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Interpersonal Perception in Virtual Groups: Examining Homophily, Identification and Individual Attraction Using Social Relations Model in Network

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Abstract

With the penetration of the Internet, virtual groups have become more and more popular. The reliability and accuracy of interpersonal perception in the virtual environment is an intriguing issue. Using the Social relations model (SRM) [1], this paper investigates interpersonal perception in virtual groups from a multilevel perspective. In particular, it examines the following three areas: homophily, identification, and individual attraction, and explores how much of these directional and dyadic relational evaluations can be attributed to the effect of the actor, the partner, and the relationship.

Keywords

Virtual Groups, Interpersonal Perception, Social Relations Model, Homophily, Identification, Individual Attraction

1. Introduction

Interpersonal perception is important for our daily activities. As Reference [2] put it "We must be able to perceive something about the people we interact with in order to know whether we should respond to them, trust them, or even befriend them" (p. 134). With the penetration of the Internet, virtual groups have become more and more popular. The reliability and accuracy of interpersonal perception in the virtual environment is an intriguing issue. Many empirical studies in the field of computer-mediated communication (CMC) tend to explore whether the lack-of-cue environment and the anonymous nature of interactions render different mechanisms for interpersonal perception in virtual

groups.

Although the literature exploring interpersonal perception in CMC has been growing, most of them have not employed multilevel data analysis. That is to say, the dyadic relational measures are often handled either at the individual level or at the group level using an aggregation. Using the Social relations model (SRM) [1], this paper investigates interpersonal perception in virtual groups from a multilevel perspective. In particular, it examines the following three areas: homophily, identification, and individual attraction, and explores how much of these directional and dyadic relational evaluations can be attributed to the effect of the actor, the partner, and the relationship. This paper investigates interpersonal perception in virtual groups from a multilevel perspective.

2. Literature Review

2.1. Interpersonal Perception Measurement in Extant Literature

The evaluation of communicative partners online is frequently explored in CMC research. Many empirical studies using the social identity model of deindividuation (SIDE) examine group-level perception as well as interpersonal evaluation including personality perception, liking for the information sender, and perception of the group prototypicality of each member. In those studies, the various scales used for gauging interpersonal perception are often administered repeatedly for each participant in the group. However, although the interpersonal perception scores were obtained dyadically, they were often averaged or aggregated to count as a group-level measure. For instance, anonymity effects on social identity processes within groups was studied [3]. The study measured the participant's perceptions of the group prototypicality of each member (4 items). Participants were instructed to "think about the individual known to you as Person A1 and the characteristics of Person A1 that have been revealed to you through the interactions" and then answer the questions "Person A1 has the right spirit for this group." "Person A1 makes a good group member." "Person A1 is an ideal member of this group." and "Person A1 has what it takes to be a member of this group." The questionnaire was completed again for "Person A2." The mean of the four items of the individual perception questionnaire was then averaged across A1 and A2 and used as the indicator of the stereotyping of others in terms of the local group (group prototypicality).

Averaging or aggregating the dyadic scores across individuals as a group level indication poses potential problems in two areas: the level of analysis and non-independence of observation, which are closely related to each other. According to [4], in most studies on interpersonal perception in CMC, the members are indistinguishable. That is to say, there is no specific ordering of group members, or the order of members is totally arbitrary. Moreover, the relational measurement is dyadic. There are two scores for each dyad. Non-independence of the observation means the degree of greater similarity (or dissimilarity) between two observations from members of the same group than between two scores from

members of different groups. Being in the same group and interacting with each other could affect the evaluation of each other. Although interpersonal perception is measured at the individual level, this does not mean that the effect occurs only at that level. An actor-partner interdependence may also exist and needs to be modeled [4]. For instance, suppose Mary, Stephanie, Mark and Danielle are in a 4-person group, how attractive Mary sees Mark can be influenced by three factors: the general tendency of Mary to perceive attraction in other people, the attraction of Mark as an individual, and the relationship between Mary and Mark. In this regard, aggregating the dyadic measures across individuals, as many previous studies have done, often overestimates the partner effect and obscures or even ignores the other two components: actor and relationship. Therefore, multi-level data analysis is needed for better understanding of the interpersonal perception in virtual groups.

