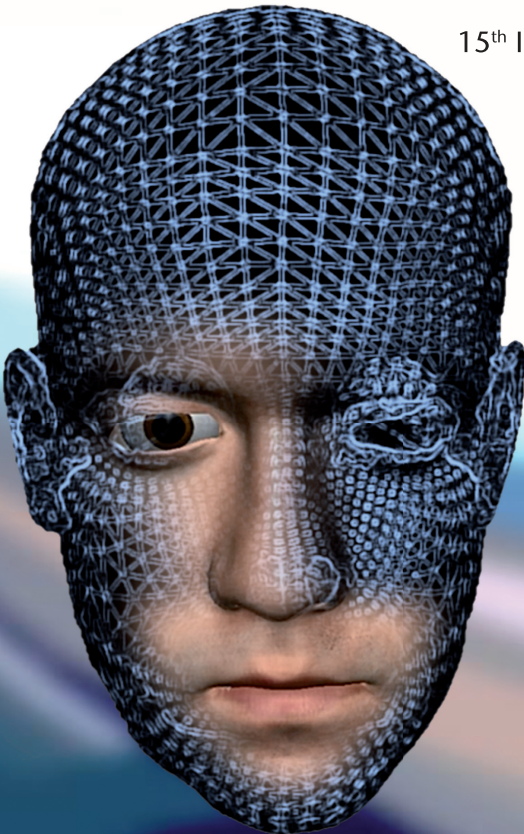


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Video Communication best for female friends?

H. Paul de Greef¹

Abstract. Video-mediated communication is widely available for decades, but not universally accepted and appreciated. Little is known about system factors, user factors and environment factors that govern its acceptance and efficacy. Recent research points to gender and relationship as important factors in the effect of VMC on outcome of negotiation tasks (Swaab & Swaab, 2009), respectively the outcome of impression formation of strangers (Fullwood, 2007). Research in this article presents evidence how factors gender, task and relationship influence the paper-and-pencil measurements of social presence according to Short, Williams and Christie (1976).

Keywords. VMC; video communication; social presence

Introduction

Two-way video communication has been around since before WWII, and in 1949 a system with half-silvered mirrors was patented that can simulate eye gaze and eye contact convincingly (Buxton, 1992). Using such theatre tricks to simulate eye contact, and using video to transmit facial expressions would cover many of the non-verbal behaviors we use to regulate intimacy (Argyle & Dean, 1965). More recent neurological research into the social brain stresses the importance of facial expressions and eye gaze in the regulation of social interaction via understanding each other's intentions and emotions (Senju & Johnson, 2009; Niedenthal, Mermillod, Maringer, & Hess, 2010). Video with eye contact that enables these socio-biological functions would intuitively provide a high level of social presence in the sense of Short, Williams & Christie (1976). Yet applications of video communication with eye contact appear problematic. It is not well understood who may profit from it in which situations. Although video communication could be an attractive medium, it may also be harmful in impression formation of strangers (Fullwood, 2007) or in negotiation tasks among males (Swaab & Swaab, 2009). In this paper, two techniques to increase an avatar's persuasiveness will be explained: mimicry and facial similarity. First, relevant theory for both techniques will be shortly reviewed, then, both techniques will be explained in detail. Resource files are freely available to make these tools more readily accessible to (social) scientists (Fox, Arena, & Bailenson, 2009).

Fullwood (2007) showed experimentally that strangers meeting first time over video without eye contact are less liked compared to first time meetings F2F. This is worse than merely not appreciating the experience of the video system.

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It is a harmful effect on impression formation that lasts beyond the video meeting. Swaab & Swaab (2009) investigated negotiation tasks, and conclude that there is an interaction between gender and quality of negotiated agreements. Video communication helps females to achieve a better result, but males receive better results without video.

In Short et al. (1976) social presence is a feature of the communication system. It is the system's level of capacity (Gunawardena & Zittle, 1997) or affordance (Biocca, Harms & Burgoon, 2003) for human social interaction and we can let people try such system and use ratings afterwards to measure the feature of the system. In schema:

Medium or artifact	- level of social presence
Interaction	- level of intimacy (Argyle & Dean, 1965)
Ratings afterwards	- level of valence or pleasure

It is complex, and not at all obvious that these levels are perfectly aligned and that paper-and-pencil ratings are always reliable and valid to measure a dispositional feature of the artifact. An analogy –it is also a dispositional feature-, is the maximum or top speed of a car. The car does not force nor causes you to drive at maximum speed, it merely enables you, should you want to. The gas pedal of the car can move smoothly over a range, and in fact the car allows you to stand still, or drive slow. The car affords a whole range of speeds. System for video communication do not come with a social presence pedal, and typically enforce rather than afford a high level of social presence. So only participants who want a high level of intimacy will grant a high valence or pleasure rating afterwards.

