relations with a remote partner.

Traditionally, videoconferencing technology has not afforded the ‘eye-to-eye’ connection. The camera is typically placed above and/or to the side of the eye line. True eye contact over a videoconferencing link is difficult, unless very specialized and expensive equipment is used (e.g. digital interpolation of multiple camera video streams in real-time).

The current research on eye contact in videoconferencing has shown that it can have significant effects on the way users of technology perceive their remote conversation partners. Bekkering and Shim (2006) used videos of an actor speaking, recorded simultaneously from a
number of angles, to investigate the effect of eye contact in videoconferencing. They found that participants gave the highest trust ratings when viewing the video of the actor taken face-on, in an angle that simulated an eye-to-eye conversation. These findings show that even when a person is not actively averting their gaze, the appearance of not meeting one’s gaze back reduces trust, perhaps because of the socially accepted connotations of an averted gaze.

In a study that examined the effects of gaze fidelity on trust, Nguyen and Canny (2007) used a videoconferencing system called MultiView that was able to be spatially faithful and maintain gaze fidelity in a group conference. This means that each partner (3 people on each side of the videoconference) could ‘look at’ a member of the remote party, and have that gaze faithfully recognised, and similarly recognised when the remote partner looked at him or herself. They showed that a videoconferencing system that maintains gaze fidelity and spatial faithfulness improved trust formation, compared to when the videoconference did not.

These studies indicate that having eye contact in videoconferencing may improve relationship development. Remote partners and co-workers need to know that they can trust and rely on each other in order to work together efficiently.

A similar approach has been taken here, using videos recorded simultaneously from two angles. As with Bekkering and Shim (2006), recorded videos were used because of the difficulty in using true and comfortable eye-to-eye live videoconferencing. It was also important to control the behaviours that the participants saw, as the type of body language was one of the factors being examined.
Experiment

Based on the literature regarding body language and eye contact, as well as the findings of the previous study regarding availability of body language cues, this study was designed to examine the effect of availability of body language cues, type of body language cues, and eye contact on user perceptions of trust and social presence.

Participants were asked to view a video of an actor presenting a business proposal, and then respond to several questionnaires regarding their perceptions of the actor and the proposal. They watched the actor present the proposal either with honest body language cues or dishonest body language cues, and they watched the video either with body language available or without body language available. The videos were either in the eye-to-eye angle, or in a more conventional non eye-to-eye angle.

It was hypothesised that: (a) participants would trust the actor more when he presented the proposal with honest body language cues than when he presented the proposal with dishonest body language cues, and (b) that this effect would be largest in the eye-to-eye angle and with body language cues available. Participants were also expected to (c) give higher ratings of social presence for the videos that were in the eye-to-eye angle and with body language cues available.

Method

Participants

One hundred and sixty four students from the Psychology Department in the University of Otago were recruited for this experiment. They were 127 female and 37 male students enrolled in first- and second-year Psychology papers, aged between 15 and 43 (M = 19.73, SD = 2.9). They participated in this study in exchange for course credit.
Apparatus and Materials

Videos. Participants viewed one of four video clips, approximately one and a half minutes long, during the experiment. These videos were of a student actor from the Theatre Department in the University of Otago, in which he introduced himself and presented a brief business proposal by a Commerce Department student. The proposal was a speech that won first place at the NBR Audacious Otago Business Plan 2008 competition. He presented the proposal two ways: in an ‘honest’ way and in a ‘dishonest’ way.

To prepare, he was given a list of honest and deceptive cues to perform during the proposal. The list was prepared using literature on deceptive cues (e.g., DePaulo et al., 2003; Caso et al., 2006) and he was allowed to use them at any point during the filming of the videos. The videos were filmed in a meeting room in the Commerce building at the university. During the filming sessions, the actor wore a business suit and tie.

The actor was filmed simultaneously from two angles. One camera was placed directly before him at eye level, to simulate an “eye-to-eye” view. The other camera was to his left and was higher than eye-level, angled downwards towards him; this simulated the more conventional webcam angle, in which the camera is usually above or on the side of the computer monitor. The final takes were chosen for the experiment by coding the number of honest and dishonest cues in each take, and selecting the take with the most dishonest cues, and the take with the most honest cues for each respective condition. The same take was used for both the eye-to-eye angle and the non eye-to-eye angle for consistency.

To control body language availability, a white cardboard sheet was used to cover the computer screen, with the actor’s head and shoulders visible through a rectangular cut-out. For the conditions where body language was made available, the computer screen was unobstructed. This is similar to the method used in Study 1. It was noted in Study 1 that this method would sometimes cause participants to not be visible to their conversation partners when they leaned away; however, in the videos the actor’s head and shoulders stayed within
the cut-out, so the cut-out method was able to be used to preserve the quality and size of the elements in the video across all conditions.

There are pros and cons for using either the zoom method or the cut-out method to obtain the head-and-shoulders view. When the camera is zoomed in, facial features and expressions are much clearer and available in more detail and nuance than when zoomed out. Using the cut-out prevents that imbalance, however the smaller size and the physical cut-out may introduce the feeling that something is being actively ‘hidden’. At this point, I decided that the trade-off was better with the cut-out method as I was concerned that the additional information from enlarged facial features/expressions might have a large impact on the interaction and participants’ perceptions.

**Questionnaire.** After viewing the videos, participants were administered several questionnaires: the Individualised Trust Scale (Wheeless & Grotz, 1997) which measured the participants’ perception of the actor’s trustworthiness, and a Social Presence Scale (as used in Hauber et al., 2006) to measure social presence and co-presence perceptions. In addition, as implicit measures of trust, they were asked how likely they would be to invest in the proposal and how risky they perceived the proposal to be. Ratings were also measured for some possible confounding factors, such as the actor’s perceived likeability, attractiveness, and friendliness (see Appendices G and H). For each item, responses were recorded on a Likert scale from 1 to 7. Items 1, 2, 4, 5, 7, 10, 11, 13, and 14 on the Individualised Trust Scale, and items 2, 6, 9, and 12 on the Presence Questionnaire were reverse-scored. The questionnaires were presented, and the responses recorded, on a separate computer using the MediaLab Research Software v2006 (Empirisoft Corporation).

**Experimental Design**

There were three independent variables, each with two levels, which made the experiment a 2X2X2 design. The first variable was the behaviour exhibited in the video; there
was an ‘honest’ video and a ‘dishonest’ video. The second independent variable was the availability of body language; body language was either available, or obstructed by a white cardboard cutout that covered all but the head and shoulders of the actor. The third independent variable was the camera angle; half the videos were in the “eye-to-eye” angle where the actor is seen speaking directly into the camera, and the other half were in the “non eye-to-eye” level where the actor is being filmed from above and to the side, and he is not speaking towards the camera.

Figure 3.1. Participant watching a video in the eye-to-eye and unrestricted body language condition.
There were 3 independent variables that were also all between-subjects, so there were a total of 8 conditions, and each participant was only administered one condition. For example, a participant might see the proposal presented with honest body language cues, with the cutout making body language unavailable, in the video that was taken from the eye-to-eye angle (condition 2 in the figure below). Following is a guide to the 8 conditions.
Table 3.1.

*The combinations of the three independent variables, with each combination forming one condition*

<table>
<thead>
<tr>
<th>Body Language Available</th>
<th>Body Language Not Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honest Body Language</td>
<td>1</td>
</tr>
<tr>
<td>Non Eye-to-eye Angle</td>
<td>3</td>
</tr>
<tr>
<td>Dishonest Body Language</td>
<td>5</td>
</tr>
<tr>
<td>Non Eye-to-eye Angle</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honest Body Language Eye-to-eye Angle</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>Honest Body Language Non Eye-to-eye Angle</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>Dishonest Body Language Eye-to-eye Angle</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>Dishonest Body Language Non Eye-to-eye Angle</td>
</tr>
</tbody>
</table>

**Procedure**

Each participant was asked to sign a consent form, and told that they would be watching a video of someone presenting a business proposal. They were instructed to treat it as though the conversation was live and that the presenter was speaking to them directly, and told that they would be asked about their perceptions of the business proposal.

After the video was played, they were directed to the computer that presented the questionnaires via MediaLab. Once they had completed the questionnaire, they were debriefed about the purpose of the experiment and dismissed.
Results

Participant responses on the Likert scales were recorded for each item on the Individualized Trust Scale, the Social Presence Scale, and for the ‘risk level’, ‘likeliness to invest’, ‘friendly’, ‘kind’, ‘competent’, ‘familiar’, and ‘attractive’ items. On all items, possible responses ranged from 1 to 7; reverse scoring was done for all necessary items prior to analysis. For the scales, a higher number indicated a higher level of trust on the Individualized Trust Scale, and a higher degree of Social Presence on the Social Presence Scale. For the individual question items, a higher number indicated a higher likeliness to invest, a lower perceived risk level, more friendliness, more kindness, more competence, more familiarity, and more attractiveness. Means of each participant’s scores on the Individualized Trust Scale and on the Social Presence were averaged across all participants for each scale. Participant scores for the individual question items were also averaged across all participants. These data are presented in Figures 3.3 to 3.6 below.

![Figure 3.3](image-url)

*Figure 3.3.* Mean Social Presence scale ratings for the eye-to-eye and the non eye-to-eye camera angles.
As shown in Figure 3.3, participants rated the video set-up as having significantly more social presence (F(1, 142) = 5.257, p = .023; η² = .036) when the videos were in the eye-to-eye camera angle (M = 3.95, SD = .67) than when the videos were in the non eye-to-eye camera angle (M = 3.74, SD = .69).

![Figure 3.4](image)

*Figure 3.4. Mean Individualised Trust Scale Ratings by male and female participants.*

As shown in Figure 3.4, there was a significant main effect of gender on trust. Female participants trusted the actor significantly more (M = 4.84, SD = .72) than male participants did (M = 4.59, SD = .74; F(1,142) = 4.810, p < .05; η² = .033).
Figure 3.5. Mean Social Presence Scale ratings by male and female participants, when body language was restricted and when it was unrestricted.

Figure 3.5 shows that there was a significant interaction effect between gender and the availability of body language cues: $F(1,142) = 5.370, p < .05; \eta^2 = .036)$. Male participants rated the video set-up as having more social presence when the availability of body language was restricted ($M = 3.94, SD = .68$) than when the availability of body language was unrestricted ($M = 3.75, SD = .70$). Female participants had the opposite pattern of results; they rated the video set-up as having more social presence when the availability of body language was unrestricted ($M = 4.01, SD = .72$) than when the availability of body language was restricted ($M = 3.71, SD = .62$).
Figure 3.6. Mean ratings of perceived risk of the presented proposal in the eye-to-eye and non eye-to-eye camera angle conditions, with body language cues restricted and unrestricted, by male and female participants.

Figure 3.6 shows that there was a significant three-way interaction between camera angle, availability of body language, and gender: $F(1,142) = 4.398, p < .05; \eta^2 = .030$. Male participants rated the proposal as more risky in the restricted conditions ($M = 2.75, SD = 1.17$) than in the unrestricted conditions ($M = 3.53, SD = 1.13$) for the eye-to-eye videos. However, the pattern is reversed for the non eye-to-eye videos. For the non eye-to-eye videos, male participants rated the proposal as more risky in the unrestricted conditions ($M = 2.30, SD = 1.16$) than in the restricted conditions ($M = 3.11, SD = 1.05$). Female participants rated the proposal as less risky in the restricted conditions, regardless of camera angle. For the eye-to-eye videos, female participants rated the proposal as less risky in the restricted conditions ($M = 3.19, SD = 1.05$) than in the unrestricted conditions ($M = 2.92, SD = 1.08$). Similarly, for the non eye-to-eye videos, they rated the proposal as less risky in the restricted conditions ($M = 3.17, SD = 1.05$) than in the unrestricted conditions ($M = 3.03, SD = 1.13$).
A MANOVA was performed to examine the effects of the independent variables on the combined dependent variables. The MANOVA showed that there was a significant effect of gender on the combined dependent variables: $F(9,134) = 2.688$, $p = .007$; Wilks’ Lambda = .847; $\eta^2 = .153$. Overall, female participants tended to give higher ratings than males did on the various measures. There was also a significant interaction effect between camera angle and gender on the combined dependent variables: $F(9,134) = 2.036$, $p < .05$; Wilks’ Lambda = .880; $\eta^2 = .120$. Overall, female participants tended to give higher ratings for the measures when in the eye-to-eye condition than in the non eye-to-eye condition, whereas male participants tended to give higher ratings for the measures when in the non eye-to-eye condition than in the eye-to-eye condition.

**Discussion**

The results did not support the hypothesis that trust would be higher when the actor presented the proposal with honest body language cues than when he presented the proposal with dishonest body language cues. This was surprising, but a likely explanation is that the videos were not sufficiently different. The video was only 1:30 minutes long, and within that time frame it would have been unrealistic to fit a large number of cues and behaviors within it.

One of the requirements for the videos was that I did not want them to be so theatrical as to be comical, as that would make the difference between the videos too obvious, and it would not be realistic. After all, liars attempt to appear credible. Perhaps, given the realistic and low-key portrayals of the actor, a longer video would have been a more effective presentation of the honest and dishonest cues. The methodology could be improved by choosing or constructing a longer speech.
Because the first hypothesis was not supported, the hypothesis that the effect would be strongest when the video was in the eye-to-eye angle and with body language cues available was not able to be tested.

It is also uncertain how much effect the body language availability of the videos had on trust as they were not ‘live’ interactions and the participants did not gain anything from trusting or not trusting the actor. As such, they may not have been sufficiently motivated to observe the actor closely, and body language cues were not deemed to be important. Ideally, a well-trained confederate would have been used to control the body language cues presented during a live interaction.

The hypothesis that social presence ratings would be highest when body language cues were available, with the video in the eye-to-eye angle, was partially supported as participants gave higher social presence ratings when the video was in the eye-to-eye angle than when it was in the non eye-to-eye angle. There was no main effect of the availability of body language cues, and there was no two-way interaction between availability of body language cues and camera angle, on social presence ratings. The results do support the notion that the eye-to-eye angle increases the feeling of ‘togetherness’ afforded by the technology. This is likely because it more resembles an actual face-to-face conversation than a camera angle that does not permit eye contact.

Surprisingly, gender emerged as a very important factor in the results, and affected many of the variables examined. Female participants trusted the actor more, and rated the actor as being more competent and more familiar than male participants did. This finding held true after controlling for participants who already knew the actor prior to the experiment.

What does it mean that women trust a male actor less, but perceive greater social presence, when body language is available? There may actually be no contradiction at all. One may feel more ‘together’ (less physically separated) but still feel unsafe. For future
research, it would be a good idea to have a female actor as well for female viewer/female actor male viewer/female actor comparisons.

An interaction effect was also found for participant gender and availability of body language cues. Female participants gave higher social presence ratings when body language cues were available than when they were not available, which is the expected pattern of results. Male participants, on the other hand, gave lower social presence ratings when body language cues were available than when they were not available. This may account for the finding that overall, social presence ratings were not significantly higher for the conditions in which body language cues were available, as the opposite patterns between male and female participants may have cancelled each other out to some degree.

A possible explanation is that men may pay more attention to verbal cues than to nonverbal cues, and as such the availability of body language may not have been regarded as increasing helpful information, and acted as a distraction instead. However, there is literature that suggests that women pay more attention to nonverbal cues, that they are better at decoding nonverbal cues than men are, and that they have more explicit knowledge of nonverbal cues (e.g., Ambady, Hallahan, & Rosenthal, 1995; Rosip & Hall, 2004).

None of the three independent variables had a significant effect on ratings for the Individualized Trust Scale. However, there was a three-way interaction between gender, camera angle, and availability of body language for the ratings of perceived risk, which was an implicit measure of trust. When body language was available, men perceived less risk when they had eye contact with the male actor than when the video was in the non eye-to-eye angle. On the other hand, women rated the proposal as more risky with the eye-to-eye angle than the non eye-to-eye angle when body language was available. The pattern produced here was completely the opposite depending on whether the participant was male or female. This
indicates that trust in VC is indeed experienced and perceived differently by the different genders, at least when viewing a male actor.

One possible explanation is that men may feel more at ease when they can see more of another person that they are interacting with, and treat eye contact as a sign of trustworthiness. For women, it is possibly disconcerting to have a male stranger looking directly at them for sustained periods.

A limitation that must be considered, however, is the extreme gender skew of the sample. There were many more female participants than there were male participants. This gender imbalance was corrected in the latter studies of the thesis. This also became a major facet of the latter studies, as the results of this experiment indicated that gender should be a strong consideration in the body language studies. It appears that the different genders may show very different preferences and perceptions towards body language in VC.

Overall, the results indicate that men and women experience, perceive, and use videoconferencing in significantly different ways. The way gender interacts with factors like the availability of body language, type of body language presented, and camera angle, appears to be complex and needs to be better understood; for example, women rated the actor higher on various attributes than men did, but trusted the actor less when the screen was unrestricted.