Noticeably, in prior SIDE research, an alternative approach, although it does not involve multilevel modeling, has tried to better tackle this problem in interpersonal perception. For instance, a more accurate personalization index, taking into account the differentiation between individuals has been developed [5]. Her personalization index was created based on the differences in the participant's ratings of each interactant along various perceptual dimensions. First, each participant indicated how well each adjective described Partner 1 and Partner 2 on a 10-point Likert scale, ranging from *describes very poorly* to *describes very well*. Then, the indices for social attractiveness (likeable, attractive, pleasant, friendly), competence (competent, intelligent, reasonable, informed), trustworthiness (trustworthy, reliable, honest), perceived similarity to oneself (thinks like me, shares my belief, similar to me), argument quality (convincing, persuasive, relevant, valid) were created. Next, the absolute difference between the ratings for Partner 1 and Partner 2 was calculated along each dimension. Finally, the personalization index was created by summing the absolute difference scores along these five dimensions, which reflects the overall differentiation between the two interactants; the higher the score, the greater personalization. Lee's approach can be considered as an improvement compared to the prior studies, since it did not simply average or aggregate the individual scores, instead, it implied that interpersonal perception is based on the differentiation among interactant evaluation depending on "who is being evaluated." However, although Lee's approach is superior in this sense, the data analysis was conducted only at one level, the dyad and group effects were still not taken into consideration.

2.2. Overview of Social Relations Model (SRM)

Having reviewed the problems in the treatment of dyadic measures, SRM was introduced as an innovative means to deal with those problems. SRM "provides researchers with a methodological and statistical tool for analyzing data dealing with interpersonal perceptions" [2].

According to [1], in SRM, a perception that a perceiver has of a target is de-

composed into three components: perceiver (or actor), target (or partner), and relationship [1]. The actor effect reflects how the person sees others. In other words, the actor effect represents a person's average level of a given behavior in the presence of a variety of partners. For example, Mary's actor effect on the variable of trust measures the extent to which she tends to trust others in general.

Assimilation is an important term related to the actor effect. It reflects the extent to which an actor rates partners in the same way. Assimilation is assessed by the degree of actor variance. In essence, it concerns whether the actor sees the partners the same or more colloquially does the actor think that the "partners all look alike." In this sense, the actor effect refers to the variation in the means of multiple actors' rating across partners. The magnitude of the actor variance indicates the consistency of an actor's rating across different targets. If there is considerable actor variance, then assimilation has occurred. If each actor gave exactly the same rating to all interaction partners and actors differed from each other on these ratings, then there would be perfect assimilation [1].

The partner effect reflects how a person is seen in general by others. It represents the average level of a response which a person elicits from a variety of partners. In other words, it refers to how an individual tends to be viewed across actors. And the magnitude of the partner variance indicates the consistency of different actors' ratings of a single target [1]. For example, Mark's partner effect measures the extent to which other people tend to trust him.

Consensus is a term closely related to partner effect. Consensus is the degree to which two actors rate a partner the same way. In this sense, if the partner variance is high, then consensus has occurred. If each partner received exactly the same ratings from all of the actors and partners differed from each other on these ratings, then there would be perfect consensus. Research on consensus addresses a fundamental issue in social science, since it helps to determine if social perception is more in the head of the actor than in reality [1]. Six factors were further identified that determine consensus: overlap (the extent to which two perceivers see the same behaviors), communication (the extent to which the actors influence each other), similar meaning systems (the degree to which the actors interpret the same behavior in similar ways), partner differences (the degree to which the partners vary on the dimension being rated), social context (there is less consensus when a person is judged in two different social contexts, e.g. home vs. at work), and shared stereotypes (the degree to which assumptions regarding the linkage between appearance and nonverbal behavior to personality are shared) [1].

The relationship effect reflects how an actor uniquely sees the partner [1]. It represents a person's behavior toward another individual in particular, above and beyond their actor and partner effects. For example, Mary's relationship effect toward Mark on the variable of trust measures the extent to which she trusts him, while controlling for her general tendency toward trusting others and his general tendency to be trusted by others. Relationship effects are directional or

asymmetric, such that Mary may trust Mark more, less, or at the same level as he trusts her. The calculation of the relationship effect is obtained by removing the individual-level effects of both actors and partners. In other words, the relationship effect represents the extent to which an actor's rating of a partner cannot be explained by the actor effect or the partner effect. *Uniqueness* is a term closely related to the relationship effect.