From the point of view of a user or a test participant, the personal optimum goal level of intimacy can be outside the afforded range of intimacy. Also, the lack of regulation options itself can be felt as a disadvantage. One of the persons once interviewed about video communication suggested the system should have a curtain in front, that could be fully closed, or opened a tiny bit, or more fully, depending on the situation –personal decorum- and depending on who it was.

The goal of the research below is to better understand when video with eye contact could be an attractive medium and this will provide more insight which factors would be nuisance variables if the aim is to measure social presence as a system feature.

The relationship hypothesis

The participant's goal levels for intimacy are expected to be a function of their relationship. Already from Argyle & Dean (1965) we may infer that goals for intimacy may be high with friends, but with strangers the desire for intimacy may be low. In VMC this would be expressed by less eye contact, less smiles and lower ratings afterwards.

The task hypothesis

In tasks that are cognitively and visually demanding video communication becomes a distraction and for good task performance the video channel may better be ignored. This is the task hypothesis.

Both factors are expected to affect the social presence ratings that are supposed to measure a fixed system feature. Female friends in simple fun tasks are expected to have the highest goal levels for intimacy. Results were previously only reported in Dutch (Van Druten, 2000).

Method

Participants

The sample contained 42 participants, 25 males and 17 females. Initially 32 individuals were sampled using a local participant database and advertisements in various buildings of Eindhoven University of Technology. To create the Relationship factor, a subset of 10 participants was asked to bring a friend, providing us with 10 dyads that were friends.

The remaining 22 participants were invited individually, and it was checked that they had never met before, providing us with 11 dyads that were strangers. Age ranged from 20 to 50, with the majority in their early twenties (mean age 26.07 and median age 23). The gender composition of dyads was 7 MM, 11 MF, and 3 FF.

The design is a mixed design, with Gender (male, female), Relation (friends or strangers), Task (simple fun or complex), and Order (Video first, Audio first) as between-subjects factors, and Video (on or off) as within-subjects factor.

Apparatus and Materials

The simple fun task consists of a set of 25 comical pictures and the instruction to select the 5 funniest. The complex cognitive task consist of 15 technical drawings of 5 houses, with for each house a 3D frontal impression and two 2D floor plans. The instruction is to match the pictures of each building.

The main dependent variable was the average of a person's scores on the same set of 12 semantic differential items used in De Greef & IJsselsteijn (2001). Afterwards a few selected non-verbal behaviors were observed from video recordings: looking at the video screen and mutual gaze: looking at the screen at the same time. The count of these was divided by session duration in minutes to provide a measure of mutual gaze frequencies.

The equipment for a shared electronic workspace comprised of a beamer projecting a computer screen on the table and an infra-red camera looking at the table for an infra-red reflecting small block that could be used to manipulate pictures on the table.

The video conferencing equipment was based on closed circuit computer video. A screen was mounted on the left side of each table, the image of the other participant projected to it using another beamer. A tiny camera was mounted behind a small hole in the screen, positioned between the eyes of the image of the other participant and directed at a 45-degree angle to the participant sitting at the front of the table. A tiny cap protected the lens from the light from the beamer. During each session the audio and the video channels were recorded synchronously - using a quad box- as four small pictures in one picture on a single video track.

Procedure

The participants were told that they would experience two sessions while in different rooms and that they would be able to see the same electronic workspace with photos. They were not told about audio and video channels. After the first session, they filled in the questionnaires individually, each in their own room. After the second session, they again filled-in the same questionnaires.

Results

The duration of a trial ranged between 6 and 22 minutes. All participants completed the two trials and questionnaires.

