

C. A. G. J. Huijnen · W. A. IJsselsteijn  
P. Markopoulos · B. de Ruyter

## Social presence and group attraction: exploring the effects of awareness systems in the home

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**Abstract** This paper describes an experimental assessment of affective user benefits that may result from adding peripheral awareness information while remote friends share an activity in a home environment. The experiment has shown that providing awareness information increases the social presence and the group attraction felt by individuals towards remote partners.

**Keywords** Social presence · Group attraction · Abstract representation · Connectivity · Calm computing · Awareness systems

### 1 Introduction

We present an investigation of the affective benefits that mediated social presence can bring to individuals. We examine how remote individuals can enjoy shared experiences, especially in situations where they know each other and where the communication technology occupies the periphery of their attention. We assess whether calm technology, as described by Weiser and Brown (1996), may lead to experiencing similar affective benefits as when people are collocated.

Examples of peripheral awareness systems include the Casablanca project (Hindus et al. 2001) and the photo-collage prototype (Markopoulos et al. 2003). In these works, the social presence experienced has not been assessed and the effects on the group relation are not yet known. The present research aims to provide an

experimental assessment of experienced social presence and the hypothesised benefits upon interpersonal relations.

The concept of social presence was introduced by Short et al. (1976) as a means to characterise the subjective experience of using a telecommunication medium, with respect to how close it emulates face to face contacts. Social presence can be defined as “the sensation of being together”. Most social presence research has involved the assumption that communication is the primary activity in which users are engaged. While social presence has been discussed as a relevant yardstick for assessing how communication technologies are perceived by users, little is known as to when social presence is desirable and what interpersonal needs can be satisfied by experiencing social presence. Our research addresses this apparent gap.

The next section discusses the notion of group attraction as a particular affective benefit of awareness systems. Section 3 describes our empirical study. Its results are presented in Sect. 4 and a more general discussion concludes the paper in Sect. 5.

### 2 Group attraction

People interact as part of many groups. In general a distinction can be made between two types of groups: primary and secondary (or complex) groups (Forsyth 1999). Primary groups are small, close-knit groups such as families, friendship cliques, children’s playgroups, emotionally close peers, and neighbourhoods. Secondary groups, on the other hand, “are larger and more formally organised and tend to be shorter in duration and less emotionally involving than primary groups.”

Earlier studies have shown that people desire more connections within primary groups, e.g. Hindus et al. (2001) and Markopoulos et al. (2003). This need may be particularly pronounced when primary groups are geographically separated, e.g. because adult children migrate away from their family home or because elderly adults

C. A. G. J. Huijnen · W. A. IJsselsteijn (✉) · P. Markopoulos  
Eindhoven University of Technology,  
P.O. Box 513, 5600 MB Eindhoven,  
The Netherlands  
E-mail: w.a.ijsselsteijn@tue.nl  
Tel.: +31-40-2474455  
Fax: +31-40-2449875

B. de Ruyter  
Philips Research Laboratories Eindhoven,  
Prof. Holstlaan 4, 5656 AA Eindhoven,  
The Netherlands

become homebound, or simply because people are quite mobile and tend to become separated from their earlier primary groups. We hypothesise that an important benefit of experiencing social presence is to strengthen the ties between remote individuals of primary groups. The question thus arises whether the provision of different levels of information to manipulate social presence will affect the way people feel about their group members.

Group attraction can be defined as an individual's desire to identify with and be an accepted member of the group (Evans and Jarvis 1986). The level of a group member's attraction to his or her group contributes to a number of important group outcomes. Members who find their groups attractive are more likely to remain members of the group and to attend gatherings regularly (Sagi et al. 1955). Members who are attracted to their groups also seem more willing to contribute to group discussion and self-exploration.

### 3 Empirical study

#### 3.1 Problem statement

Consider individuals engaging in some common activity with remote members of a primary group. The research question we addressed is two-fold:

- Do individuals experience social presence when they are provided with peripheral awareness of their remote friends?
- Does the feeling of social presence experienced in this situation influence the attraction experienced towards the social group?

#### 3.2 Setting

An experiment was conducted in the HomeLab at the Philips Research laboratories in Eindhoven, The Netherlands. HomeLab is a home-simulation, a test laboratory that looks like a normal house and thus provides a natural setting to test the behaviour of participants in different conditions. The target user group for this research was groups of friends who wanted to share an activity with each other at different (home) locations.