Other than assimilation, consensus, and uniqueness, *reciprocity* is also an important concept in SRM. In reciprocity, if Person A sees Person B one way, does this imply that Person B sees Person A in the same way? There are two forms of reciprocity: generalized and dyadic reciprocity. The former implies a correlation between actor and partner effects. It can be explained as: if Person A sees others as friendly, is Person A seen as friendly? The latter implies a correlation between relationship effects. That is, if Person A sees Person B as especially friendly, does Person B see Person A as especially friendly? Dyadic reciprocity is closer to what we usually mean by the term reciprocity [1].

In sum, the SRM is a multilevel model for dyadic perception within groups. The focus in this model is not on estimating the effects of specific persons and relationships but in estimating the variance due to these effects. It assumes that people are both stimuli for and producers of responses. To study both aspects of social functioning simultaneously, data generated from dyadic social interactions are used. Take a study of how attractive people see each other as example, the interest would be in whether there is actor, partner, and relationship variance. Actor variance would assess if people saw others as similar in terms of attraction, partner variance would assess whether people agree with each other in their ratings of attraction, and relationship variance would assess the degree to which perceptions of attraction are unique.

Using SRM, [2] investigated interpersonal perception in Internet chat rooms. In the experiment, participants interacted in chat rooms for 15 minutes either one-on-one or in groups of six. They found that in one-on-one interactions, actors were able to achieve consensus for the partners' traits of extraversion, agreeableness, and openness. For extraversion and openness, this agreement corresponded with partners' self-perceptions. Meanwhile, consensus was highest and assimilation was lowest when participants interacted one-one-one. Actors in group interactions tended to like the partners less and viewed them less favorably across all personality traits than did actors in one-on-one interactions. Partners' self-reported personality had little predictive power in determining who was liked in Internet chat rooms.

3. The Present Study

To further investigate the interplay of the actor, partner, and relationship effects in interpersonal perception in virtual groups, a study focused on the evaluation of homophily, individual-level identification, and individual attraction was conducted.

3.1. Participants

Participants were recruited from six different colleges in North America. The participants were recruited through classes in Communication, Speech, English, and Psychology, and were given partial course credit for their participation. Participants initially volunteered by accessing a website where they gave their informed consent, provided demographic and contact information, indicated with which institution and specific course/instructor they were affiliated, and completed a pre-test questionnaire. Researchers tentatively assigned individuals to experimental conditions (geographically collocated vs. distributed vs. mixed) by quota and mailed them paper copies of the experimental task, including experimentally varied instructions and information, and a request to email the researchers with their initial, individual rank-order preferences on the decision task. When researchers received this response, only then did they assign a participant to a group, according to quotas from a predetermined stratified randomized blocked design for the various experimental conditions. Since there were differences in the number of volunteers across schools, groups in the collocated or mixed conditions disproportionately involved participants from schools with the greatest numbers of participants. Therefore, the blocking design was employed so that no condition was comprised of members from only one school or combination of schools.

A total of 286 people was recruited and assigned to groups. Of these, a small number explicitly withdrew their consent from the project; some others simply did not participate in their discussions. Due to attrition, some groups contained three or fewer members. Some groups were later removed from the data set due to anomalies in the group assignments with respect to location/distribution, or, upon inspection of responses it was indicative that participants did not understand or attend to the instructions. The final sample included 259 participants in 64 groups, as follows: 86 participants were from "Upstate University" and 37 were from "New York Tech"; 29 came from "Southwest Tech," 82 from "Midwest State," 18 from "Western Community College," and 7 were recruited from "Canadian University." Fifty-eight percent of the participants were female. Twenty-five percent were seniors; 27 percent were juniors, 29 percent were sophomores, 16 percent were freshmen, and 2 percent were master's students. Participants' ages ranged from 17 to 49, with a mean of 21 and mode of 20.