A mixed model ANOVA was performed using SPSS Univariate Generalized Linear Model with the average of the 12 semantic differential scores as dependent variable. There are order effects: a main effect of Order of treatment conditions over the two trials $F(1, 35) = 9.48, p=0.004$, and an interaction effect of Order and Gender, $F(1, 35) = 4.55, p=0.040$. The effect of Video, the only within subjects factor, is significant, $F(1, 38) = 35.79, p=0.000$. Figure 1 shows the effects of Order, Gender and Video. There is no main effect of gender, and the effects of the video factor show much stronger on the second trial.

There is no main effect of gender, but Figure 1 shows the the effect of video is larger for women than for men. This pattern is very similar to what was found in De Greef, P., & IJsselsteijn, W. A. (2001).. If we take the semantic differential measure, and use the data from the second trial, the effect size of video is 1.87 for females, and 0.95 for males.

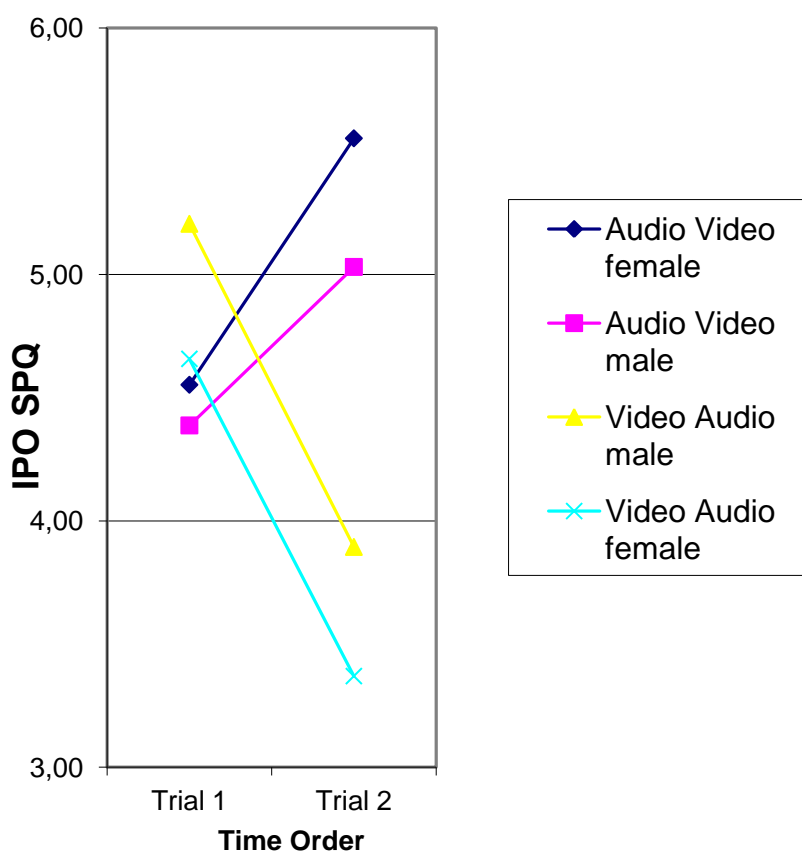


Figure 1. The effect of video, order and gender on social presence measurements using paper-and-pencil semantic differential ratings.

The interaction effect of Task and Relation was significant, $F(1, 35) = 6.64, p=0.014$. Figure 2 shows these effects. Ratings by friends in a simple fun task are much higher than in the three other conditions.

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In trials with Video on, the number of times the participant had eye contact were observed and divided by the duration of the trial in minutes. Eye contact frequency in video conditions ranged from 0.7 to 3.14 times per minute.

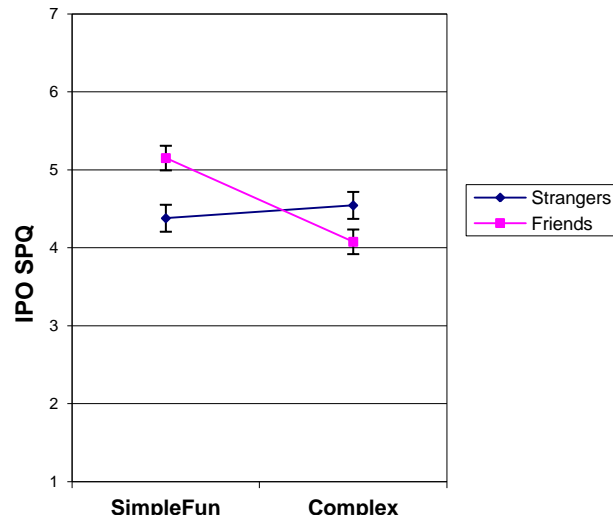


Figure 2. The effect of relationship (friend or stranger) and task (simple fun, or cognitive complex) on social presence measurements using paper-and-pencil semantic differential ratings.