It’s also unclear why males rate the restricted video set-up as having more social presence than the unrestricted video set-up. Social presence is understood to be the degree to which the communication medium allows the participants to feel physically together (non-remote or non-mediated), and is based partly on how much information about the participants is transmitted. So a medium that transmits more information about the actor should have been rated as having more social presence (which is the pattern the female participants produced).

The findings of this study are consistent with the previous findings in Study 1, suggesting that although the availability of body language is considered to be of extreme
importance to people who use videoconferencing for business or formal interactions, it appears that the effect of body language availability is subtle. The effects of body language availability appear to interact with other factors such as gender, camera angle, and the actual body language presented, rather than affecting perception on its own. This again indicates that research into body language in video-mediated communication needs to take a deeper, more nuanced approach rather than approaching body language availability as an all-or-nothing factor.

The findings reaffirm that it is important to consider the actors, contexts, and technology together in VC research, and consistent with previous research that shows gender differences in reactions to and perceptions of VC. They also have implications for development of VC tools. If the gender difference holds true, what would it mean for the design of VC software?

The gender difference in perceptions of the interactions based on body language availability presents a conundrum for design. There is always a ‘default’ setting, so what should that setting be? Perhaps as part of the installation and set-up process, or at the start of each conversation, the software would prompt the user to adjust the body language availability (i.e. the field of view of the camera, often referred to as Zoom in the software) on their webcam.

It is important that the interface is not designed to explicitly offer different sets of settings based on sensitive demographic boundaries such as gender, race, or nationality. At no point should the software inform the user that because of their gender, a particular combination of settings is recommended. However, there can still be ways to design the software to improve feelings of trust and social presence, and subsequently reduce any unease that may arise from the lack of trust and social presence, for the individual users, through the manipulation of body language availability.
One way might be to make adjusting body language easy and salient in the interface, without recommending a particular direction for the user. This would make it more universal as the approach would work for both men and women, and would not draw attention to the gender issue. But the salience would still encourage the user to experiment with the settings.

Future studies on this subject could improve on the methodology by using a longer video so that more cues could be included to differentiate the videos. However, in subsequent studies, the decision was made to move back to a live videoconference interaction, so that participants could base their perceptions on actual conversations. The videos were only used here to control exactly what cues participants saw, and because using a confederate for all the sessions was not practical.

Gaze as a factor was also dropped in the studies for practical reasons. With both gender and body language availability as major factors of interest, keeping gaze would increase the number of conditions and interactions to a point where the experiments would be too impractical. Furthermore, gaze fidelity is a feature that is already widely supported and widely desired for VC systems. There is little argument that gaze fidelity adds to positive perceptions of VC interactions (e.g., Bekkering & Shim, 2006), and this was supported by the results of the current study.

Chapter Summary

This experiment was designed to answer the question presented by the first study: are body language cues or expectations of behaviour the cause of differential trust ratings? While this study was unable to answer that question, likely because the video was too short or because it was not a live interaction, the results showed that interestingly, gender was an important factor in participants’ ratings. The limitation was that the gender representation was skewed, and the next study was designed to control for that imbalance. In the next study,
gender is also considered as an important independent variable, as the results of the current study show that the different genders may experience body language availability in VC very differently.
CHAPTER 4: STUDY 3

BODY LANGUAGE AVAILABILITY AND GENDER

Chapter Overview

Following the second empirical study, which presented significant gender-related findings, Study 3 was designed to include gender as a main independent variable. Furthermore, the previous two experiments had only looked at the ‘perception of other’ side of communication. Communication is a two-way process, and we are very invested in how we project ourselves to others and monitoring how others perceive us. Thus, the experiment was designed to measure the extent to which participants felt able to transmit themselves to their conversation partner. The aim of this study was to examine the effects of gender and body language availability on perceptions of trust, social presence, impression management, and dominance. There was a strong gender effect, from both the participants’ own gender as well as the gender of their conversations partners, on perceptions of impression management efficacy and dominance over the other participant. This chapter was adapted from the paper presented at the Australian Computer-Human Interaction conference in 2011 (OZCHI 2011) and subsequently published in the OZCHI 2011 conference proceedings.2

Introduction

The second study in this thesis showed that there was a strong gender difference in perceptions of trust and social presence. There were concerns stemming from the skew of the sample, as there were 127 females to 37 males, due to the population of students in the

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Psychology department being predominantly female. As such, it was decided to control for participant gender and the gender of the conversation partner in this experiment.

Most gender research in CMC focused on text-only communication modes, as it was precisely the anonymity (via the lack of visual and aural cues) offered by text-only communication that was so interesting to the researchers (Yates, 1997; Herring, 2000). However, some research has shown that male and female users behave differently in text-only communication, and that gender can be determined with a very high success rate through text-only communication (e.g., Thomson & Murachver, 2001; Hannah & Murachver, 2007). Responses to others can differ depending on the gender of both the participant themselves and their communication partner.

The disparity between how the same behaviour in the different genders are perceived can start when the individuals are very young. For example, when shown the same video of a young infant playing, but told that the infant was either male or female, participants interpreted the same actions differently (Condry & Condry, 1976). At one point in the video, a Jack-in-the-box pops out of the box, and the child responds by crying. If the participants thought the child was a boy, the reaction was considered an angry one. If the child was thought to be a girl, the reaction was interpreted as fear.

There have long been concerns regarding differential treatment of and behaviour/attitudes towards men and women. The text-only communication research presented an opportunity to investigate equalized interaction, where cues such as gender, status, attractiveness, and so on, are not available. As such, the majority of gender research in CMC does not include videoconferencing as that reintroduces the gender cue. However, as noted before, gender is not actually ‘equalized’ over text-only CMC, as male and female participants/users approach CMC and their language used in CMC in different ways.
In VC research, the different genders are also known to react to and perceive technology in different ways. Maurin et al. (2006) found that compared to female paramedics, male paramedics had more favourable attitudes towards collaboration with a remote physician. In another study, Wheeler (2000) found that women had more favourable 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 due to the parameters of the technology. Additionally, the different genders also show differences in their skill to transmit and decode body language, with the research overwhelmingly showing an advantage for women (Hall, 1979; Rosip & Hall, 2004). Because
of the findings of Study 2, as well as the above findings about gender differences in body language, it was important to extend previous research on body language availability in VC to include an examination of gender.

The other side of communication: Transmitting the self

An aspect that had been neglected in this thesis and in a lot of CMC research is how people perceive they are being perceived. That is, the perception that we are being transmitted over the medium in the way that we desire ourselves to be transmitted and received.

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).

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, and most of these processes are automatic (Schlenker, 2003). 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.

The notion of oneself being ‘transmitted’ electronically is prominent in virtual reality, in the sense that researchers are concerned with the extent to which a user feels physically transported into a virtual environment. For example, in virtual reality research, 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). Also, the notion of ‘telepresence’ refers to the perception that one is transported physically through the users’ control of remote machinery or systems (Minsky, 1980). The type of transmission being discussed here is less about feeling physically transported, but rather how one’s physicality and the impressions being projected are being received by remote conversation partners.

Self-presentation is also explored through Walther’s hyperpersonal theory (1996), which suggests that users control how they are perceived through the capabilities of CMC. In his 2007 study Walther examined how different communication contexts, such as the gender of the conversation partner and their status/rank relative to the participant, elicited different forms of self-presentation behaviours. The study found that participants did change their self-presentation efforts depending on who they perceived their conversation partner to be. However, the study was conducted over non-visual CMC, so anonymity was preserved in this experiment.

Another study that utilized Walther’s (1996) hyperpersonal theory to examine impression formation in CMC was done by Hancock and Dunham (2001). However this study focused on the impressions formed about the participants’ conversation partners, not of their self-efficacy at transmitting impressions. It also only studied text-only CMC and an FTF condition where participants could not see each other. This study was aimed at continuing the
line of research of the previous two studies as well as extending Walther’s (2007) findings by examining self-presentation in videoconferencing.

Another electronic venue that has explored self-presentation visually is the area of media space. This can be in the form of continuous video feeds in certain work areas, which is designed to present a constant ‘shared space’ between the remote locations (de Vasconcelos Filho, Inkpen, & Czerwinski, 2009). These media space installations can also facilitate a type of self-presentation through users’ interactions with the technology. For example, in (Roussel, Evans, & Hansen, 2004) the image of users that was transmitted would blur and obscure their identity the further away they moved from the camera. As such, they could control how they would appear to others by moving towards and away from the lens. Users responded to this technology positively and appeared to enjoy controlling and changing how their image appeared. This also shows the importance of feelings of self-transmission efficacy.

There has been a lot of work done on measures of efficiency and productivity of VC, such as performance (Hollingshead et al., 1993; Suh, 1999; Straus & McGrath, 1994). There has also been work done on the social aspect of VC, such as social presence (Hauber, et al., 2006), and conversation and turn-taking (Sellen, 1995; van der Kleij et al., 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.

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, two promising factors in self-transmission are addressed, 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?

Additionally, the first study in this thesis showed an interaction between task type and body language availability in videoconferencing for trust (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.

Body language has also been strongly linked to self-presentation or impression management efforts (DePaulo, 1992). People perform different actions depending on the impression they are trying to convey, and this nonverbal behaviour has been found to affect perceptions of traits such as intelligence (Murphy, 2007) and likability (Rosenfeld, 1966).

Based on the findings for gender, body language, and impression management, the current study was designed to extend the findings through examining these factors in videoconferencing. The effects of gender and body language availability in videoconferencing on social presence, trust, impression management, and persuasion were examined.
Method

This study was designed to follow through on the findings of the previous study and address an important gap in research. The 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.
Figure 4.1. Photograph of Room 1.

Figure 4.2. Photograph of Room 2.
A headset (headphones with attached microphone) was connected to each computer to allow participants to converse with each other, and a webcam was attached to the top of each computer’s monitor to capture video of the participant. The webcams were set so that each participant would receive the same view of their conversation partner and the partner’s surroundings. Although the webcams had internal microphones, headsets were used because the microphones picked up the sounds coming from speakers, creating a feedback loop.

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.

This experiment differs from the first empirical study in the way that the ‘head-and-shoulders only’ condition was obtained. In the first empirical study, there was concern that zooming in on the face would increase the richness of the facial cues available. Thus, the ‘head-and-shoulders’ only view was administered by covering the screen with a board. This board had a cut-out to display the other participant’s head and shoulders. However, because they had a sheet of paper to write on, sometimes participants would lean downwards or change their seating position, which would take them outside of the available view and they would effectively ‘disappear’ from their partner’s sight during the session.
There was not an elegant way to minimize participant movement to keep their faces visible through their conversation partner’s cut-out while maintaining natural conversation and body language. For example, using a chin-rest to hold participants’ faces within a particular frame of the camera would be extremely unnatural, and would interfere with the body language used and the interactions. Therefore, for this experiment, the trade-off was made to allow participants in the ‘head-and-shoulders only’ condition to see more or enlarged facial cues/expressions in order for the participants to remain visible and salient to their conversation partners at all times.

**Task.** As with Study 1, McGrath’s (1984) Group Task Circumplex was used to select the task for this study. The Choose quadrant, which describes tasks that require users to choose a solution to a presented problem, was selected. 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. The Cognitive Conflict task from the Negotiate quadrant would also appear to be a good choice, as there is significant give-and-take required and participants must attempt to persuade their conversation partner to give up valuable resources.

However, I also needed to consider the needs and motivations of the experimental sample. The majority of experiment recruitment at this university 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 time was considered 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. The Cognitive Conflict task had been used in Experiment 1 and it was observed that participants were not motivated to perform well.

With an Intellective task, however, a standard could be set which students could attempt to reach. Also, it allowed a potential punishment to be presented. In this case, participants were told that failure to arrive at an answer close enough to the correct answer might result in having to do up to two more tasks. This engaged their desire to end the experimental session quickly by spending a bit more time discussing the task in order to avoid the penalty delay.

In this task, called Lost at Sea (adapted from Nemiroff & Pasmore, 2001), participants were given a written description of a scenario where they and their partner had been stranded at sea (see Appendix I). 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 (see Appendix J). 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.
The sheets of paper were taken away from the participants before the start of the videoconferencing session, so that they would look at each other instead of down at the table/paper. Because people can only hold an average of 7 items in short-term or working memory (Miller, 1956), participants were only asked to rank the top 7 items from the main list for ease of memory. Usually in normal collaborative meetings, the meeting participants would have access to papers and handouts to refer to. However, allowing participants to keep the sheets of paper resulted in them constantly looking down at the paper instead of at each other. The decision was made to remove the sheets of paper to induce participants to look at each other during the conversation.

*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 (see Appendix K). As in the first and second empirical studies, they were asked to complete the Individualised Trust Scale to measure how trustworthy they felt their conversation partner was (see Appendix M). Unlike the first two studies, the Social Presence scale was changed for this study. Because the original Social Presence scale only measured a participant’s perception of how others had been transmitted to them, a scale that included both self-transmission and other-transmission was trialed. The Networked Minds Social Presence scale (Harms & Biocca, 2004) was used, which was developed to try to measure social presence in a balanced, ‘two-way street’ form (see Appendix L).

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 the more dominant partner in this conversation”. There were 12 items on this Dominance scale (see Appendix N). 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 on this Impression Management scale (see Appendix O). These scales were constructed specifically for this thesis as existing measures of impression management/self-presentation address more ‘macro’ behaviours than are being examined. For example in the Bolino and Turnley scale (as appears in Kacmar, Harris, & Nagy, 2007) include items such as “Stay at work late so people will know you are hard working” and “Let others know you can make things difficult for them if they push you too far” (pg. 30). Other studies do have a ‘micro’ focus but tend to focus on one variable such as how intelligent observers judge others to be and how nonverbal cues are involved (e.g., Murphy, 2007). The aim for the questionnaire constructed for this study was to examine how effective the transmitter of the cues themselves felt at managing impressions with their conversation partner.

Both scales were 7-point Likert scales, constructed by the experimenters because there was no available measure that specifically examined the factors of interest. Most impression management questionnaires are designed for examining strategies employed in the workplace to create favourable impressions, and ask if the responder engages in macro behaviours like trying to impress the superior or co-workers. In this case, the feeling of efficacy of communication was being examined: 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 Individualised Trust Scale, Networked Minds Social Presence scale, individual items (Kindness, Familiarity, Friendliness, Attractiveness), the Dominance 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 participants trusted their partner (Individualised Trust Scale), felt that the medium had high social presence (Networked Minds Social Presence scale), felt that they were the more dominant partner in the conversation (Dominance 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 and Impression Management scales, and reliability analyses were conducted for all scales. For the PCA, components were extracted with varimax rotation for the Dominance and Impression Management scales; each scale had 12 items, and extraction was set at an eigenvalue of 1. The Dominance 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, 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. All the scales were found to be reliable: Individualised Trust Scale (14 items, $\alpha = .84$), Networked Minds Social Presence scale (36 items, $\alpha = .90$), Dominance scale (12 items, $\alpha = .75$), Impression Management scale (12 items, $\alpha = .85$).

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.

Trust

![Graph showing mean ratings for Individualised Trust Scale as a function of body language availability and partner’s gender. The x-axis represents body language availability (Available vs. Not Available) and the y-axis represents mean trust ratings. The graph shows bars for male and female partners.]

Figure 4.3. Mean ratings for the Individualised Trust Scale, as a function of body language availability and partner’s gender.

As seen in Figure 4.3, there was a marginally significant interaction effect between body language availability and partner’s gender on scores on the Individualised Trust Scale; F(1, 133) = 3.317, p = .071. When body language was available, participants trusted female partners (M = 6.12, SD = .48) as much as male partners (M = 6.08, SD = .54). When body language was not available, participants trusted female partners (M = 6.19, SD = .63) more than they trusted male partners (M = 5.85, SD = .73).
It appears that when body language was available, the gender of the participant’s partner had little effect, but when body language was not available, trust in male partners dropped.

**Impression Management**

*Figure 4.4.* 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 4.4; $F(2,133) = 3.40, p < .05$. 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).

Figure 4.5. Mean ratings on the Impression Management scale as a function of body language availability and partner’s gender.

Figure 4.5 shows that 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 project the impressions of themselves that they wished to with a female partner (M = 3.30, SD = .69) than with a male partner (M = 2.83, SD = .84).
Figure 4.6. Mean rating scores on the Impression Management scale as a function of gender, partner gender, and body language availability.

Figure 4.6 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**

Gender group was shown to have a significant effect on ratings on the Dominance 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 4.7](image)

**Figure 4.7.** Mean ratings on the Dominance scale for each of the gender groups as a function of body language availability.