3.2. Procedures

By drawing on participant volunteers from several colleges in various geographic locations, virtual groups were formed in four experimental conditions, who were charged with reaching a consensus on a hidden profile decision-making task. Three conditions were created to reflect different degrees of member distribution: completely collocated, completely distributed, and geographically mixed with two members in one location and two members isolated.

All participants communicated via an asynchronous discussion board in the

Blackboard online courseware system which was located on the server of one of the universities. To enter the Blackboard system, participants used an individual user i.d. and password, which they had received via email. Every group had a separate discussion board, which was only accessible to its members. On the opening page of the group discussion board, participants saw the name and college logo of each member of their group. The opening page also contained instructions on how to complete the discussion (entering a "Final Answer" and indicating agreement by each member).

Each group had two weeks to arrive at the decision, during which the group discussion boards were available 24 hours a day. The starting date for each group was the day the group members received their individual user i.d.s and passwords. The participants were instructed to do all their electronic communication via the group discussion board, and refrain from using email, electronic chats, phone, or other electronic means of communication to interact about this project, in order to maintain complete records of the discussion. The only exception was that face-to-face communication among collocated members was not explicitly discouraged; while meeting that way would potentially eliminate records, concerns over ecological validity outweighed recording concerns. However, inspection of the transcripts indicated that no face-to-face interactions took place. Transcripts also indicated that one group used Instant Messenger, and that group was removed from further analysis.

3.3. Measures

To gauge the interpersonal perception in the virtual groups, three interpersonal-oriented measures were administered repeatedly for each group member in this study.

Homophily: an 8-item homophily scale (perceived similarity, from [6]). ($M =$ 3.83, $SD =$ 0.57, Cronbach's $\alpha =$ 0.48 for Person A; $M =$ 3.88, $SD =$ 0.53, $\alpha =$ 0.53 for Person B; $M =$ 3.82, $SD =$ 0.53, $\alpha =$ 0.55 for Person C). Questions include "Person A doesn't think like me" (recoded), "Person A did not treat me as an equal" (recoded), "Person A is from a social class similar to me", "Person A's economic situation is different from mine" (recoded), "Person A is similar to me", "Person A's background is different from mine" (recoded), "Person A has problems like my own" and "Person A has experiences like me".

Individual identification: a 3-item individual-level identification scale adapted from [7]. ($M =$ 4.43, $SD =$1.00, $\alpha =$ 0.43 for Person A; $M =$ 4.45, $SD =$ 0.94, $\alpha =$ 0.39 for Person B; $M =$ 4.38, $SD =$ 1.02, $\alpha =$ 0.54 for Person C). Questions include "I feel uneasy with Person A" (recoded), "I feel a bond with Person A" and "I consider Person A's opinions to be important."

Individual attraction: an 11-item measure adapted from [8], which consisted of two subscales: 6-item task attraction measure. Questions include "If I was taking part in another project like this, I would like to do it with Person A", "If I wanted to get things done, I could probably depend on Person A" "I would enjoy working on any task with Person A" "Person A is lazy when it comes to working

on a task" (recoded), "Person A is an unreliable work partner" (recoded), and "I enjoyed working with Person A." Questions of 5-item social attraction include "I think Person A could be a friend of mine" "I would like to have a friendly chat with Person A" "Person A was sociable with me" "Person A is not very friendly" (recoded) and "I would not like to spend time socializing with Person A" (recoded). (M = 4.62, SD = 1.17, α = 0.93 for Person A; M = 4.42, SD = 1.03, α = 0.91 for Person B; M = 4.31, SD =1.06, α = 0.91 for Person C). Since the reliability for the whole scale (11 items) was high, individual attraction was then analyzed as one construct, instead of two dimensions.

3.4. Data Analysis

Software SOREMO

SOREMO is a computer program designed especially for exploring the actor, partner, and relationship effects in the interpersonal perception. It analyzes continuous dyadic data from a round-robin research design [2], in which each person in a group interacts with or rates every other person in the group, and data is collected from both members of each dyad. If there are multiple groups, the number of people in each may vary within the range of 3 and 25. The abbreviation "*i.e.*" means "that is", and the abbreviation "e.g." means "for example".

SOREMO presents various analyses of the data. The program partitions variance into actor, partner, and relationship components, and outputs the relative variance of each component. Significant tests with the group as the unit of analysis (the mean of the estimates across groups are tested to determine if it is significantly different from zero) are used to test variances and covariances. The reliabilities of the actor and partner effects are also available. Finally, various correlations among the different types of effects and variables are computed.