An analysis was performed with frequency as dependent variable and Relation and Task as factors. The main effects of Relation, $F(1, 38) = 8.06$, $p=0.007$, and Task, $F(1, 38) = 14.66$, $p=0.000$, were significant. Strangers exhibit less eye contact and the complex task leads to less eye contact. Both Task and Relation have a substantial effect on the use of the medium (Figure 3).

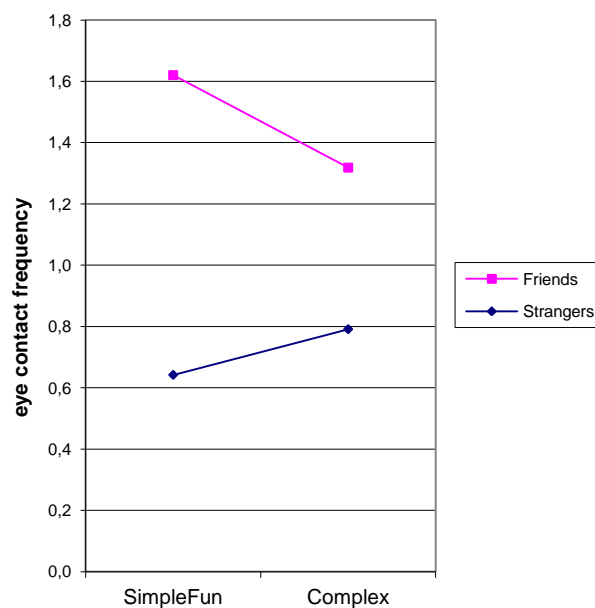


Figure 3. The effect of relationship and task on eye gaze behavior in the video conditions.

This also showed in some remarks by participants: “We can start looking at each other, but that isn’t the fastest way for solving the problem.”

Discussion

The results show that strangers have less appreciation for an eye contact video system than friends, and that both friends and strangers have less appreciation for video with eye contact if they are working on a task that can only be accomplished by ignoring the video channel. Social presence measures thus do not only depend on a system feature, but measurement is biased by gender, relationship and task of the participants. Argyle and Dean's idea of a goal level provides a simple explanation. The social presence measure reflects the closeness of system affordances to the goals of the participant. If the goal is intimacy or affiliation, and the system affords a high level of intimacy, ratings will be highest. This also suggests that if a researcher wants to evaluate systems intended for high intimacy levels, the best choice of participants would be female friends in a simple task requiring no visual attention outside the video channel. More support for this suggestion is that research in non-verbal social interaction also points to gender differences in non-verbal behavior such as smiling and mimicking of smiles (Hess & Bourgeois, 2010) and for a study in mimicry in affiliative dyads the researchers even used a 'women-only' event to recruit their participants (Fischer, Becker & Veenstra, 2012).

A promising application area for video with eye contact is the private or family context. For dispersed family and spouses, video with eye contact is the most suitable medium to facilitate emotional support (Gao, Dai, Fan & Kang 2010) and therefore it is an essential ingredient for a family information space (Judge, Neustaedter, & Kurtz, 2010). Even though it may be a very appropriate application area, it would still be somewhat difficult to use, participants have to be there at the same time, there may be differences in time zones, it may be difficult to find a time and some formal appointment making may be needed. Apart from that there are issues like privacy, not in the sense of being disturbed, but in the sense of a third party that might be looking and overhearing (Fish, Kraut, Root, & Rice (1993) and who may misuse that information (Perlroth, 2012; White paper networking, 2012).

For work or office related communication systems, if intimacy goals of participants are decisive video or video with eye contact cannot be a universal solution, no matter how close it approaches F2F. Goals of participants can be much better served by a variety of communication channels of different intimacy levels.

We may conclude that paper and pencil measures based on semantic differential ratings are not very good at measuring social presence as a system feature unless nuisance factors task, relation and gender are experimentally controlled. Contra-indications for applications of high-end video communication are persons who have never met before, persons with low intimacy goals level for each other, and persons engaged in complex tasks and males in task that can be framed as competitive (Swaab & Swaab 2009).

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