Figure 4.7 shows that there was a marginally significant interaction effect for gender group and body language availability on ratings on the Dominance 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 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 4.8.* 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 scale, as seen in Figure 4.8; $F(1,133) = 3.26, p = .073$. 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 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 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 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**

The current study supports the findings of Study 2 that there are significant gender effects in VC, and that they interact with body language availability. An unexpected effect was how strongly the gender of the participant’s partner affected ratings of Dominance as well as of Impression Management. This should not be a complete surprise, however, as we
often moderate our behaviour differently according to our audience and our role in a particular moment. People’s behaviour, and as such, the impression they desire to 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.

The methodology of the experiment, particularly in relation to the task protocol, appeared to be very effective in motivating the participants. When told that there was a significant time penalty for not reaching an appropriately high score, most participants reacted with visible horror. They would often exchange glances, and would sometimes comment that they “had to get this right!”

Additionally, after the task was completed and they were informed that their score was high enough to bypass the penalty, participants were visibly relieved. They would sometimes exchange congratulatory comments, or sigh with relief, and occasionally perform a triumphant fist-pump. They would also frequently ask the experimenter to settle disputes about certain items, or ask for the full correct ranking. These behaviours seemed to indicate that the protocol had the desired effect, which was to encourage participants to be sufficiently invested in ranking the items correctly that they would debate with and attempt to persuade their conversation partner.

**Trust**

When body language was available, the gender of the participant’s partner had little effect and the ratings were similar for both male and female partners. However, when body language was not available, trust in male partners dropped. One possible interpretation for this may be that males may be stereotyped as being less trustworthy, and not being able to see male body language may arouse suspicion or keep an initial distrust from lowering.
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

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. This may be because of a common perception of women as ‘the weaker sex’. Another possible explanation is that women are perceived not as weaker, but more agreeable and less aggressive than men are.
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 because there is still a degree of physicality that they are attempting to transmit through the VC.

However, Figure 4.7 and Figure 4.8 both show that body language availability has no effect when both the participant and the partner are female. This indicates that women may 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.

One of the limitations was the use of the new questionnaires. As the questionnaires were constructed for the purpose of this experiment, they needed to be tested again to show that they were reliable and valid. The questionnaires were subsequently tested again in Study 4, and recommendations for modification made after the completion of Study 4.

The social presence scale did not show significant differences, and there was concern that the scale may not be sensitive enough or that the media are not significantly different. In the next and final study, the Social Presence Scale (Short et al., 1976) is once again used. Items are added to the scale to introduce the aspect of one’s presence being perceived by the conversation partner.

The implications of the study are that 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.

These findings are consistent with Walther (2007) in the sense that participant gender and partner gender influenced self-presentation preferences. However, contrary to Walther (2007) the findings indicate that women have a more nuanced response to who their partner is, whereas male participants in this study behaved in similar ways to conversation partners of both genders and in both body language conditions.

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. One challenge here is that presenting options for men and women, and indicating that men and women may require different zoom settings or fields of view on the camera, may be perceived as stereotyping and prejudiced. If design or development is changed to accommodate these differences, it would need to be in a diplomatic and sensitive way.
Given the sensitivity surrounding the issue of gender inequality and unequal treatment, any design that attempts to instruct the different genders in different ways may encounter resistance. An alternative would be to merely offer more control to all users, or make the relevant settings (e.g., zoom) more salient to the user. In that way, users can be prompted to experiment with the parameters of the medium to make using the medium more comfortable, without bringing their gender and other aspects of their identity (such as race or age) directly into the situation.

It would also make sense to make the availability of the relevant settings (like zoom) more salient to the user, as end-users who are not very tech-savvy but would still like to utilise VC/CMC may not experiment with ‘hidden’ settings otherwise. More broadly, we should consider (more) modes for control of impression management and perception in VC systems.

**Summary of Chapter 4**

This study found that men and women do perceive their impression management efficacy and domination efficacy in videoconferencing differently, and that the gender of the conversation partner, and whether or not body language is available, are important in these perceptions. These findings support the continued examination of gender and self-transmission in the thesis.

Additionally, that perceptions of self-transmission were affected by body language availability presented a new aspect for the final study. If men and women’s perceptions of self-transmission efficacy is affected differently by body language availability, would they actively choose different settings if given the opportunity to?

In the next and final study, the different gender groups and their perceptions of impression management and domination efficacy in videoconferencing were again tested.
However, unlike in this study and the two previous studies, the participants were asked to adjust the zoom settings on the webcam, which effectively adjusted how much body language was available to their conversation partners.

The literature as described previously showed strong support for differential performance and perception with regard to different task types. However, in Study 2 and Study 3 (this study) task had been removed as a variable to make the experiments manageable. For the final study, it was important to reintroduce different task types.

One might expect that tasks that differ on co-operativeness or persuasiveness may lead to different levels of adjustment of body language availability. For example, a purely co-operative and additive task may not require body language to be made available to a conversation partner, whereas a mixed-motive or persuasive task may encourage participants to make more or less body language available. As the findings of this study shows, whether participants want more or less body language available may depend on their partner’s gender as well as their own gender.
**CHAPTER 5: STUDY 4**

**BODY LANGUAGE AVAILABILITY, GENDER, AND TASK TYPE**

**Chapter Overview**

The fourth and final study of this thesis was based on the findings of Study 3, which showed that there were strong effects of participant gender, partner gender, and body language availability, on feelings of self-transmission efficacy. Because participants rated their efficacy at domination and impression management differently when body language was restricted and unrestricted, it was reasoned that users may desire to control body language availability. The aim of the fourth study was to investigate the effects of gender group, task, and initial body language availability (determined by the field of view), on perceptions of trust, social presence, dominance/persuasion, impression management, and user-defined body language availability.

**Introduction**

The previous study’s findings indicated that users’ self-efficacy in dominance and impression management can be affected by body language availability in VC. Control over self-transmission and message impression over CMC is a desired feature, and can be easy over asynchronous forms of CMC. In Walther (2007), participants altered their message content and spent time editing their messages in different ways according to characteristics they were provided about the supposed recipient.

Controlling self-transmission/self-presentation over synchronous forms of CMC such as videoconferencing is more difficult, as the conversation partner(s) are able to both see and hear the transmitter in real time. Therefore, each person has to consider their actions and
speech prior to executing any behaviour, as well as monitor feedback and adjust accordingly on the fly, as they might in a face-to-face conversation.

Most videoconferencing programs do allow self-monitoring in a way that is not present in face-to-face conversations, in the form of a small inset window on the computer screen that shows the image capture of the person’s own camera (PIP or picture-in-picture). This allows participants to see themselves as they would appear to their conversation partner(s). de Vasconcelos Filho, Inkpen, & Czerwinski (2009) found that participants liked having the PIP available much more than not having the ‘mirror’ feedback, primarily because it enabled them to see how the other person saw the participant. Subsequently, they would be able to adjust their actions in accordance to their knowledge of their own appearance. They also found, in a second study, that participants’ perceptions of their self-transmission affected their comfort with using videoconferencing to communicate with others.

These findings from Walther (2007) and de Vasconcelos et al. (2009) indicate that people do want to be able to control how others see and perceive them, and that different contexts and settings in the technology change what they do and how they feel towards the medium. This is consistent with the findings of the previous study of the thesis (Teoh et al., 2011), which showed that participants felt differently enabled in their self-efficacy for dominance and persuasion (aspects of self-transmission) depending on whether or not body language was made available.

It follows then, that participants may actively control how much body language is made available to their conversation partner if prompted and given the opportunity to exercise that control. This study extends the design of Study 3, and examines the effects of task type, initial field of view (i.e. the anchor point for how much body language is made available at the start of the session), and gender, on the field of view as set by participants, as well as on perceptions of trust, social presence, dominance, and persuasion.
Method

Participants

One hundred and twenty-two students from the University of Otago were recruited for this study. There were 61 males and 61 females, aged between 18 and 62 years old (M = 21.30, SD = 5.90). Eighty-two of the participants were 100- and 200-level students from the Psychology Department recruited in exchange for course credit. A further 40 participants were recruited through Student Job Search in exchange for remuneration.

Materials/Apparatus

The experiment was run in the same two rooms as in Study 3. The rooms were two booths side by side, which were set up to look identical to each other. Each room had a desk and a swivel office chair, with a computer monitor, keyboard, and mouse on the desk. The computer tower was on the floor next to the desk.

The webcams used in this experiment were Logitech Pro 9000s, which have a slightly wider field of view than the C500s used in the previous experiment. This change was made to allow more of the participants’ gestures to be captured in case they made wide movements. Unfortunately, the wide-screen function enabled by Skype 5 was not usable, because the program would switch between full-screen and wide-screen modes automatically based on its own estimates of the connection quality. It was not possible to fix the setting on one or the other, and it was very disruptive to have the screen mode switch so frequently during the conversation. (Although by ‘full-screen’ we usually mean ‘to have the chat window maximized so that it fills the entire computer screen’, in cinematography terms (and for the chat window settings) ‘full-screen’ refers to a 4:3 aspect ratio video compared to ‘wide-screen’ which refers to a 16:9 aspect ratio video that allows more information to be displayed). Additionally, the ‘wide-screen’ mode in Skype 5 actually truncated the ‘full-
screen’ image from the top and bottom, causing less information to be visible in ‘wide-screen’
than in ‘full-screen’.

Figure 5.1. ‘Full-screen’ mode in Skype 4.2.

Figure 5.2. ‘Wide-screen’ mode in Skype 5.

As such, an older version of Skype was used (Skype 4.2), which only had a full-screen
mode instead of wide-screen. Not having the wide-screen option meant that the field of view
captured was not as wide as hoped for, but using a stable full-screen mode over the ever-changing modes of the newer version of the program was preferable, and the Pro 9000 still had a slightly wider field of view than the C500 even in full-screen mode.

Two initial view/field-of-view settings (the anchors) were used: head-and-shoulders only, and head-to-torso. In the unrestricted head-to-torso view, the field-of-view setting on the camera was fixed at the widest field-of-view. This allowed participants to see their conversation partner’s head, shoulders, and torso down to the desk, as well as any posture or hand gesture cues. In the restricted head-and-shoulders only view, the field-of-view setting on the camera was adjusted so that the field-of-view captured just the participant’s head and shoulders.

Figure 5.3. Screenshot of webcam software showing participant’s video feed and settings panel for the wide field-of-view (zoom) anchor.

As shown in Figure 5.3, the field-of-view has been set at the widest setting. To quantify the setting, an onscreen measurement was taken with a ruler from the top of the field-
of-view slider. At the widest setting, the center of the setting indicator is 19.5mm from the top of the slider. This method of quantifying the field-of-view was used because there was no way of digitally acquiring the setting, and there was no access to the source code of the program in order to modify it.

Figure 5.4. Screenshot of webcam software showing participant’s video feed and settings panel for the narrow field-of-view (zoom) anchor.

Figure 5.4 shows the field-of-view set at the narrow, head-and-shoulders-only view. At this setting, the centre of the indicator is 15mm from the top of the slider. The upper (narrow) range of the field-of-view available was not used because the field-of-view was too close-up; at the very narrowest, the field-of-view would show only the eye of the participant.

Occasionally, due to some participants being very tall or very short, the participant was asked to adjust the height of the chair to facilitate the appropriate framing.
Task. Two tasks were used, chosen from McGrath’s Task Circumplex (1984). The aim was to compare how much body language participants chose to transmit, and how these choices were affected by the type of tasks they were doing during the videoconference. To do so, a very co-operative, less interdependent task, as well as a more persuasion-oriented, interdependent task, was required.

For the persuasion-oriented task, the Intellective task type from the Choose quadrant was selected. Intellective tasks are ones where participants need to come to an agreement to a solution for a problem that has an objectively correct answer. Having an objectively correct answer to the problem gave participants a clear goal to achieve. Also, in order to increase investment in attaining the correct answer, the participants were told that if they did not come close enough to the correct answer, they would have to do a 15-minute online math task as a penalty. Both these things were included in the design and selection of the task to increase the persuasive interaction between the participants, and to discourage them from simply ceding to their conversation partners in order to end the experiment quickly.

The task used was called Lost At Sea (adapted from Nemiroff & Pasmore, 2001), the same as the task used in the previous study (Study 3). It describes a scenario in which the two participants are stranded in the middle of the ocean after their yacht caught fire. The task provides a list of 15 items, which the participants had to prioritize in order to ensure their rescue and survival.

This task was split into three phases: in the first phase, participants were to come to an agreement about the optimal ranking of the top 5 items; in the second phase, the ranking for items 6-10, and finally in the third phase they ranked items 11-15. Prior to discussing the task together, participants were instructed to rank all 15 items privately. This was another measure to increase persuasive interaction, as participants would arrive at the discussion phase having already generated arguments for and against various items.
For the co-operative task, the Idea Generation task type from the Generate quadrant of the circumplex was selected. Idea Generation tasks involve simply brainstorming for ideas; in this task, all input from each participant contributes to task completion, and there is little debate over the feasibility of the ideas. In this task, participants were asked to generate ideas to help the region of Christchurch, New Zealand, battered by the severe earthquakes over the last year. Like the Lost at Sea task, this task was also split into three phases: 7 ideas to help the survivors, 7 ideas for rebuilding the economy, and finally 7 ideas for handling and preventing future incidents (see Appendices R and S).

To discourage persuasive interaction, participants were told that the realism and feasibility of the ideas generated was not important, as long as they were loosely grounded in reality and not in fantastical ideas like unicorns and magic. They were told that most ideas would be acceptable, and that there were no right or wrong answers. They were encouraged to just throw out ideas, one after the other.

**Questionnaires.** After completing each task, participants were asked to complete a series of questionnaires on the computer using the Medialab program. They were asked demographic questions such as age and gender, and then they were asked about their experience with either type of scenario (see Appendices P and Q). For the Idea Generation task, they were asked if they had any friends or family in Christchurch, and if they had prior experience with rebuilding or rescue efforts.

For the Intellective task, they were asked how much experience with sailing they had. They were also asked how well the participant knew their conversation partner. After this, they were presented with four questionnaires: the Individualised Trust Scale (Wheeless & Grotz, 1997), the Social Presence scale (Short, Williams, & Christie, 1976), as well as the Impression Management, and Persuasion/Dominance, scales that were used in the previous study.
Design

There were three independent variables. Gender composition of the conversing pair was between-subjects, and had three levels: male/male, female/male, and female/female. Task type was within-subjects as all participants experienced the same two tasks (Lost at Sea and Rebuilding Christchurch). The initial field-of-view (anchor) for the webcam was also varied, and it had two levels: narrow (head-and-shoulders only) and wide (head and full torso with hand gestures visible). This variable was also within-subjects as one task was administered with the narrow initial field-of-view, and the other task was administered with the wide initial field-of-view. Because one variable was between-subjects and two were within-subjects, this was a 3X2X2 mixed-design experiment.

The experiment was fully counter-balanced for task order and initial field-of-view order. Some participants received the Lost at Sea task first and the Rebuilding Christchurch task second, and for others it was the other way around. Also, some participants received the narrow field-of-view anchor first and the wide field-of-view anchor second, and vice versa for the other participants.

Procedure

Participants were introduced to one another once they had both arrived, and sat at a meeting table where all debriefing and instruction took place. Then they were asked to read the information sheet, and sign the consent form. They were told that they would be discussing two scenarios over videoconferencing, and that each scenario was broken down into 3 discussion phases. At this point, either the Rebuilding Christchurch scenario or the Lost At Sea scenario was described and administered, depending on the counter-balancing order for each pair of participants.
Figure 5.5. Example of experimental procedure where the participants receive the Rebuilding Christchurch task first and the Lost At Sea task second.

For the Rebuilding Christchurch task, participants were asked to read the scenario quietly and without discussion at the meeting table, while the videoconference link was started. Then, they were told that for Phase 1, they were to come up with 7 ideas between
them for aiding the survivors, and shown to their respective booths. After they had generated 7 ideas, they were each given a sheet to write the ideas down. This continued for Phase 2 (rebuilding the economy) and Phase 3 (prevention/handling of future incidents).

At the start, and for the duration, of Phase 1 the field-of-view of the webcam was set to the starting anchor. In between Phase 1 and Phase 2, and Phase 2 and Phase 3, each participant was asked to experiment with the field-of-view settings on the camera, and to adjust it to where they felt most comfortable for themselves. During this process, they could see what the webcam in their own booth was capturing, and were told that it was what their conversation partner would see during the videoconference. After the participants had finished all phases, they were asked to fill out the questionnaires on the Medialab program.

For the Lost at Sea task, participants were shown to the booths and asked to read the scenario in private, then rank all 15 items for their private ranking. When both participants finished ranking the 15 items, the sheets of paper were taken away and the videoconference link started. They were told that they should come to an agreement about the optimal ranking for the top 5 items. When they had agreed on the ranking, they were given the ranking sheets to write down the team ranking. This continued for Phase 2 (items 6-10) and Phase 3 (items 11-15).