The three key variables in this study are homophily, individual identification and individual attraction. First of all, mean scores of each measure were calculated and used as the index for each participant in the groups. The final sample had 42 groups (N = 168) in total, that was acceptable by SOREMO.

4. Results

First of all, due to the difference in the geographic composition of the groups in this study, ANOVA was conducted to test whether this difference affected interpersonal perception in the three areas. ANOVA results revealed that there were no significant differences on any of them. For homophily $F(2, 165)$ = 1.58, p = 0.21, for identification $F(2, 165)$ = 0.16, p = 0.85, for individual attraction, $F(2, 165)$ = 0.39, p = 0.68. SOREMO output showed that overall mean scores of homophily, individual identification, and individual attraction were 3.84, 4.41 and 4.44 respectively.

SOREMO examined the three types of effects: actor, partner, and relationship on interpersonal perception. Assimilation and consensus were also examined in SRM. The SRM partitions the variance of an actor's rating into three compo-

nents: actor, partner, and relationship. Reference [1] stated that "a variance measure states how different people are from one another on that component. So if a measure has a great deal of perceiver variance, then that demonstrates that the perceivers differ quite a bit from one another on how they see others. The larger the variance, the more people differ from one another on that component" (p. 21). With regard to significance tests, [1] pointed out that most of the SRM results presented are correlations. Relative perceiver and target variances can be interpreted as correlation coefficients. "Unfortunately, these correlations cannot be tested in the usual way, because they use adjusted variances in their estimation" (p. 33). Therefore, when presenting correlations and relative variances, Kenny does not report whether the correlations are significant or not. Instead, he asks researchers to "pay attention to the size of the correlations and the pattern" (p. 33).

Table 1 displays the relative partitioning variance (the percentage of variance accounted for by each component relative to the other components) for homophily, individual identification, and individual attraction. The means of these estimates were then tested to see whether they were greater than zero [1]. The significant actor variance (34% for homophily, 36% for identification, and 24% for individual attraction, $p < 0.05$) revealed that the actors differ quite a bit from one another on how they see others. This indicated that some actors see the partners in one way and other actors see the partners in another way. Meanwhile, assimilation occurred for all these three aspects of interpersonal perception. There was a high consistency of an actor's rating across different partners. In other words, speaking of an actor, he/she sees little difference among partners. Specifically, the actor has the tendency to perceive others as not much different in homophily, identification and individual attraction.

With regard to consensus, it only occurred on individual attraction. The significant partner variance on individual attraction was 18% ($p < 0.05$). The degree to which two actors rated a partner on individual attraction was significantly consistent with one another. However, this partner effect was not detected on homophily and identification perceptions. The variances that the partner effect explained were very limited (0% and 9.8%, respectively), which indicated that the same partner tended to be viewed differently on homophily and identification by different actors.

A large relationship effect was detected. The relational component explained the most variances (66% for homophily, 54% for identification, and 58% for

Table 1. Relative variance partitioning.

Variable	Actor	Partner	Relationship
Homophily	0.34*	0.00	0.66
Identification	0.36*	0.10	0.54
Individual Attraction	0.24*	0.18*	0.58

*$p < 0.05$, df = 41.

individual attraction). Reference [1] stated that partitioned variance can be interpreted as correlation coefficient. In this case, there were more relationship variances than any other type of variance, which indicated that all these three interpersonal perceptions were better explained by how an actor uniquely rated a partner. That is to say, uniqueness did occur. "Who is rated by whom" was a determining factor of interpersonal perception in the virtual groups. Noticeably, the SOREMO output did not indicate significance of the relationship effect. According to [1], this may be explained by the fact that relationship effect is highly correlated with error terms. "To separate error from relationship variance, there must be multiple replications or measures of the theoretical construct. Replications are obtained by measuring the construct at more than one time or by multiple indicators" [1] (p. 241). With replication, the relationship effect can be partitioned into stable and unstable components. "If the measures are carefully chosen, there is usually little unstable perceiver and target variance, and so the only unstable variance is relationship variance, which is treated as error" [1], (pp. 241-242). Although the relationship effect could contain unstable component here, it was still informative. It showed that after controlling for the actor and partner effects, the uniqueness of how an actor rated a partner—either due to systematic relationship effect or to random relationship effect, was very important in interpersonal perception.