Participants were asked to watch a sports event on TV together. This was a classic 1974 soccer game of the Dutch national team which the test-participants were too young to have seen live in 1974.

#### 3.3 Participants

Thirty-four Dutch and male participants took part in the experiment in groups of three friends (an exception being two groups consisting of two people only). The groups were divided (two-one) and split in two different rooms. The participants were not lovers to avoid biasing the measurements of group attraction.

#### 3.4 Independent variables

A mixed experimental design was adopted. The between-subjects independent variable concerned the allocation of participants to groups. We distinguished two kinds of viewers: single viewers who watched the soccer match alone and group viewers who were one of two people watching the game together at a different location.

The second independent variable concerned the type of visualisation of the remote location and the participant(s) located there. Three conditions were distinguished, manipulated within-subjects:

1. The *control* condition, where participants watched the same match on TV at remote locations. Participants were not shown any visualisation of their friends but they were told that their friends were watching the same match simultaneously.
2. A *sketchy visual* condition (Fig. 1). In this case, participants watched the game on the TV screen at the two locations while a processed visual representation of the person(s) in the other location was projected on the wall behind and above the screen. This representation was a black and white image that was updated in real-time whenever a movement occurred, basically only transmitting change information. This visualisation thus portrays the amount and nature of movements at the different locations.
3. In the third condition subjects were shown *full video* of their friends while they were watching the match. In this visualisation, full visual detail is shown in colour and the people in the visualisation are constantly visible.

In all conditions no audio communication was possible. The trials were counterbalanced to avoid any potential sequence effects.

#### 3.5 Dependent variables

After each condition, social presence was measured by using a slightly adapted version of the IPO Social Presence Questionnaire (IPO-SPQ; de Greef and IJssel-



**Fig. 1** Silhouette visualisation of three people, portraying their instantaneous movement

steijn 2001). IPO-SPQ combines two approaches to measure social presence: a semantic differential based on Short et al. (1976) and subjective attitude statements. Each is reported separately.

Group attraction was measured by the Group Attitude Scale (GAS) of Evans and Jarvis (1986), filled in after each condition. GAS is applicable to a broad range of groups whose purpose is to measure members' feelings about a group.

## 4 Results

### 4.1 Social presence

Figure 2 illustrates the effects of different levels of visual information on the experience of social presence for the different types of viewers, as measured by the subjective attitude statements of the IPO-SPQ. The condition in which people saw the full visualisation is rated higher on social presence than either the sketch or the control condition [ $F(2)=119.2, p<0.001$ ]. The social presence scores for the sketch visualisation are only marginally higher than the control condition in which no visualisation of the remote communication partner(s) was present. There was no significant difference between the different types of viewers.

Figure 3 illustrates the results of the manipulations of the independent variables on the experienced social presence of the medium, as measured by the semantic differential scales of the IPO-SPQ, which are sensitive to various affective qualities of the medium. There is a clear and significant difference between the social presence ratings of the medium for the different visualisations ( $F(2)=36.7, p<0.001$ ). The full video visualisation was rated higher on social presence than the sketch visualisation for both the single and group viewer. The full visualisation is found more personal, accessible, and warmer compared to the sketch visualisation.

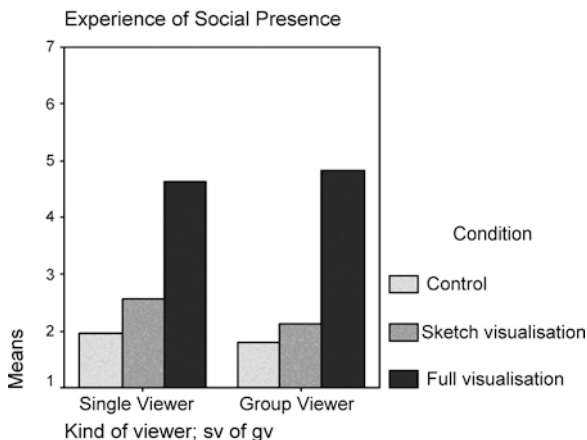


Fig. 2 Social presence as measured by the subjective attitude statements of the IPO-SPQ