As with the Rebuilding Christchurch task, participants experienced the anchor point of the webcam field-of-view for the duration of Phase 1 of the Lost At Sea task. They were then asked to adjust the field-of-view of the webcam in between Phase 1 and Phase 2, and in between Phase 2 and Phase 3. After the participants had ranked all 15 items together, they were asked to fill out the Medialab questionnaire while their team ranking was ostensibly being compared against the correct ranking.

After participants had finished the first task and the first round of questionnaires, they were asked to return to the meeting table to begin the second task. After the participants had
finished the second task and second round of questionnaires, they were asked to fill out the exit interview questionnaire, also on Medialab. Regardless of what order the tasks were in, participants were told after they had completed the Lost At Sea task that their team ranking had been close enough to the correct answer and that they would not have to do the 15-minute online math task.

Additional contrast was created between the two tasks, depending on which one the participants received first in their session. If the Rebuilding Christchurch task was administered first, they were told during the instructions for Lost At Sea that, “unlike the first task, in this one you are personally at immediate risk because you are the ones lost at sea.” If the Lost at Sea task was administered first, they were told during the instructions for Rebuilding Christchurch that, “unlike the first task, in this one you are not personally at immediate risk because you are here in Dunedin and not in Christchurch where the damage is occurring.”

After all tasks and questionnaires had been completed, participants were debriefed about the purposes of the experiment and dismissed. They were not told the correct ranking for the Lost at Sea task, in order to prevent their possibly biasing future participants who might have been in their lectures or social groups.

**Results**

For each participant, scores were recorded for the Individualised Trust Scale, the Social Presence scale, the Dominance 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 participants trusted their partner (Individualised Trust Scale), felt that the medium had high social presence (Social Presence scale), felt that they were the more
dominant partner in the conversation (Dominance 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 and Impression Management scales, and reliability analyses were conducted for all scales. For the PCA, components were extracted with varimax rotation for the Dominance and Impression Management scales; each scale had 12 items, and extraction was set at an eigenvalue of 1. The Dominance scale had 3 components accounting for 63.2\% of variance, whereas the Impression Management scale had 2 components accounting for 58.8\% of data variance.

The Individualised Trust Scale (14 items, $\alpha = .77$), the Social Presence scale (15 items, $\alpha = .78$), and the Impression Management scale (12 items, $\alpha = .88$) were reliable. The Dominance scale, however, had moderate reliability (12 items, $\alpha = .67$); in the previous study, the Dominance scale had slightly better reliability ($\alpha = .75$).

Repeated-measures MANOVAs were conducted on all measured variables for Gender X Task X Anchor (initial field-of-view setting), Partner Gender X Task X Anchor, and Gender Group X Task X Anchor. The results are presented in the following section:
Field-of-view settings

Figure 5.6. Mean field-of-view settings by participants for the Lost at Sea and Rebuilding Christchurch tasks, as a function of initial field-of-view setting (anchor).

The anchor settings had a significant interaction effect with the tasks on where the field-of-view was set (F(1,118) = 29.80, p < .001, eta^2 = .20). Overall, the initial field-of-view settings affected the degree to which participants changed the field-of-view when they were asked to. In both tasks, the field-of-view was set wider when the anchor was set wide (M = 18.02, SD = 1.72) than when it was narrow (M = 17.03, SD = 1.82). That is, participants tended to choose a setting close to the anchor.

As Figure 5.6 shows, the difference was slightly larger in the Lost at Sea task than it was in the Rebuilding Christchurch task. For the Lost at Sea task, the difference was 1.2 (M = 18.17 vs M = 16.97), and for the Rebuilding Christchurch task, the difference was .78 (M = 17.87 vs M = 17.09).
Gender had a significant main effect on the field-of-view settings. Overall, women made more of themselves visible to their conversation partners than men did in both tasks and regardless of where the initial field-of-view was set (F(1,120) = 9.72, p = .002). On the Lost at Sea task, women (M = 17.98, SD = 1.42) set the field-of-view wider than men did (M = 17.14, SD = 2.10; F(1,121) = 7.54, p = .007). There was a similar finding for the Rebuilding Christchurch task, where again women (M = 17.86, SD = 1.59) set the field-of-view wider than men did (M = 17.11, SD = 1.99; F(1,121) = 5.37, p = .02).

![Figure 5.7](image)

**Figure 5.7.** Mean field-of-view settings by participant as a function of partner gender and initial field-of-view setting (anchor).

As shown in Figure 5.7, partner gender had a significant interaction effect with the anchor (initial field-of-view setting) (F(1, 118) = 5.67, p = .02). Overall, field-of-view was set wider when the anchor had already been set wide than when it was set narrow, but the
difference was larger when the partner was female than when the partner was male. When the partner was female, the difference was 1.13 (M = 18.32 vs M = 17.19). When the partner was male, the difference was .85 (M = 17.72 vs. 16.87).

Gender group showed a significant main effect on field-of-view setting, with participants in female/female groups setting the field-of-view widest, followed by male/female groups, and then male/male groups (F(1, 116) = 6.20, p = .003; eta^2 = .1). This is likely accounted for by the earlier finding that women tended to set the field-of-view wider than men did, and not due to the gender combination of the dyads, especially since partner gender had no significant main effect on field-of-view setting.

**Presence**

Overall, the co-presence part of the Social Presence scale was affected more than the social presence part of the scale. The co-presence section contains items pertaining to the degree to which participants felt they were ‘together’ with their conversation partner. The social presence section of the scale involves the perception of the communication medium in terms of its warmth, size, etc.

Partner gender significantly affected the co-presence ratings in the Rebuilding Christchurch task (F(1, 118) = 5.80, p = .017, eta^2 = .05). In this task, participants felt slightly more ‘together’ when their conversation partner was a woman (M = 4.65, SD = .86) than when the partner was a man (M = 4.28, SD = .85).

Though it was partner gender that affected co-presence ratings in the Rebuilding Christchurch task, it was the initial field-of-view settings (anchor) that had a significant effect on co-presence ratings in the Lost at Sea task (F(1, 121) = 7.27, p = .008, eta^2 = .06). Co-presence ratings were higher when the anchor was wide (M = 4.77, SD = .96) than when the anchor was narrow (M = 4.33, SD = .86).
Dominance

**Figure 5.8.** Mean ratings on the Dominance scale for male and female participants, as a function of task and initial field-of-view setting (anchor).

There was a significant three-way interaction between gender, task, and anchor settings on ratings of dominance ($F(1, 118) = 5.65, p = .019$). Figure 5.8 shows that both male and female participants rated themselves as being the more dominant partner equally when the field-of-view was set narrow or set wide (body language was available or not) for Lost at Sea. However, in the Rebuilding Christchurch task, males felt more dominant when the field-of-view was set wide (body language available) ($M = 4.19, SD = .62$) than when the field-of-view was set narrow (no body language available) ($M = 3.86, SD = .49$), whereas female participants felt more dominant when the field-of-view was set narrow (no body language available; $M = 4.13, SD = .52$) than when the field-of-view was set wide (body language available; $M = 3.95, SD = .48$).

There were no significant effects of familiarity with the task type or any of the demographic responses on any of the measured variables.
Pre-Discussion Considerations

Participants were observed to spend long periods of time on the Rebuilding Christchurch task, and the time spent was much longer than anticipated or instructed. The participants debated animatedly and at length with their conversation partners about each of the ideas they proposed, despite repeated instruction that the feasibility and realism of the ideas were not important and that they should not think too much about each idea. They had also been encouraged to think of the task as less serious than the Lost at Sea task, and to ‘just toss up’ each idea one after the other without much discussion. Yet participants persisted in spending a long time on the task.

What this behaviour may indicate is that perhaps the task was not being perceived as an Idea Generation task, but as a Judgement-type task from the circumplex. That is, they were discussing the task as a problem that they needed to arrive at a solution to, which did not have clear and objective answers. This may be because of the context and connection between the task (ongoing natural disaster in Christchurch affecting many people) and the participants (residents in New Zealand, who may also have family and friends in Christchurch).

The situation in Christchurch has been prominent in the media, and participants who may not have spent time in Christchurch may yet have known people from and in the affected area. Thus, the topic was likely not a neutral one for participants, and they may have been highly motivated to discuss the matter deeply and been invested in the outcome of the task.

One of the implications of this is that, if indeed the Rebuilding Christchurch task was conducted as a Judgement task, it would indicate that the task was more ‘persuasive’ in nature than the Lost at Sea (Intellective) task. This is because the Judgement task is lower on the vertical axis of the task circumplex than the Intellective task. The vertical axis of the circumplex denotes how co-operative vs. combative the tasks are, and thus how much persuasion is required during the interaction to secure the desired outcome. Judgement tasks are not necessarily combative in the sense that participants are fighting each other, but rather
potentially disagreeing with each other on what the most appropriate solution to the problem is and having to persuade the other that theirs is the best idea.

The implication of that reclassification of the Rebuilding Christchurch task as a Judgement task rather than as an Idea Generation task is in the interpretation of the results when comparing the Rebuilding Christchurch and the Lost at Sea tasks. The case for supporting the reclassification of the Rebuilding Christchurch task is strong, and thus the results were interpreted in that way in the following discussion.

Discussion

Task type affected the field-of-view settings of the webcam. Participants adjusted the settings more during the Rebuilding Christchurch task than in the Lost At Sea task, moving further away from the anchor or initial points. In the Lost At Sea task, participants tended to stay close to the anchor points. It appears that when executing a more persuasive task, participants are more motivated to adjust and think about the field-of-view settings, which in turn adjusts the image and information received by their conversation partner.

The results showed that there was a significant gender difference in ratings on the Dominance scale in the Rebuilding Christchurch task, depending on the field-of-view anchor point. Male participants felt like the most dominant partner when the anchor point was set wide (when body language was available) than when the anchor point was narrow. The pattern was reversed for women, who felt like the more dominant partner when the anchor point was set narrow (when body language was not available) than when the anchor point was wide.

This indicates that men feel more dominant when their body language is available to their conversation partner, which shows that there may still a degree of physicality that they are trying to transmit during the interaction. On the other hand, women feel more dominant
when their body language is not available to their conversation partner. A possible explanation for this is that women may not feel physically imposing because of their relative slightness compared to men, and may feel that their slight physical appearance is detrimental to efforts to dominate.

There were also significant gender differences in the field-of-view settings of the webcam. Overall, female participants preferred to set the field-of-view of the webcam wider (to show more) than male participants did. This could be an indicator of their preferences for body language availability, as when the field-of-view of the webcam was set wider, more of themselves could be seen.

However, adjusting the field-of-view of the webcam does not just change how much of the participant is visible, but also the perceived proximity between the participant and the computer. Many participants, particularly female participants, showed startled and uncomfortable reactions when they adjusted the webcam to field-of-view in, and would hurriedly pull the field-of-view back out as far as it would go. Particularly when the field-of-view was adjusted quickly, it appeared that the screen or webcam was approaching the participant’s face very suddenly. Of the participants who were noticeably startled, many also commented on the peculiar perception of the screen or webcam coming towards them.

This unintended effect appeared to be more salient than the perception of body language availability, which may have negatively affected the participants’ awareness of the field-of-view’s effect on the latter. Because of the salience of the perceived proximity and approach of the computer screen and webcam, and the associated discomfort experienced by participants, the results for the field-of-view settings may have been affected. Many of the female participants appeared to pull the field-of-view all the way out in reaction to the proximity effect, and this may account for the gender differences for the field-of-view settings.
Partner gender affected co-presence ratings (how ‘together’ participants feel with their conversation partner) in the Rebuilding Christchurch task. Participants felt more ‘together’ when their partner was female, while executing a more persuasive task. This may indicate that women interact in a way that encourages a feeling of closeness or a feeling of social bonding. Alternatively, when interacting with a woman, participants may feel encouraged to bridge a perceived gap, or interact closely with the woman.

One limitation was that in the previous study, participants were only required to state a preference for body language availability. This study required participants to actively and manually change the field-of-view of the camera, and thus the amount of their own body language that was made available to their conversation partner. Unfortunately, there may not have been sufficient motivation for participants to take a lot of time and care in choosing their settings.

In a real, professional setting, business users put effort into their appearance and behaviour because that may impact on their jobs through the perceptions of their co-workers, superiors, clients, and associates. Two students who are not well-acquainted (and do not expect to be further acquainted in the future) may not be very interested in exactly how the other perceives them. In the future, this study might be better suited in a more ecological setting where motivation to impress or persuade is high.

Overall the results showed that task type, participant gender, and the gender of the conversation partner were important factors that affected perceptions regarding the medium and interactions, as well as affected participants’ choices in how they manipulated the medium to transmit themselves. There are implications not just for design but also in training.

Business users may find themselves uneasy with videoconferencing if they feel they are not being transmitted how they would prefer to be perceived. To encourage users to modify the settings of the program to change how they are being transmitted, it may help to
make the pertinent settings (i.e., field-of-view/body language availability) more prominent and salient to the user. Having one or two features stand out from the host of other possible modifications (like colour saturation, contrast, digital expressions/facial masks) may make experimenting with the settings more approachable.

Yet, as a lot of videoconferencing or video chat software is marketed to a cross of different populations, it may not be desirable to make prominent some of these settings if the users do not particularly care about changing them. In these cases, for example in very casual use, making the settings prominent may be perceived as intrusive and unnecessary. As seen in this experiment, casual users may not be motivated to optimize their self-transmission, and saw the adjustments as a hindrance to finishing the task.

It is also important for developers to not show assumptions made about their users’ differences. That is, developers must not tell users that one set of settings would be more appropriate for them than another because of their gender. For one, gender equality and division are sensitive issues. And for another, many users will find that their preferences run counter to what is ‘typical’ of their gender. A more general ‘awareness’ approach such as suggested above would still encourage users to adjust their settings without indicating in which way they should adjust their settings.

Another important component is on the training end of the application of these findings. IT departments in businesses/offices are involved in instructing business users on how to use the applications they have been provided with, and videoconference settings could be a part of that. Again, without instructing users on how they should set the field-of-view or BLA settings, IT trainers would show the users how to change these particular settings, in this way both prompting their attention towards the settings and hopefully encouraging them to be comfortable with taking that control over their self-transmission. Pointing out that the users may desire different settings depending on the context of the communication/meeting may
also help users to think of the self-transmission process as one that they can exercise a fair amount of control over, depending on who they would be speaking to.

Summary of Chapter

This was the fourth and final study of the thesis, and examined the effects of task type, gender configuration of the conversing dyads, and starting field-of-view point on participants’ perceptions of trust, social presence, dominance self-efficacy, and impression management self-efficacy, as well as participants’ settings for the field-of-view of the webcam. In particular, the study was designed to examine if participants would adjust the field-of-view of the webcam to allow less or more of their own body language to be available to their conversation partners.
CHAPTER 6: GENERAL DISCUSSION

Chapter Overview

This thesis had been undertaken to investigate the effects of body language availability in videoconferencing (VC) on human communication. Almost all studies that investigate VC use the default head-and-shoulders field of view on the cameras, and have not examined the role of body language and its availability in remote communication. My aim was to address that gap in the literature, and in four studies examine the role of body language in user perceptions and interactions in VC. The studies showed that body language availability does have a strong but nuanced effect on perceptions of interactions and interpersonal attitudes (such as trust and feelings of dominance efficacy) between VC conversation partners. Additionally, gender emerged as an important factor that interacted with body language availability on the above variables.

Why the research was undertaken

Technology has advanced to the point where communicating remotely with others is easy and cheap. Video chat is widely available, would benefit business users and organizations greatly, and there are even elaborate business videoconferencing suites available. Yet, uptake of VC for business use has not been great, and people still prefer to travel to meetings. There is still a sense of ‘loss’, that they are missing something of human communication over VC that they would be able to perceive in FTF. Decision-makers in organizations still feel it is worth travelling to conduct FTF meetings (Oxford Economics USA, 2009), and though 51% of executives say they would be interested in using VC if the technology became available (Cisco, 2010), that still leaves almost 50% that are not interested.
There has been a lot of CMC research done to understand how users communicate remotely, and to improve systems and software to increase uptake of CMC, specifically VC. However, studies that investigate VC usually use the default head-and-shoulders field of view on the cameras, and studies that examined the role of body language availability in remote communication are scarce.

Nonverbal cues/body language cues are an important channel that can ‘complete’ (or even contradict) the meaning and understanding of the messages that are sent and received. For example: if one’s conversation partner is adamant that they are being truthful, it may ‘complete’ the message to be able to see them open their palms towards us, or ‘contradict’ the message to be able to see them wring their hands and fidget nervously. Is support for body language cues important for VC uptake in business use?

This thesis was undertaken to examine the role of body language availability on VC communication. Specifically, the aim was to examine factors that may influence perception and use of videoconferencing for business-type meetings. There was also the broader goal to increase uptake of videoconferencing by business users to reduce costs in time, money, and to the environment.