Finally, reciprocity was examined (see Table 2). There was no generalized reciprocity on these three aspects since none of the actor-partner correlation was significant. This indicated that if Person A sees others as homophious, attractive, and identifies with others, he/she is not perceived as friendly in return. However, dyadic reciprocity was found, but only on the identification perception, since the correlation between relationship effects on identification was significant ($r = 0.23$, $p < 0.05$). This indicated that if Person A identifies more with Person B, Person B sees Person A in the same way in return.

5. Discussion

This study not only examined how group members rated each other in terms of homophily, identification and individual attraction in virtual teams, but also went deeper to investigate how these ratings were influenced by the actor, partner, and relationship. In this sense, by applying the multilevel SRM, it extended the extant literature on interpersonal perception in CMC that often emphasizes only the differences in the evaluations. It revealed that in virtual groups the actor

Table 2. Reciprocity correlations.

Variable	Actor-Partner	Relationship
Homophily	0.00	0.22
Identification	0.11	0.23*
Individual Attraction	−0.00	0.19

*$p < 0.05$, df = 41.

assimilation was high and the consensus was relatively low. That is, internally, the actor sees little difference in partners and rated them based on his/her general tendency, while different actors' general tendency differed from each other, that is, actors differed significantly from each other on their ratings of other members in the group. They were less likely to agree with each other about an individual's homophily and identification, but more likely to agree with each other about an individual's attraction.

Reference [1] studies on interpersonal perception suggest that assumed similarity (actors think others are similar to them) likely serves as a basis for creating assimilation, at least for the perception of ingroup members. This was supported by this study, as it showed a significant actor effect on homophily. Kenny also suggests that the level of consensus is fairly modest. Usually, no more than one-third of the total variance is due to the partner, even when the actors know the partner fairly well. Kenny suggested that an important reason that actors do not agree is that they have relatively idiosyncratic theories about partners. This was also supported in this study, since it failed to detect a significant partner effect on either homophily or identification. Moreover, although the partner effect was significant for individual attraction, the variance it explained (18%) was far lower than one-third.

The most important finding of this study was it revealed that the relational component, which is often ignored in the extant CMC literature, actually constitutes to a large portion of the difference. Most of interpersonal evaluations could be explained best by the uniqueness that the actor sees in the partner. Reference [1] suggests that uniqueness is much greater for affect or liking than for trait ratings. But even for trait ratings, the relationship component is often dominant. It is assumed that about two-thirds of the variance in trait ratings is due to uniqueness. Moreover, uniqueness in trait perceptions correlates strongly with uniqueness in liking. This study partially supported these claims. Homophily, identification and attraction perceptions are better suited to an affect and liking classification rather than trait. Consistent with Kenny's claim, the relationship effect explained 66% of the variance of homophily. It also explained 54% of the variance of identification and 58% of the variance of individual attraction. Although the amount of variance the relationship effect explained in identification and attraction was not as large as the two-thirds, it still accounted for a large fair of the variance and could be considered strong enough.

Finally, [1] suggested that liking measures show clear evidence of dyadic reciprocity. Although this present study did not directly measure liking, it assessed the individual attraction and identification. Evidence of dyadic reciprocity was found for the latter, but not for the former. This suggests that identification with others in the group, rather than attraction, may be more closely related to liking.

6. Future Research

This present study has extended the literature on interpersonal perception in

CMC by using SRM. However, there are some limitations that could be addressed in future research. For instance, SOREMO is a powerful program, which enables researchers to use latent constructs rather than the observed measures in the SRM. In this study, homophily, identification and attraction were index scores. Therefore, future research can extend this by treating them as latent variables to better partial out the error variances and obtain the stable component in the relationship effect in the model. Meanwhile, this present study did not ask participant to provide self-measure ratings on any of the three aspects of interpersonal perception, therefore it is impossible to test the accuracy of the actor's perception. Incorporating this factor in the future research will be beneficial in terms of enriching the knowledge on interpersonal perception.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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