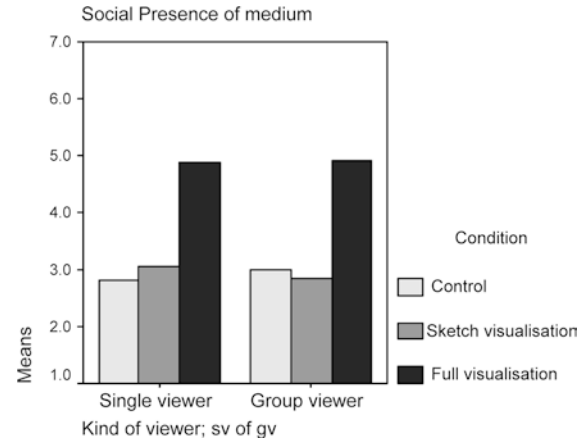


Fig. 3 Social presence of the medium as measured by the semantic differential scales of the IPO-SPQ

There was no significant difference between the control and sketch condition. Both kinds of viewers rate the social presence of the different media the same.

### 4.2 Group attraction

Figure 4 illustrates the results for group attraction as measured by the GAS. A significant difference can be observed between the results of the different types of viewers, with group viewers reporting higher group attraction in the control and sketch conditions [ $F(1)=4.36, p=0.045$ ].

The effect of the full visualisation on group attraction is the same for both kinds of viewers. Providing single viewers with information about the rest of the group enhances their attraction to the group.

## 5 Discussion

This study has explored a very simple technology that can provide a background visual communication chan-

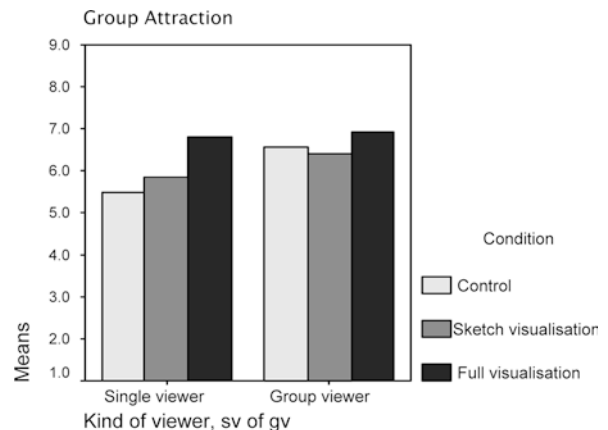


Fig. 4 Group attraction as measured by the GAS

nel for individuals in remote locations sharing a similar event.

The experiment revealed that social presence can indeed be experienced through such a background communication channel and that higher levels of social presence may also lead to increased group attraction, at least for the single viewer. We consider this to be a significant positive result as to the value of awareness technologies and evidence as to the relevance of social presence as a requirement for such technologies.

The sketch visualisation did not perform very well overall in terms of enhancing social presence or group attraction. This may be because the sketch visualisation did not always convey meaningful information about the communication partner.

Information from informal observations revealed that the participants did think there was a difference between seeing nothing from the other location or looking at the sketch visualisation. The single viewers seemed more bored in the control condition than in the sketch condition.

Both the sketch and the full visualisation were capable of increasing the group attraction for the single viewer. The single viewer increasingly identified with the group and felt himself to be a more accepted member of the group as more information from the group was communicated. This result suggests that with rich communication technology it will be possible to change the extent to which people feel part of a group. Even though the sketch visualisation did not perform very well on both measures of social presence, it does appear to have an effect on the group attraction experience of the single viewer. This is in line with the observations people made about the visualisations and the observations of the participants during the experiment. The sketchy visualisation did not really give participants the feeling of being together; however, it was perceived as better than having nothing at all.

In conclusion, the experiment discussed provides concrete evidence of hypothesised benefits of supporting primary social relationships through awareness systems and of the relevance of social presence as a requirement for the engineering of peripheral awareness displays. Nevertheless, we only found limited affective benefits in the abstract visualisation condition, which was specifically designed to be less obtrusive and to guard privacy by showing only change information. Clearly, finding the optimal balance between immediacy, relevance, and obtrusiveness in designing awareness applications remains a considerable challenge. Additionally, affective benefits other than social presence and group attraction may be considered in designing and evaluating future awareness systems.

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