It started with a brief pilot study where 3 frequently-travelling business users were interviewed, and patterns in their concerns were noted. Two of the subjects that the interviewees mentioned were trust over remote communication/relationships, and the importance of body language availability in FTF meetings that they felt was absent in VC. Based on the literature on VC, and body language, four studies were conducted to examine various ways and contexts that body language availability (BLA) could affect users’ perception of videoconferencing technology.
The studies conducted

In the following section is a brief recap of the studies conducted for the thesis. The recap describes the design, methods, and results from each study. This is then followed by a discussion of the findings according to theme.

Study 1 – BLA X Task Type. The first study examined the effects of body language availability and task type on trust, social presence, satisfaction, and performance. Pairs of participants were asked to discuss an idea generation task (they were asked to generate as many ideas/solutions as possible for a given scenario), as well as a negotiation task (the participants were to agree on a certain number of facilities to include and discard, and each item had different point values for each participant). Body language was available in one task discussion but not in the other, and the order of task presentation as well as body language availability was counter-balanced between pairs of participants. After each task they were then asked to fill out questionnaires regarding how much they trusted each other, the social presence of the medium, and their satisfaction with the task. Performance was measured by the difference in points acquired for each participant of the pair (negotiation) and how many ideas each pair came up with (idea generation; they were asked to generate as many ideas as possible).

The results showed that social presence was higher when body language was available than when it was not. Measures of performance and satisfaction did not show a significant difference. In the idea generation task, participants trusted their conversation partners more when body language was available than when it was not. However, in the negotiation task, participants trusted their conversation partners more when body language was not available than when it was available.

Study 2 – BLA X BL Type X Camera Angle. In addition to body language availability (available vs. not available), body language type (honest vs. dishonest) and camera angle (eye-to-eye vs. non eye-to-eye) were also examined. Each participant only watched one video
out of 8 possible conditions (e.g., body language available, honest body language type, eye-to-eye angle). After viewing the video, participants were asked to fill out questionnaires regarding their trust in the presenter, the social presence of the medium, and several individual items that measured if the actor’s likability or familiarity influenced the participants’ trust and social presence ratings.

Social presence was rated higher when the video was in the eye-to-eye condition than in the non eye-to-eye condition. Female participants trusted the actor in the video more than male participants did. There was a significant two-way interaction between gender and body language availability on social presence ratings; when body language was available, female participants trusted the actor more than male participants did, but the pattern was reversed when body language was not available.

There was a significant three-way interaction between body language availability, gender, and camera angle on perceptions of risk (an indirect measure of trust). Female participants rated the proposal as less risky when body language was not available, regardless of camera angle. For the eye-to-eye videos, female participants rated the proposal as less risky when body language was not available than when body language was available. Similarly, for the non eye-to-eye videos, they rated the proposal as less risky when body language was not available than when it was available. Male participants rated the proposal as more risky when body language was not available than when it was available for the eye-to-eye videos. However, the pattern was reversed for the non eye-to-eye videos. For the non eye-to-eye videos, male participants rated the proposal as more risky when body language was available than when it was not available. Overall, gender had a significant effect on the combined measured variables; female participants on average tended to give higher ratings than male participants did.
Study 3 – BLA X Gender. In the third study, the effects of body language availability as well as the gender combination of the conversing dyad on trust, social presence, dominance self-efficacy, and impression management self-efficacy were examined. Pairs of participants (male/male, female/male, female/female) were asked to solve a survival task together, and told that if their answer did not match the correct answer closely enough, they would have to do a task that would delay their departure for another 15 minutes. After the task was completed, participants were asked to respond to questionnaires regarding trust in their conversation partner, the social presence of the medium, as well as their own feelings of dominance and impression management during the experiment.

Body language availability and partner gender affected ratings on trust. When body language was available, participants trusted both male and female partners equally. When body language was not available, participants trusted female partners more. Body language availability also interacted with gender group on participants’ self-efficacy on impression management. Both female/female and male/male groups rated impression management higher when body language was not available, but the pattern was reversed for mixed groups.

There was an interaction between availability of body language and partner gender for impression management. When body language was available, the scores were similar for both male and female conversation partners. When body language was not available, however, participants felt they were more able to project the impressions of themselves that they wished to with a female partner than with a male partner.

Participant gender, partner gender, and body language availability also interacted on ratings for impression management. Both male and female participants felt more able to control impression management with a female conversation partner when body language was not available. The pattern was different for male and female participants when the partner is male. Male participants again felt more able to control impression management when body
language was not available, but female participants felt more able to control impression management when body language was available.

Dominance self-efficacy was affected by gender group: participants in female/female dyads gave the highest ratings, followed by male/female dyads, and male/male dyads gave the lowest ratings. Ratings for dominance were also affected by an interaction between gender group and body language availability. Ratings for when body language was available and not available were similar for the male/male dyads and the mixed-gender dyads, where dominance was rated higher when body language was available. In female/female dyads, however, ratings were similar for both body language conditions. Dominance self-efficacy was also affected separately by partner gender. Participants were more likely to rate themselves as the more dominant partner when their conversation partner was female, regardless of the participant’s own gender.

There was a marginally significant effect of participant gender, partner gender, and body language availability on ratings on the Dominance scale. In most cases (male participants with male and female conversation partners, and female participants with male conversation partners), ratings were higher when body language was available than when it was not available. However, female participants with female conversation partners felt equally able to be dominant when body language was available and when it was not available.

*Study 4 – Initial BLA X Gender X Task.* For the fourth and final study, the aim was to examine the effects of initial body language availability settings (wide field-of-view vs. narrow field-of-view), gender composition of the group (male/male, female/male, female/female), and task type (intellective vs. judgement) on trust, social presence, dominance self-efficacy, impression management self-efficacy, and adjustments made to camera field-of-view. Pairs of participants were asked to discuss two tasks together, and twice during each task, participants were asked to adjust the field-of-view (zoom) of their own camera. These
user-made settings were recorded with screenshots each time. After each task, they were asked to respond to questionnaires regarding trust in their conversation partner, the social presence of the medium, as well as their own feelings of dominance and impression management during the task.

The initial field-of-view settings (anchors) interacted with the tasks on how participants then set their own camera’s field-of-view. Overall, participants tended to choose a setting close to the anchor. But participants changed the settings further away from the anchors in the Rebuilding Christchurch task than in the Lost At Sea task.

Gender also had an effect on field-of-view settings. Overall, women made more of themselves visible to their conversation partners than men did. Partner gender interacted with the initial field-of-view settings on the participants’ settings. Overall, field-of-view was set wider when the anchor had already been set wide than when it was set narrow, but the difference was larger when the partner was female than when the partner was male.

Partner gender also affected ratings of co-presence in the Rebuilding Christchurch task; participants felt more ‘together’ when their conversation partner was female than when the partner was male. In the Lost At Sea task, co-presence ratings were affected by the anchors; ratings were higher when the anchor was wide than when the anchor was narrow.

Gender, task, and anchor settings interacted on participants’ self-efficacy on dominance. Both male and female participants rated themselves as being the more dominant partner equally for the Lost at Sea task. However, in the Rebuilding Christchurch task, males felt more dominant when the field-of-view was set wide (body language available), whereas female participants felt more dominant when the field-of-view was set narrow (no body language available).
**Findings according to theme**

*Body Language Availability*

Body language availability was shown to affect trust, social presence, impression management, and dominance. These findings indicate that body language does add something significant to VC interactions, and the support for body language availability could be important for VC. However, it is important to note that body language availability did not have a direct or main effect on users’ perceptions. Instead, body language availability interacted with other factors such as gender and task type. What this shows is that the effects of body language availability on communication, and perceptions of communication, are not as clear-cut as ‘having body language available/visible is good’ and ‘body language not being available/visible is bad. The effects of body language availability are actually nuanced and complex. What the findings do show about body language availability is that people perceive and use it in different ways depending on the context, which includes the task as well as the other party/parties involved.

*Gender*

At the start of the thesis project, gender was not included in the initial considerations for an independent variable for the studies. However, it soon emerged as a very strong, overarching factor in the findings. Gender affected many of the dependent variables and had strong main or direct effects. This supports earlier work that shows that the different genders interact with and perceive technology in very different ways (e.g., Maurin et al., 2006; Wheeler, 2000; Stuhlmacher et al., 2007; Kray & Thompson, 2005; Wachter, 1999).

Additionally, gender interacted strongly with body language availability on trust, social presence, impression management, and dominance. That the different genders have differing levels of skill with regard to perception and transmission of nonverbal cues is not surprising, as there is ample literature that shows just that (e.g., Argyle, 1975; Hall, 1979;
Rosip & Hall, 2004). The studies show that this extends to body language availability over VC as well. The different genders appear to respond differently when body language is available and not available. The findings also show that the gender of the conversation partner is as important, if not more, than one's own gender. While unexpected, this is also not too surprising, given that we often tailor our messages to different audiences, and that we also have biases and preconceived notions about different groups of people. Other people’s identities can also seem more salient than ours are, as we are actively perceiving them and they are more unknown to us.

It seems counter-intuitive that female participants tended to prefer their own body language to be more available, given that women’s bodies can come under uncomfortable scrutiny in everyday life. However, this may relate to the pattern found in the literature for skills in nonverbal cues that shows that women are more skilled in both decoding and encoding nonverbal cues (e.g., Argyle, 1975; Hall, 1979; Rosip & Hall, 2004) as well as the common stereotype and perception of women being better at ‘reading’ nonverbal cues. Potentially, the female participants may have felt more able to influence their conversation partner through their own body language, and thus set their cameras to make their body language available for that reason.

Task Type

McGrath’s Task Circumplex (1984) was used to examine different types of tasks and their effects on interpersonal communication. The findings from Study 1 and Study 4 show that task type does have an effect on user perceptions of interactions and interpersonal attitudes, though not always in expected ways. As seen in Study 1, though participants trusted their conversation partners more when body language was available than when it was not in the Idea Generation (co-operative) task, which is to be expected, they also trusted their conversation partners more when body language was not available than when it was available in the Negotiation (combative) task.
In Study 4, participants adjusted the field-of-view on their cameras (thus also adjusting their own body language transmission) away from the initial field-of-view settings more in the judgment task, the more persuasive of the tasks, than in the intellective task. This may indicate that users take more care to manipulate how much of their own body language is available according to the context of the task and the gender of their conversation partner.

These findings are consistent with the argument that task classification is important and with the proposals of the circumplex. They show that the tasks do differ and that users respond in different ways to them. This indicates that it is important to consider task as a factor, both in research and its effects on how potential users may interact with VC (and how satisfied they may be with the remote communication).

That body language availability (technology), gender (actors), as well as task type (context) all affected participants’ perceptions of the interactions and each other supports the core argument of Adaptive Structuration Theory (AST; DeSanctis & Poole, 1994) and the general socio-technical school of thought (e.g., Norman, 1986; Trist & Bamforth, 1951). That is, we need to consider multiple elements in the interaction, not just the elements in isolation, in order to fully understand the communication process in VC. As seen in the studies here, these different elements all contributed to the users’ experience with remote communication.

*Self-Transmission*

Users’ perceptions of their self-transmission or self-presentation efficacy emerged as a concern later in the thesis, as I realised that I had been studying just one half of the whole of communication process. To communicate is not just to receive/perceive, but also to transmit/be perceived. It is important to us that we feel communicated to others in the manner in which we wish to be seen. In other words, that we feel effective at transmitting or presenting our personae to others.
The findings showed that participants’ self-efficacy of dominance and impression management is affected by body language availability as well as gender (both own-gender and partner-gender). Participants felt more able and effective at dominance and self-presentation during their discussions depending on how much of their own body language was available as well as the genders of themselves and their conversation partner.

There also seemed to be an anchor effect relating to the initial field-of-view settings in Study 4. In each task (counter-balanced across groups) the initial field-of-view was set to either make body language available (full head-to-waist shot) or unavailable (head and shoulders only), and during intermissions in the task the participants were asked to adjust the settings to where they felt was comfortable. Participants did not stray far from these anchors, and after experimenting, would decide on a setting close to the initial field-of-view. They did, however, move further away from the anchors in the Rebuilding Christchurch task (judgment task) than in the Lost At Sea task (intellective task). Though this is so far a one-off finding, we may speculate as to why this happened.

One possible reason is that in the more persuasive task (Rebuilding Christchurch), participants were more motivated to adjust or control their self-presentation, and thus adjusted the field-of-view away from the anchors more in that task than in the Lost At Sea task. This would be consistent with the idea that the desire to control self-presentation can differ depending on the context of the task. When stakes are high and people are trying to convince others to agree to their own point of view (e.g., a business merger, a job interview) they may want more control over how they come across and the message that the recipient receives (e.g., dressing one’s best and making a good impression). This may extend to how they appear over VC in a persuasive task as well.

The other possibility is that in the more persuasive task, users are adjusting their camera’s field-of-view to a middle point between the wide field-of-view anchor and the narrow field-of-view anchor. This would account for users shifting away from each anchor
type. This may indicate that there is a certain ‘universal’ approximate setting that is preferred in more persuasive-oriented interactions, that there is a certain field-of-view or framing that users feel best suit their self-transmission needs in that kind of scenario. However, the user-made settings did not appear to converge to a set middle point, and still maintained a difference between the wide field-of-view anchor and the narrow field-of-view anchor. Therefore, at this time it looks as though the first explanation may be more plausible.

**Social Presence**

Overall, participants rated social presence as higher when more information about their conversation partners were available, such as body language availability (Study 1, 2, and 4), and eye contact (Study 2), which is consistent with Social Presence Theory (SPT; Short et al, 1976). This indicates that body language availability does contribute to a higher sense of ‘being together’, which in turn may indicate that body language could be considered its own channel and comprises its own set of cues that contribute significantly to remote communication. This could be important to business users who need to foster a relationship between team members, with superiors/employees, and when liaising with people from other organizations. Speculatively, improving support for body language availability in VC systems (or even making the ‘body language available’ field-of-view the default instead of the ‘head-and-shoulders only’ field-of-view) could help to improve VC uptake in the business-user sample if they do feel an improved closeness, particularly in co-operative tasks/contexts.

**Trust**

Participants’ trust in their conversation partners were affected by body language availability, task type, and partner gender. Trust was rated in some rather unexpected ways in the studies. For example, in Study 1, participants rated their conversation partners as more trustworthy when body language was available, which is the expected direction, but only for
the co-operative task. The pattern was reversed for the mixed-motives/negotiation task, where participants found their partners less trustworthy when body language was available.

This seems like a contradiction with what the business-users interviewed stated – that they wanted to see body language, particularly in persuasion-oriented meetings, because they wanted to know if they could trust the other parties. It is a little unclear, however, if the interviewees really meant that they would trust others more if body language was available, or if the information would help them make a decision about whether to trust the other party. Speculatively, if body language availability in persuasive tasks hampers trust development, this in turn could lead to uneasiness with VC and lower uptake. Users may not even realise why if they expect the opposite to occur (that body language being available would aid trust). It is possible that VC use is more helpful and productive with co-operative meetings like remote team collaboration than with non-co-operative meetings like negotiations.

*Implications of these findings*

An implication of knowing that different body language availability settings may affect the other party’s trust in oneself, as well as one’s self-efficacy in factors like dominance and impression management, is that it may encourage instruction on how to use VC in organizations. It would be in the interest of the organization and its employees to manage the impressions sent during its remote communications and meetings. Instructing the user on adjusting their body language availability to influence interpersonal factors such as trust, dominance, and impression management may also boost the user’s confidence in themselves. Feeling more in control of their self-transmission, and being more confident in themselves, may also increase the user’s likelihood and desire to use VC as a remote collaboration/meeting option.

One of the possible drawbacks and ramifications from awareness and instruction around adjusting body language availability according to our goals and audiences is that the other parties in the meetings may also have awareness of (and had instruction in)
manipulating body language availability. Then, the other party may be aware that the user is actively controlling their self-presentation, and may become suspicious. *Why has s/he chosen this particular field-of-view option,* they might wonder. *Are they hiding their body language because they do not want me to see their leaked cues? Or: are they purposely displaying their body language because they are trying to appear more trustworthy and influence me more?*

On the other hand, one might easily say the same of our everyday choices in portraying ourselves, such as general appearance, attire, and mannerisms. Whenever communicating with someone else, particularly in a context where there is much at stake, such as a job interview or a business negotiation, we are keenly aware that each party is trying to put themselves and their positions forward in the best and most persuasive light. That is, people in and out of organizations already take measures to manage impressions of themselves and the organizations they represent. So body language availability in VC would likely not have a negative impact on professional relationships and relationship development.

*Generalization*

The generalizability of the findings may be examined in three aspects: task, sample, and environment. The tasks used in the studies were selected from McGrath’s Group Task Circumplex (1984), which he designed for research in organizations and professional groups. The circumplex was also empirically tested for its validity in Strauss (1999), and it is widely used in group research (e.g., Ward et al., 1995; Rao & Jarvenpaa, 1991; Hollingshead et al., 1993; Straus & McGrath, 1994; Shinnawy et al., 2006; Alel et al., 2010). The benefit of the circumplex is that it defines tasks according to the communication processes as well as the outcomes of the tasks. It allows flexibility in exactly what the task is so that researchers can select tasks that are appropriate for their sample, but are still analogous in their interaction processes and goals to business-type meetings or collaborations.
The environment of the experiment was set up to mimic a workstation in a cubicle or office room. The testing cubicles were professionally presented, and the rooms and workstations were clean of clutter and very neat. The experiments were conducted in a professional (rather than casual) manner, as was the experimenter’s conduct. There were some limitations in the environment’s ecological nature in that it was not the participant’s ‘natural habitat’, which is discussed later in the limitations section.

The sample is and yet is not analogous to business-type users of remote VC, as the studies used students enrolled at the university as participants. The reason why business use of VC was a driving force for this thesis project was that they are the ones less likely to tolerate the perceived deficiencies in the remote communication process. Student studies are widely used and the findings generalised upon, both because they are samples of convenience and because the studies were in regards to generalizable factors. Though the findings would be used for the benefit of business-type users, and indeed the motivations may be quite different as are the actual rewards/costs, but it is possible to generalise from the student studies as they involve communication processes and interactions that are common between business-type users and the students.

Communication is a universally human process, and there are major body language cues that are also considered universal (for example, expressions of anger, happiness, and sadness). The elements of communication investigated in the thesis (trust, persuasion, dominance, self-presentation) are present in many instances and contexts in our lives. We are all to some extent concerned about how we come across to others and how they perceive what we say, do, and are. Similarly, we are often concerned with getting others to “see things our way”, whether it is in making decisions or in the perceptions they have about the issue at hand or about ourselves.

There were several instances in the experiments that demonstrated this. In Study 4, when participants were asked to adjust their camera’s field-of-view settings, one participant
was observed placing her hands on the table, making gestures with her hands, and then readjusting the field-of-view. It appeared that she was specifically concerned about being able to have her hand gestures, as presented while her hands were actually touching the desk, visible/transmitted to her conversation partner. Also, the participants frequently asked for the correct ranking of the Lost At Sea task in Study 3 and Study 4, primarily so that they could prove to their conversation partner that they had put forward the correct ideas. When they were politely denied access to the correct answers, they would often repeat their requests and exclaim how they wanted to show their conversation partner who was ‘right’. In Study 1, discussions sometimes got heated and on occasion, participants could be heard raising their voices to each other through the closed cubicle doors. These incidents indicated that they were invested in ‘being right’ and convincing their conversation partner, a stranger, that their point of view had been the right course to take.

**Limitations**

One of the limitations of the studies was that they were not ecological. That is, without the actual work environment and task contexts for business users, perhaps the participants may not be sufficiently motivated or invested in attaining satisfactory communication processes with a stranger. This was not a significant issue in most of the studies as external motivation was induced by potential time punishments and task design, but may have played an important role in the fourth/final study. In the final study, though participants were motivated to discuss the tasks at length and communicate their ideas to each other, they did not seem invested in controlling their self-representations to their conversation partners. However, ecological studies are not without their limitations as well.

There is always a trade-off between laboratory studies and ecological studies in terms of control. In an ecological study, the ‘real world’ contexts, actors, and processes can be examined, but they compromise on control over the variables being examined. Laboratory
studies allow greater control over the independent and dependent variables, but are missing some of the contexts of the ‘real-world’ situations. In this thesis it was decided to make the trade-off to have greater control over the variables.

Another limitation from Study 4 was that having the participants adjust the field-of-view of their own camera appeared to have a discomfiting effect. When participants zoomed in, the image on the screen changed rapidly and gave the impression of something approaching the participant very quickly. Some participants expressed discomfort at this effect and hastily reversed the process so that the field-of-view was set as wide as possible. Because of this effect, it is unclear how much of the field-of-view user-made settings were due to a desire to control their self-presentation versus a reaction to that discomfort. The user-made settings were found to significantly differ depending on the initial setting of the field-of-view, however, indicating that despite their discomfort they still displayed an anchor effect.

One of the limitations was that the questionnaires used for measuring self-efficacy for dominance and impression management were constructed specifically for Studies 3 and 4. They need to be further tested and improved upon for increased validity, and to ensure that they are measuring what they are meant to measure. To do this, a possibility may be to test them alongside existing measures of impression management and dominance self-efficacy to show that they result in similar findings. One concern may be that they both contain items that explicitly reference ‘persuasion’; further effort should be made to distinguish between them as two distinctly separate scales. A difficulty possibly associated with the term ‘persuade’ and these two measures is that both dominance and impression management are forms of persuasion. In one, we are trying to persuade others to cede to our demands or points-of-view. In the other, we are trying to persuade others to accept our version of self-presentation as the truth.

Another limitation was that participant familiarity with one another was not examined in more detail. They were asked if they were acquainted with their conversation partners, and
the vast majority indicated that they did not. Examining the data with and without the pairs that were acquainted showed that there were no significant differences in the two sets of data. However, in Study 3, participants had a second session with the same partner, so ostensibly there was some degree of familiarity there. This was not examined further and so it is unclear what effect having the same partner might have had on the interaction.

**Venues for future work**

*Groups of 3 or more participants*

The first and most obvious venue for future work that could extend on this thesis would be to investigate the effect of body language availability in videoconferencing with groups that consist of three participants. The vast majority of meetings conducted are between two or three people, so it is important to examine groups of these sizes for improving VC uptake. Groups of two people (dyads) were examined here, but future work should also look at groups of three as there may be significant differences. Communication between two remote people is much simpler than when a third party is added. For example, when the one is speaking, the other can be almost certain that they are the intended recipient of the message.

In groups of three or more, however, communication can become more confusing. If Person A is speaking, how do the other parties know if A is speaking to B, C, or D? Factors such as turn-taking indicators and gaze support enter the equation, for which nonverbal cues can be very important. For example, Person A may gesture to Person B by pointing or nodding to indicate either that they are addressing the other person or handing over the floor. The use of body language and the importance of its availability in non-dyadic groups may change when compared to dyadic conversations. Larger groups also introduce different social dynamics. Participants can agree with one but disagree with another, creating an imbalance of power. People may align with another because they identify with the same group (organization, team, gender, race, nationality, etc). or because they hold the same view
regarding the issue at hand, which may frustrate or silence the non-agreeing party when the majority ‘gang up’ on them.

Future studies in this area could look at how body language availability affects perceptions of trust, social presence, dominance/persuasion, and impression management, when there are three or more parties. The studies could also look at choices made in regards to making their body language available.

*Culture*

Remote communication naturally invokes the question of cross-cultural differences. Organizations may have branches in different countries, and employees converse with their overseas associates. Sometimes members of a single team will be remotely separated and collaborate through various CMC routes. In other cases, business users may communicate with those from other organizations that are located out of town or overseas.

Business can now be conducted between participants separated by entire oceans, and each locale will have its own culture that may affect the interaction. Cross-cultural studies have been of great interest to CMC researchers because of the differences between the way people communicate in different countries and cultures, and organizations will have their own cultures as well (Hofstede, 1994). These cultural differences include body language cues.

For example – holding up the index and middle finger in a ‘V’ is commonly known as the ‘peace’ sign and is widely considered a friendly gesture. However, in some countries like New Zealand, UK, and Ireland, making the ‘V’ with the index and middle finger with the palm facing inwards is considered an insult. The gesture’s meaning is allegedly derived from wartime when captured archers’ index and middle fingers were cut off. Other norms for nonverbal cues can include physical proximity. In Middle Eastern countries, people have much smaller personal “bubbles” than people in countries like the US or New Zealand.
There is also the question of whether body language would be considered necessary in the conversation at all. In some cultures, like in Japan, people are relatively inexpressive through their faces and body (Scherer, Wallbott, Matsumoto, & Kudoh, 1988), and body language availability support may not add anything significant to the communication or interaction.

**Reducing the proximity effect**

In Study 4, participants were asked to adjust their body language availability by changing the zoom setting on the webcam. Zooming in, however, had the unintended effect of giving the impression of a sudden closing of distance between the participant and the computer screen. Future studies should try to separate the effects so that the effect of zooming in only changes the perception of more cues being available.

**Ecological studies**

An issue that came up in Study 4 was that participants did not appear to be sufficiently motivated to manipulate or control their self-presentations, and subsequently seemed to find the zoom-adjustment phases distracting. Future studies should use an ecological design to address BLA-manipulation as part of self-presentation. This might mean using an actual organization (their employees and work processes, and actual meetings) in the study. Alternatively, researchers could devise ways to motivate student participants to be invested in their self-presentation within the context of the tasks. This would be a similar endeavour to how participants in these studies were motivated to discuss things at length with their partner and attempt to persuade their partner through the potential of a time punishment.

These studies could examine CMC between employees of the same organization in the same building, employees of the same organization but in different locations/branches, and between people who do not work in the same organization or even in the same field but whose work requires communication over distance. Even though it is all remote communication, the
situations describe different social and official dynamics which may affect some factors such as the formality of the interactions and trust between communicating parties. For example, one might be formal with the CEO of the organization, but more informal with a team member that one sees on a daily basis.

The limitation with ecological studies is in finding multiple groups that share enough characteristics and processes that they can be compared against each other (McGrath, 1984), as studying just one group would be a case study. For this reason, there is a trade-off between examining a ‘real world’ context complete with the actual social/communication/technological processes involved in the ‘real world’ scenario, and the control over the variables that may affect users’ perceptions of the technology, interactions, and each other.

*Gender as a Social or Learned construct vs. Biology*

In the thesis I stuck to a fairly uncomplicated use of ‘gender’ as defined by biology. Participants were asked if they were male or female, and they selected their self-identified gender. One of the things to keep in mind is that femininity/masculinity is not the same as, and is not always dictated by, biological sex. The expressed and internalised gender of any particular individual is certainly affected by norms impressed upon them from the way they are dressed and treated by family and others around them. One’s biological sex elicits markedly different perceptions and reactions. For example, when shown a baby crying after being surprised by a Jack-in-a-box, people believe the infant is crying out of fear when told it is female, but that it is crying out anger when told it is male (Condry & Condry, 1976). Also, parents are more likely to encourage male children to play actively and ‘rough-and-tumble’, whereas female children are encouraged to stay close and play tamer, less ‘dangerous’ games (Rosen & Peterson, 1990; Jacklin, DiPietro, & Maccoby, 1984).

However, not all parents raise their children in accordance to stereotypical gender roles, and some people flourish in the non-stereotypical gender role despite stereotypical
nurturing. Argyle (1975) examined research that suggested that femininity/masculinity had more bearing on accuracy in encoding and decoding body language than biological sex. Things are further complicated when one considers that some people identify as queer (gay, lesbian, bisexual, genderqueer, transgender), some of whom also express non-stereotypical gender roles.

Why then, do the results of the studies in this thesis show such strong gender effects? One explanation is that male Kiwi culture is hyper-masculine; the image cultivated in Kiwi males is tough, rough, and stoic (Law, 1997; Scherer & Jackson, 2007). New Zealand society is also considered to be masculine, that is, where the gender roles are very distinct and strong (Hofstede, Hofstede, & Minkov, 2010). This may serve to increase the gulf between the majority of males and females in these studies. However, it would be of great interest to replicate these studies using measures of femininity and masculinity, as well as to factor sexual orientation into the findings. Different cultures would also have different approaches to gender roles and sexual orientation, as well as to dominance, persuasion, and self-representation.

Future studies examining these factors may show that the results can be generalized to different demographics, and/or contribute a more nuanced understanding of how the different demographics influence perception of the self, other, and medium. For example, the results in a largely Kiwi demographic may be similar to a study conducted with the Latino community, as there is also a hyper-masculine narrative for males (Hofstede et al., 2010). They might differ in other communities where machismo and hyper-masculinity are not as prevalent. For example, European countries like Sweden and the Netherlands have more ‘feminine’ societies, where the gender roles are less distinct and more egalitarian (Hofstede et al., 2010), and the narrative for a strong, alpha male may be lesser there.
However, there needs to be caution in the use of ‘masculinity’ and ‘femininity’ as variables of interest. Some tests, particularly older measures, differentiate between masculine and feminine in stereotypical ways that may not be reliable anymore. For example, in the Bem Sex-Role Inventory (Bem, 1974), ‘has leadership abilities’, ‘athletic’, and ‘self-sufficient’ are considered masculine traits, whereas ‘flatterable’, ‘gullible’, and ‘childlike’ are considered feminine traits! Another concern is that, as noted before, there may be substantial differences in what is considered masculine or feminine in differing cultures/countries.

**Personality**

Culture and biological sex are group differences. The aspect of masculinity/feminity starts to approach individual differences, and in that vein would also be the aspect of personality. Research in personality is extensive in psychology, and has revealed that people’s personalities do have an effect on their communication styles, including their nonverbal behaviour (e.g., Campbell & Rushton, 1978; Friedman, DiMatteo, & Taranta, 1980; Riggio & Friedman, 1982; Geerts & Bouhuys, 1998; Berry & Hansen, 2000; Isbister & Nass, 2000; Lieberman & Rosenthal, 2001). For example, Campbell and Rushton (1978) found that several measures, including IQ scores, and self-reported and observer-rated scores of neuroticism, were correlated with nonverbal behaviours. One of their findings was that self-reported scores of neuroticism on a personality test was correlated with gaze aversion; observers’ ratings of the participant’s neuroticism was also correlated with how much they touched themselves.

Researchers could measure where participants fall in the Big Five (measured on the NEO Personality Inventory), or Myers-Briggs, personality tests, and examine if these personality traits are related to body language availability preferences. These personality differences could explain why some users are more or less willing to transmit more visual information, and hence body language, about themselves. For example, some people may identify/test as introverted and others as extroverted, and introverts may desire to transmit less
body language than extroverts do. There is also a measure that uses visual representations of behaviour (drawings) as items to measure personality (Nonverbal Personality Questionnaire; Paunonen, Jackson, & Keinonen, 1990; Paunonen, Zeidner, Engvik, Oosterveld, & Maliphant, 2000).

Then there is the consideration that personality is not just expressed through their nonverbal behaviour (passive) but that people can also express their personalities through their nonverbal behaviour (active; Argyle, 1975; Goffman, 1959). For example, a person with higher neuroticism touching themselves more (like stroking or rubbing their own arm) is likely an unintended action. Also, if one smiles all the time without realising that they are doing so, their optimistic and friendly personality is being expressed through their nonverbal behaviour. On the other hand, people may deliberately endeavour to convey that they are a friendly person by smiling more often, which is a more active expression of personality. In this endeavour to convey personality, they may desire more or less of their body language to be available through remote communication, depending on how adept they feel at controlling their various modes of expression.

Personality may introduce further nuance into preferences for body language availability as it may also interact with gender and task type. For example, female/female dyads where one participant tests as introverted/open/aggressive/dominant and the other participant tests the same or the opposite, discussing a task that is highly relevant to one of these aspects, such as a negotiation. Examining personality and body language availability may help to explain more variance in settings preferences. It may also lend credence to examining gender as separate from biology as they are both more individual than group factors.
Longitudinal studies

The literature shows support for distinguishing between one-off/temporary mediated groups and long-term mediated groups (e.g., Hollingshead et al., 1993; Chidambaram et al., 1991; Cornelius & Boos, 2003; van der Kleij et al., 2004). It is evident that social processes, interpersonal attitudes, and experience changes as the group continues to meet and use the mediating technology over time. Studies done in longitudinal groups have shown that performance and interpersonal attitudes (like trust) in long-term mediated groups can approach and then exceed those of FTF groups.

As these factors like trust and experience change and grow over time, we might expect people to behave differently as well. Users may grow more comfortable with their conversation partners and the technology, and subsequently stop moderating/monitoring their behavior as much. It would be of interest to examine if body language availability affects long-term groups, and how it affects them.

Comparison to FTF studies

Related to conducting longitudinal studies, future works might compare CMC groups to FTF groups to see how body language affects these groups over time. It would be unrealistic to limit body language availability for participants meeting in person, but the FTF condition may be compared to CMC conditions where body language was available or not. CMC was not compared to FTF conditions in this thesis because of the experience consideration. That is, that people are vastly more experienced at FTF than CMC interaction, which would make a one-off comparison almost moot, so the longitudinal study would be apt for doing the comparisons.

Controlling ‘the other side’

The current studies have examined participants’ perceptions of interactions, of their conversation partners, and of how they were being perceived in return, based on whether or not body language was available to see. In the final study, participants were also given control
of their own body language availability. However, if participants have different preferences
(or feel differently abled in terms of persuasion, impression management, trust, etc). based on
the body language availability of their conversation partner, it makes sense to then give
control to participants over their conversation partner’s body language availability.

This would be of value to be more wholly informed about the effects of body language
availability in VC conversations, and to look at both sides of the control issue. This would not
be feasible in a ‘real world’ application, as having others controlling our cameras would be
uncomfortable and off-putting. Indeed, the ramifications of acceding that control to others
may be the interesting aspect of such an investigation. When other people control your mode
of self-transmission, able to pan and zoom around the room and upon one’s body as they like,
it becomes not so much self-transmission but transmission against your will.

This may seem to be analogous to most FTF interactions anyway, since our
conversation partners, or even those we are not interacting with but are in our line-of-sight,
can look at and examine us as they desire. This may include them scrutinizing us in ways we
would rather they not, like looking at our attire instead of our presentation, or looking at us or
parts of us in inappropriate ways that may make us feel very uncomfortable. The difference
may be that in remote communication, we expect to have more control over how others
perceive us.

Remote communication in its current forms, such as audio- or teleconferencing/phone
calls, videoconferencing, and synchronous text chat sessions, allow us to control our self-
transmission much more than in FTF, and we are only ‘under the spotlight’ for a finite
amount of time. For example, when in a phone call or audio conference, we know that the
other parties cannot see us, and so we may only control what they can hear; vocal intonation,
pitch, word choices. In VC, we control what the camera shows; the background, how much of
ourselves is transmitted, the quality of the image and so on. We also expect, based on the
perimeters of the task, that the period for which we are ‘on’ is finite. In some ways, we expect VC to be different from FTF in a positive way: we are more in control of our self-transmission. Giving that control to the other party, taking it away from us, may make the experience uncomfortable precisely because it more resembles the lack of control over the other party’s scrutiny that we experience in FTF.

*Different body language availability settings for each participant*

The effects of body language availability may be due to either one’s own body language availability, or to the other party’s body language availability. In the present studies the settings were the same for both partners in each pair, so it is difficult to tell whose, if not both, users’ settings is the major influence on participant perceptions and ratings. Do participants feel more confident in their persuasive abilities when body language is available because their body language is available, or the other party’s? Isolating these effects (‘my’ body language availability versus ‘their’ body language availability) might be investigated in future studies.

*Effects of physical size*

When considering certain interpersonal feelings such as self-efficacy for dominance and persuasion, it is possible that the participants’ physical size was a factor in their perceptions. On average, males are physically larger than females, so physical size may account for some differences in dominance and persuasion. However, social feedback towards physical size is often different for men and women. Men are praised for being large; the opposite is true for women. So a man and a woman who share the same physical size or stature may have very different perceptions of how that size benefits or impedes their interactions. It would be interesting to investigate to what extent physical size affects feelings of self-efficacy for dominance and persuasion, and how it interacts with the gender of the participant.
Other facets of communication affected by body language availability

The majority of the suggestions for future works have referred to what future studies could manipulate or change. However, there is also much that could be measured; what other effects does body language availability have on communication? Nguyen and Canny (2007) examined how body language availability affected empathy. Other possible variables to examine may be perceptions of proximity (does a head-and-shoulders view appear to be ‘close’ because it is zoomed in?) and intimacy, which may stem from the perception of proximity.

Breaks in social presence

If social presence is about the extent to which a mediated experience is unmediated, what happens when something happens to break the feeling of non-mediation? Slater and Steed (2000) examined breaks in spatial presence in virtual reality and how that affected users’ perceptions. It would be interesting to examine whether a high feeling of social presence could be ‘broken’ as well and what impact that might have on the interaction, and to measure these changes as they vary throughout the duration of the interaction. For example, in Study 4 the participants’ discussions were interrupted twice in each task and were asked to modify and experiment with the webcam settings. It is possible that there was a strong break in social presence due to those interruptions.

Information/Collaboration space

VC would be considered a communication space, as it is the means by which the participants are communicating with each other. There is another, related concept, of information or collaboration space, which refers to shared information such as a screen or window where the participants saw and interacted with the same/mutual objects. An example of information space is sharing a document on both users’ screens so they could both examine the same object and refer to it during the conversation. Adding this element would make the
remote meeting much more like a face-to-face meeting than traditional VC, as there are often objects or documents that can be shared or handled by all participants.

**Prototype: A tentative design proposal based on the studies’ findings**

The following illustration presents a speculative example of how a videoconferencing interface might look like if the findings of the thesis were used in the design.

*Figure 6.1. Conceptual drawing of potential future VC interface.*

In the program, users might be prompted to identify the conversation partner(s) they will be videoconferencing with. This would make salient who their audience will be, which may affect how they want to present themselves, including how much of themselves they want visible. For example, explicitly knowing that one will be ‘meeting’ with the director of
the company may prompt the employee to try to make the best impression possible, compared
to conferencing with a team member with whom they might be more relaxed around.

There might also be a space for users to enter the purpose of the meeting. For example, the user might enter ‘Obtain 10% raise from the boss’ or ‘Strike compromise between team branches on 3D interface project’. This goal would not be visible to the other party. The aim of this would be to make salient the context or ‘task type’ of the meeting, giving the user an idea of the social processes involved in the conversation. Again, this will inform the user on how they might want to appear or behave.

The user may be presented with several windows that show the webcam at various zoom settings, ranging from the widest field-of-view (showing the head, shoulders, and torso view) to the narrowest field-of-view (showing just the head and shoulders). Ideally, the software would be able to deliver live images simultaneously to all the windows, so the user could move around and perform example gestures to see how they would appear in each of the views. The reason the options are presented instead of just showing the field-of-view/zoom adjustment slider to the user is to mitigate the visual effect of something suddenly approaching when users zoom in.

These elements are meant to deliver the prompts needed to give users control over their impression management, without directing the user to prescribed settings. It should encourage the users to think about who they are speaking to, what they want to achieve through the videoconferencing session, and the options of appearance that are available to them. The design takes into account the findings from the thesis on the effect of task type, gender (audience), and body language availability on perceptions of conversation partners, as well as perceptions of being perceived.
Conclusions and summary

This research was undertaken to address a gap in VC literature, namely that body language availability was a scarcely-examined factor in remote communication. The findings showed that body language availability did have a significant, complex effect on user perceptions of interactions and on their interpersonal attitudes towards their conversation partners. As body language availability can affect important communication processes such as social presence and trust, support for body language in VC (such as through the software and through training) may improve uptake by business users. Additionally, gender and task types were found to affect these variables as well, and interact with body language availability. The findings also showed that users’ sense of self-efficacy in transmitting their desired self-presentation and their adjustment of ‘own’ body language availability transmission was affected by these variables. These factors may also play a part in business users’ decision to use VC more as an option for remote communication. As examining body language availability in VC and remote communication is fairly new, many venues for future research in this area have also been identified that may also help the understanding and improvement of VC uptake in business users.
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doi: http://dx.doi.org/10.1007/s10111-003-0146-7


Appendix A: Interview Questions (Pilot)

1. Do you consider yourself a frequent traveller?

2. How many times a year do you travel for business purposes?

3. How much time do you think you spend travelling for business purposes?

4. Do you consider yourself technologically savvy?

5. On a scale of 1 to 10, with 1 being the worst and 10 being the best, how would you rate your computer literacy skills?

6. Is videoconferencing or teleconferencing available where you work?

7. Have you used teleconferencing before?

8. What do you consider the pros and cons of teleconferencing?

9. What do you consider to be the important elements of face-to-face conversation?

10. What sort of meetings do you engage in when you travel? For example, are they primarily relationship-building, or are goal-oriented? Are they negotiations, collaborative, media-related?

11. Are the majority of your meetings one-on-one, or are there more than 2 or 3 participants?

12. What sort of documents are used or discussed in meetings? For example, power point slides, Excel databases, blueprints, etc.
13. Do you engage in many social activities with the participants of the meetings, outside of the meeting itself? How important would you consider these social activities?

14. To what extent does technology help or hinder your meetings?

15. Would you feel more comfortable engaging in certain types of meetings in teleconferencing? For example, would you feel more comfortable doing a collaborative-type meeting over teleconferencing than a negotiative-type meeting, or vice versa?

16. What are the main reasons for why you are not using more of the technology available?

17. How do the interactions in teleconferencing differ from face-to-face meetings? For example, do you rely on particular cues?

18. What sort of cues, in face-to-face meetings and/or teleconferencing meetings, signal to you that a meeting is going well or that your goal is being accomplished?

19. Have you had any formal training in using videoconferencing technology? For example, conversation management or how to do turn-taking in videoconferencing?

20. What would be the ideal teleconferencing environment? What would it look like, or what features would it have?
Appendix B: Demographic Questionnaire (Study 1)

Demographic Questionnaire

Name: __________________________________________

Age: _______ PSYC: 100-level/200-level (circle one)

Gender: M / F (circle one)

Were you acquainted with your experiment partner prior to taking part in this experiment?

Yes / No (circle one)

If you answered Yes to the previous question, how well did you know each other?

a. Only briefly
b. Less than a semester
c. More than a semester, less than a year
d. 1-2 years
e. Longer than 2 years

How often do you use computers?

a. Daily for hours on end
b. Daily for short periods of time
c. At least once a week
d. Once a fortnight
e. Once a month
f. Have never used a computer
Have you used video communication programs, such as Skype, Netmeeting, or webcams?

a. Never
b. Once or twice
c. Occasionally
d. Frequently

What is your current major, and/or the degree to which you are working towards?

__________________________________________________________________________
__________________________________________________________________________

How do you feel about computers in general?

a. Hate them
b. Dislike them
c. Indifferent
d. Like them
e. Love them

How do you feel about computer-mediated communication?

a. Hate it
b. Dislike it
c. Indifferent
d. Like it
e. Love it
Appendix C: Task Scenarios (Study 1)

Idea Generation Task 1

As of late, the University of Otago has recorded a great increase in the number of recorded thefts of student belongings in the libraries and computer labs. With the other participant, try to come up with as many ideas as possible to reduce theft in these areas.
Idea Generation Task 2

As of late, the University of Otago has recorded a great increase in the amount of litter and rubbish being found across the campus grounds. With the other participant, try to come up with as many ideas as possible to reduce littering on campus.
Negotiation Task ver 1

The Psychology Department at the University of Otago have been planning to introduce a new series of Psychology lecture topics. The move was meant to cater to a wider variety of interests and to broaden students’ knowledge of the fields available in Psychology. However, a recent budget means that 3 of the 8 prospective fields will have to be cut. Your task is to agree with the other participant on which 3 fields should bear the brunt of the budget cut.

Below you will find your pay-off list; each field is assigned a “pay-off” in the form of a numerical value. The higher the pay-off (or number), the more valuable the field is to you. Your goal should be to maximise your own pay-off.

<table>
<thead>
<tr>
<th>Field</th>
<th>Pay-off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rehabilitation/disability therapy</td>
<td>100</td>
</tr>
<tr>
<td>Industrial psychology</td>
<td>90</td>
</tr>
<tr>
<td>Family psychology</td>
<td>80</td>
</tr>
<tr>
<td>Human personality</td>
<td>70</td>
</tr>
<tr>
<td>Sports psychology</td>
<td>60</td>
</tr>
<tr>
<td>Counselling techniques</td>
<td>50</td>
</tr>
<tr>
<td>Environmental psychology</td>
<td>40</td>
</tr>
<tr>
<td>Educational psychology</td>
<td>30</td>
</tr>
</tbody>
</table>
Negotiation Task ver 2

The Psychology Department at the University of Otago have been planning to introduce a new series of Psychology lecture topics. The move was meant to cater to a wider variety of interests and to broaden students’ knowledge of the fields available in Psychology. However, a recent budget means that 3 of the 8 prospective fields will have to be cut. Your task is to agree with the other participant on which 3 fields should bear the brunt of the budget cut.

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<tr>
<td>Rehabilitation/disability therapy</td>
<td>30</td>
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**Appendix D: Individualised Trust Scale (Study 1)**

**Individualised Trust Scale**

We are interested in how trustworthy you felt the other party was. Please indicate in the space provided the degree to which each statement applies to your interactions. There are no right or wrong answers. Many of the statements are similar to other statements – do not be concerned about this. Indicate your choice by circling the appropriate number.

1. Did you feel:

<table>
<thead>
<tr>
<th>Trustful of this person</th>
<th>Distrustful of this person</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

For the following questions, please indicate how you would describe the trustworthiness of the other party.

2. trustworthy

| 1 | 2 3 4 5 6 7 |

3. confidential

| 1 | 2 3 4 5 6 7 |

4. benevolent

| 1 | 2 3 4 5 6 7 |

5. safe

<p>| 1 | 2 3 4 5 6 7 |</p>
<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>candid</td>
<td>deceptive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>not deceitful</td>
<td>deceitful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>straightforward</td>
<td>tricky</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>respectful</td>
<td>disrespectful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>considerate</td>
<td>inconsiderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>honest</td>
<td>dishonest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>reliable</td>
<td>unreliable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>faithful</td>
<td>unfaithful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>sincere</td>
<td>insincere</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>careful</td>
<td>careless</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix E: Social Presence Questionnaire (Study 1)

Presence Questionnaire

_Copresence_

Please mark how much you agree or disagree with each of these statements by circling the appropriate number under each statement.

“I was always aware of my partner’s presence.”

1  2  3  4  5  6  7

“I was always aware that my partner and I were at different locations.”

1  2  3  4  5  6  7

“It was just like being face to face with my partner.”

1  2  3  4  5  6  7

“It felt as if my partner and I were in the same room.”

1  2  3  4  5  6  7
Social Presence

Please rate the communication medium you just used (i.e., the technological set-up) by circling the appropriate number under each pair.

<table>
<thead>
<tr>
<th>cold</th>
<th></th>
<th>warm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>sensitive</th>
<th></th>
<th>insensitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>small</th>
<th></th>
<th>large</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>formal</th>
<th></th>
<th>spontaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>personal</th>
<th></th>
<th>impersonal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>passive</th>
<th></th>
<th>active</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>unsociable</td>
<td>sociable</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>open</th>
<th>closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>
Appendix F: Satisfaction With Performance Questionnaire (Study 1)

Performance perception questionnaire

We are interested in how you and the other party approached the task. Please indicate in the space provided the degree to which each statement applies to your interactions. Indicate your choice by circling the appropriate number. There are no right or wrong answers. Many of the statements are similar to other statements – do not be concerned about this.

1. How satisfied or dissatisfied are you with the quality of the solution (or outcome) which you and the other party reached?

   very dissatisfied                         very satisfied
   1       2       3       4       5       6       7

2. To what extent does the final solution (or outcome) reflect your inputs?

   not at all                                    very much
   1       2       3       4       5       6       7

3. To what extent do you feel committed to the solution (or outcome)?

   not at all                                    very much
   1       2       3       4       5       6       7
4. To what extent are you confident that the solution (or outcome) is optimal?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

5. To what extent do you feel personally responsible for the solution (or outcome) which you and the other party reached?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

How would you describe the problem solving (or negotiation) process you and the other party used?

6. Efficient | Inefficient
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

7. Uncoordinated | Coordinated
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

8. Fair | Unfair
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
9. understandable | confusing
1 2 3 4 5 6 7

10. dissatisfying | satisfying
1 2 3 4 5 6 7
Appendix G: Social Presence Questionnaire (Study 2, adapted from Medialab software presentation for print)

Copresence

For the next set of questions, please rate how much you agree or disagree with each of these statements by clicking the appropriate number.

“I was always aware of Ben Truman’s presence.”

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

“I was always aware that Ben Truman and I were at different locations.”

<table>
<thead>
<tr>
<th>Disagree</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

“It was just like being face to face with Ben Truman.”

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

“It felt as if Ben Truman and I were in the same room.”

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
Social Presence

Please rate the communication medium you just used (i.e., the technological set-up) by clicking on the appropriate number.

<table>
<thead>
<tr>
<th>Cold</th>
<th>Warm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Insensitive</th>
<th>Sensitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Small</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Formal</th>
<th>Spontaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impersonal</th>
<th>Personal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Passive</th>
<th>Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unsociable</th>
<th>Sociable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Closed</th>
<th>Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Appendix H: Individualised Trust Scale (Study 2, adapted from Medialab software presentation for print)

You will now be asked to rate the trustworthiness of the person you just watched. Please read each question carefully, and indicate your response by clicking the appropriate button.

1. You felt _______ of this person:
   trustful                                      distrustful
   1    2    3    4    5    6    7

2. Rate the individual in the video on whether he seemed:
   trustworthy                  untrustworthy
   1    2    3    4    5    6    7

3. Rate the individual in the video on whether he seemed:
   confidential                divulging
   1    2    3    4    5    6    7

4. Rate the individual in the video on whether he seemed:
   exploitive                  benevolent
   1    2    3    4    5    6    7

5. Rate the individual in the video on whether he seemed:
   safe                        dangerous
   1    2    3    4    5    6    7

6. Rate the individual in the video on whether he seemed:
   candid                      deceptive
   1    2    3    4    5    6    7
7. Rate the individual in the video on whether he seemed:
   deceitful  not deceitful
   1  2  3  4  5  6  7

8. Rate the individual in the video on whether he seemed:
   straightforward  tricky
   1  2  3  4  5  6  7

9. Rate the individual in the video on whether he seemed:
   disrespectful  respectful
   1  2  3  4  5  6  7

10. Rate the individual in the video on whether he seemed:
    inconsiderate  considerate
    1  2  3  4  5  6  7

11. Rate the individual in the video on whether he seemed:
    honest  dishonest
    1  2  3  4  5  6  7

12. Rate the individual in the video on whether he seemed:
    reliable  unreliable
    1  2  3  4  5  6  7

13. Rate the individual in the video on whether he seemed:
    unfaithful  faithful
    1  2  3  4  5  6  7
14. Rate the individual in the video on whether he seemed:
   | sincere | insincere |
   | 1  | 2 | 3 | 4 | 5 | 6 | 7 |

15. Rate the individual in the video on whether he seemed:
    | careful | careless |
    | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

[note: these next items appeared as part of the same set of items as the previous 15 to the participant, but were not analysed as part of the Trust scale. They were items analysed as possible confounding factors, i.e., did the participant rate the actor as being trustworthy because they found him friendly/kind etc.?]

16. Rate the individual in the video on whether he seemed:
    | unfriendly | friendly |
    | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

17. Rate the individual in the video on whether he seemed:
    | kind | unkind |
    | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

18. Rate the individual in the video on whether he seemed:
    | competent | incompetent |
    | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

19. Rate the individual in the video on whether he seemed:
    | unfamiliar | familiar |
    | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
Appendix I: Scenario description for Lost At Sea task (Study 3 and 4)

Lost At Sea

You have chartered a yacht with a friend, for the holiday trip of a lifetime across the Atlantic Ocean. Because none of you have any previous sailing experience, you have hired an experienced skipper and two-person crew.

Unfortunately, during travel a fierce fire breaks out in the ship’s galley, and the skipper and crew are lost whilst trying to fight the blaze. Much of the yacht is destroyed and is sinking fast.

Your location is unclear because vital navigational and radio equipment have been damaged in the fire. Your best estimate is that you are many hundreds of miles from the nearest landfall.

You and your friend have managed to save 15 items, undamaged and intact after the fire. In addition, you have salvaged a two-man rubber life raft and a box of matches.

IMPORTANT: Because of various space and manoeuvring constraints, you are unable to transfer more than 1 item at a time onto
the life raft. You will need to decide the order of importance of each item to be taken with you onto the raft, as the ship is sinking fast. Thus, you may not be able to take all 15 items onto the raft, and risk losing them.

Your task is to rank the 15 items in terms of their importance for you to survive and be rescued. Place the number 1 by the most important item, the number 2 by the second most important, and so on through to number 15 for the least important.
## Appendix J: Ranking Chart for Lost At Sea task (Study 3 and 4)

### Lost At Sea Ranking Chart

<table>
<thead>
<tr>
<th>My ranking</th>
<th>Salvaged items</th>
<th>Team ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A sextant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A shaving mirror</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A quantity of mosquito netting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A 25 litre container of water</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A case of army rations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maps of the Atlantic Ocean</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A floating seat cushion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A 10 litre can of oil/petrol mixture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A small transistor radio</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 square feet of opaque plastic sheeting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A can of shark repellent</td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One bottle of 160% proof rum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 feet of nylon rope</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 boxes of chocolate bars</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A fishing kit</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Please indicate your gender:
   a. Male
   b. Female
2. Please type your age in years: _______ (Press ENTER when you have typed your answer)
3. Please indicate how experienced you are in sailing and other forms of sea travel:
   a. No experience at all
   b. A little bit of experience
   c. Moderate experience
   d. Quite experienced
   e. Expert
4. Please indicate how familiar you are with your conversation partner:
   a. We are total strangers
   b. We are only briefly acquainted
   c. We are friendly towards each other
   d. We are friends
   e. We are close or best friends
Appendix L: Networked Minds Social Presence Measure (Study 3)

Please indicate how much you agree or disagree with the following statements by clicking the appropriate number.

Co-presence

1. I noticed (my partner).
   Agree  Disagree
   1  2  3  4  5  6  7

2. (My partner) noticed me.
   Agree  Disagree
   1  2  3  4  5  6  7

3. (My partner’s) presence was obvious to me.
   Agree  Disagree
   1  2  3  4  5  6  7

4. My presence was obvious to (my partner).
   Agree  Disagree
   1  2  3  4  5  6  7
5. (My partner) caught my attention.
   Agree           Disagree

   1    2    3    4    5    6    7

6. I caught (my partner’s) attention.
   Agree           Disagree

   1    2    3    4    5    6    7

Attentional Allocation

7. I was easily distracted from (my partner) when other things were going on.
   Agree           Disagree

   1    2    3    4    5    6    7

8. (My partner) was easily distracted from me when other things were going on.
   Agree           Disagree

   1    2    3    4    5    6    7

9. I remained focused on (my partner) throughout our interaction.
   Agree           Disagree

   1    2    3    4    5    6    7

10. (My partner) remained focused on me throughout our interaction.
    Agree           Disagree

    1    2    3    4    5    6    7
11. (My partner) did not receive my full attention.
   Agree  Disagree
   1  2  3  4  5  6  7

12. I did not receive (my partner’s) full attention.
   Agree  Disagree
   1  2  3  4  5  6  7

Perceived Message Understanding

13. My thoughts were clear to (my partner).
   Agree  Disagree
   1  2  3  4  5  6  7

14. (My partner’s) thoughts were clear to me.
   Agree  Disagree
   1  2  3  4  5  6  7

15. It was easy to understand (my partner).
   Agree  Disagree
   1  2  3  4  5  6  7

16. (My partner) found it easy to understand me.
   Agree  Disagree
   1  2  3  4  5  6  7
17. Understanding (my partner) was difficult
   Agree 2 3 4 5 6 7
   Disagree

18. (My partner) had difficulty understanding me.
   Agree 2 3 4 5 6 7
   Disagree

Perceived Affective Understanding

19. I could tell how (my partner) felt.
   Agree 2 3 4 5 6 7
   Disagree

20. (My partner) could tell how I felt.
   Agree 2 3 4 5 6 7
   Disagree

21. (My partner’s) emotions were not clear to me.
   Agree 2 3 4 5 6 7
   Disagree

22. My emotions were not clear to (my partner).
   Agree 2 3 4 5 6 7
   Disagree
<table>
<thead>
<tr>
<th>23.</th>
<th>I could describe (my partner’s) feelings accurately.</th>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>24.</th>
<th>(My partner) could describe my feelings accurately.</th>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Perceived Emotional Interdependence

<table>
<thead>
<tr>
<th>25.</th>
<th>I was sometimes influenced by (my partner’s) moods.</th>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>26.</th>
<th>(My partner) was sometimes influenced by my moods.</th>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>27.</th>
<th>(My partner’s) feelings influenced the mood of our interaction.</th>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>28.</th>
<th>My feelings influenced the mood of our interaction.</th>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
29. (My partner’s) attitudes influenced how I felt.  
   Agree | Disagree
   1 2 3 4 5 6 7

30. My attitudes influenced how (my partner) felt.  
   Agree | Disagree
   1 2 3 4 5 6 7

Perceived Behavioural Interdependence

31. My behaviour was often in direct response to (my partner’s) behaviour.  
   Agree | Disagree
   1 2 3 4 5 6 7

32. The behaviour of (my partner) was often in direct response to my behaviour.  
   Agree | Disagree
   1 2 3 4 5 6 7

33. I reciprocated (my partner’s) actions.  
   Agree | Disagree
   1 2 3 4 5 6 7

34. (My partner) reciprocated my actions.  
   Agree | Disagree
   1 2 3 4 5 6 7
35. (My partner’s) behaviour was closely tied to my behaviour.
   Agree  Disagree
   
   1  2  3  4  5  6  7

36. My behaviour was closely tied to (my partner’s) behaviour.
   Agree  Disagree
   
   1  2  3  4  5  6  7
Appendix M: Individualised Trust Scale (Study 3 and 4, adapted from Medialab software presentation for print)

You will now be asked to rate your perceptions of your conversation partner. Please read each question carefully, and indicate your response by clicking the appropriate button.

1. My partner was:
   trustworthy  untrustworthy
   1  2  3  4  5  6  7

2. My partner was:
   confidential  divulging
   1  2  3  4  5  6  7

3. My partner was:
   exploitive  benevolent
   1  2  3  4  5  6  7

4. My partner was:
   safe  dangerous
   1  2  3  4  5  6  7

5. My partner was:
   candid  deceptive
   1  2  3  4  5  6  7
6. My partner was: deceitful not deceitful
   1 2 3 4 5 6 7

7. My partner was: straightforward tricky
   1 2 3 4 5 6 7

8. My partner was: disrespectful respectful
   1 2 3 4 5 6 7

9. My partner was: inconsiderate considerate
   1 2 3 4 5 6 7

10. My partner was: honest dishonest
     1 2 3 4 5 6 7

11. My partner was: reliable unreliable
     1 2 3 4 5 6 7

12. My partner was: unfaithful faithful
     1 2 3 4 5 6 7
13. My partner was:

<table>
<thead>
<tr>
<th>sincere</th>
<th>insincere</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2  3  4  5  6  7</td>
</tr>
</tbody>
</table>

14. My partner was:

<table>
<thead>
<tr>
<th>careful</th>
<th>careless</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2  3  4  5  6  7</td>
</tr>
</tbody>
</table>
Appendix N: Dominance Scale (Study 3 and 4, adapted from Medialab software presentation for print)

Now, please indicate your perceptions of your and your partner’s behaviour during the experiment by clicking the appropriate number.

During the discussion of the task with (my partner), I was:

<table>
<thead>
<tr>
<th>Strong</th>
<th>Weak</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

During the discussion of the task with me, (my partner) was:

<table>
<thead>
<tr>
<th>Strong</th>
<th>Weak</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

During the discussion of the task with (my partner), I was:

<table>
<thead>
<tr>
<th>Not assertive</th>
<th>Very assertive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

During the discussion of the task with me, (my partner) was:

<table>
<thead>
<tr>
<th>Not assertive</th>
<th>Very assertive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

During the discussion of the task with (my partner), I was:

<table>
<thead>
<tr>
<th>More dominant</th>
<th>Less dominant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
During the discussion of the task with me, (my partner) was:

More dominant  Less dominant

1  2  3  4  5  6  7

During the discussion of the task with (my partner), I was:

The leader  The follower

1  2  3  4  5  6  7

During the discussion of the task with me, (my partner) was:

The leader  The follower

1  2  3  4  5  6  7

During the discussion of the task with (my partner), I engaged in persuading and convincing (my partner):

Not at all  A lot

1  2  3  4  5  6  7

During the discussion of the task with me, (my partner) engaged in persuading and convincing me:

Not at all  A lot

1  2  3  4  5  6  7

During the discussion of the task with (my partner), I readily agreed with (my partner):

On very little  On most everything

1  2  3  4  5  6  7
During the discussion of the task with me, (my partner) readily agreed with me:

<table>
<thead>
<tr>
<th>On very little</th>
<th>On most everything</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
Appendix O: Impression Management Scale (Study 3 and 4, adapted from Medialab software presentation for print)

For the next set of questions, please rate how much you agree or disagree with each of these statements by clicking the appropriate number.

I was able to successfully influence (my partner).

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

(My partner) was able to successfully influence me.

<table>
<thead>
<tr>
<th>Disagree</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

I was able to successfully use non-verbal cues to influence (my partner).

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

(My partner) was able to successfully use non-verbal cues to influence me.

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

I was able to manage or influence (my partner’s) impression of myself.

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
</tbody>
</table>
(My partner) was able to manage or influence my impression of them.

Disagree | Agree
---|---
1 | 2 3 4 5 6 7

The technological set-up easily allowed me to project the image or impression that I desired to, to (my partner).

Agree | Disagree
---|---
1 | 2 3 4 5 6 7

The technological set-up easily allowed (my partner) to project the image or impression that they desired to, to me.

Agree | Disagree
---|---
1 | 2 3 4 5 6 7

I was able to project myself in the way that I wanted to be perceived.

Agree | Disagree
---|---
1 | 2 3 4 5 6 7

(My partner) was able to project him- or herself in the way that they wanted to be perceived.

Disagree | Agree
---|---
1 | 2 3 4 5 6 7

I was successful in persuading (my partner).

Agree | Disagree
---|---
1 | 2 3 4 5 6 7
(My partner) was successful in persuading me.

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>
Appendix P: Demographic Questionnaire for Lost At Sea task (Study 4)

1. Please indicate which task you have just completed:
   a. First
   b. Second

2. Please indicate your gender:
   a. Male
   b. Female

3. Please type your age in years: _______ (Press ENTER when you have typed your answer)

4. Please indicate how experienced you are in sailing and other forms of sea travel:
   a. No experience at all
   b. A little bit of experience
   c. Moderate experience
   d. Quite experienced
   e. Expert

5. Please indicate how familiar you are with your conversation partner:
   a. We are total strangers
   b. We are only briefly acquainted
   c. We are friendly towards each other
   d. We are friends
   e. We are close or best friends
Appendix Q: Demographic Questionnaire for Rebuilding Christchurch task (Study 4)

1. Please indicate which task you have just completed:
   a. First
   b. Second
2. Please indicate your gender:
   a. Male
   b. Female
3. Please type your age in years: _______ (Press ENTER when you have typed your answer)
4. Do you or did you have friends or family in Christchurch?
   a. Yes
   b. No
5. Please indicate your experience with any sort of rescue or rebuilding efforts:
   a. No experience at all
   b. Participated once or twice
   c. Participated several times
   d. Frequently involved in efforts
   e. Currently and have been instrumental/heavily involved in efforts
6. Please indicate how familiar you are with your conversation partner:
   a. We are total strangers
   b. We are only briefly acquainted
   c. We are friendly towards each other
   d. We are friends
   e. We are close or best friends
Appendix R: Scenario description for Rebuilding Christchurch task

Rebuilding Christchurch

An earthquake with a magnitude of 7.1 occurred in the South Island, New Zealand at Saturday 04:35 am local time, 4 September 2010 with no fatalities. Sewers were damaged, gas and water lines were broken, and power to up to 75% of the city was disrupted. People inside the Christchurch city centre were evacuated, and the city's central business district remained closed until 5 September.

The earthquake was reported to have caused widespread damage and power outages. 63 aftershocks were also reported in the first 48 hours with three registering 5.2 magnitude. Christchurch residents reported chimneys falling in through roofs, cracked ceilings and collapsed brick walls. Total Earthquake Commission, insurance and individual costs may reach as high as NZ$11 billion according to the New Zealand Treasury.

A large aftershock of magnitude 6.3 occurred on 22 February 2011 at 12:51pm. Although lower on the moment magnitude scale than the quake of September 2010, the intensity and violence of the ground shaking was measured as among the strongest ever recorded globally in an urban area due to the shallowness and proximity of the epicentre. The vertical shaking is estimated to be three times greater than would be expected in a 1 in 500 year earthquake.
At present it is assumed that one third of buildings in the Central Business District will have to be demolished. In contrast to the September 2010 quake, the quake struck on a busy weekday afternoon. The current death toll as of 6 March 2011 stands at 166 people. The death toll is expected to reach the 200-220 mark, with hundreds of reported injured.

A National State of Emergency was declared as a result of the loss of water, power and damage to sewerage system throughout the city. This is the first time this has been invoked. Many buildings and landmarks have been severely damaged, including the iconic Christchurch Cathedral.

**Your task:**

As part of the committee overseeing rescue and rebuilding efforts for Christchurch, you will be brainstorming and discussing ideas with your conversation partner. For the first phase of the discussion, you will need to discuss 7 solutions to give aid to the survivors of the earthquake. The ideas should be specifically aimed at the individuals who have been personally affected by the disaster.
Rebuilding Christchurch

PHASE 1 – AIDING SURVIVORS

PHASE 2 – REBUILD ECONOMY

PHASE 3 – PREVENTION/HANDLING OF FUTURE INCIDENTS
Appendix T: Example Screenshots from Medialab Software

Please indicate your previous experience with any sort of rescue or rebuilding efforts:

- no experience at all
- participated once or twice
- participated several times
- frequently involved in efforts
- currently and have been very instrumental/heavily involved in efforts

My partner was:

Explosive: 1 2 3 4 6 6 7
Benevolent:
For the next set of questions, please rate how much you agree or disagree with each of these statements by clicking the appropriate number.

(My partner) was able to manage or influence my impression of them.

1 2 3 4 6 6 7
Agree  Disagree