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Abstract

Chapter One introduces and outlines the possible contribution of the thesis to telecommunications research. There were four main objectives, the first of which was to demonstrate that theoretical contributions of social psychology might be applicable to questions of mediated interaction. Previous research in social psychology, for the most part conducted in a face-to-face condition, might generalize to the new research and if it did not, this too might be of interest. Familiar research findings related to such phenomena as leadership role emergence, intimacy management and effects of self-focused attention are among the theoretical concepts employed in the reported investigations of mediated communication. A second objective was to develop research methods for use in communication studies. A standardized test for assessing person perception in the video medium was developed. Further, a method for assessing communality of impressions, also termed intersubjectivity, was created for use in communication studies. The third objective was to attempt to find answers to problems posed by telecommunications designers and evaluators. For example, systems engineers have long pondered the issue of how much information is necessary for successful audio-video interaction. A more basic question, namely, whether or not nonverbal cues could be communicated effectively through this medium, was given careful consideration. Finally, the fourth objective of the thesis was the attempt to identify the most successful dependent variables for use in experimental communication studies.

Chapter Two was concerned with significant changes to social processes which might occur during mediated interaction. Two experimental studies comprised the chapter.

Teleconferencing and leadership emergence. An attempt was made to assess the role of medium of communication on leadership differentiation in discussion groups. Groups of undergraduates met on five different occasions to solve human relations problems, either in face-to-face discussion situations, or over video conferencing networks. In face-to-face conditions, development of leadership took almost a classic form, with sociometric measures system-

atically related to behavioural indexes; in the video (teleconference) conditions, role differentiation tendencies were sharply curtailed, and the relationship of sociometric indexes with indexes of verbal output were greatly diminished. Speculations about how mediated communication may affect differentiation processes were offered.

Distance, gaze and the intimacy equilibrium model in video-mediated and face-to-face dyads. This experiment focused on the Argyle-Dean Intimacy Equilibrium Model, gaze and social distance in face-to-face and video-mediated dyads. It was found that, during video-mediated interaction, communicators did not experience the anticipated degree of interpersonal remoteness or separation. What was expected to act as a technological barrier appeared to affect social influence but not interpersonal or informational communication. Under video-mediated (teleconference) conditions, certain negative consequences of excessive intimacy (especially assertiveness or dominance) appeared less salient, while certain positive effects remained unchanged. Consequently, subjects in the video-mediated conditions liked each other to a greater degree, enjoyed the experiment to a greater extent, and perceived greater "closeness" than did subjects in face-to-face conditions. The levels of intradyadic gaze, which were significantly higher in the video-mediated dyads, may have increased perceived intimacy between communicators.

Chapter Three examined the conceptualization and methodological development of intersubjectivity for use in communication studies. Four empirical studies are reported in this chapter.

Intersubjectivity: a concept and methodology for communication studies. A theoretical study of intersubjectivity, a condition of shared impressions or communality of experience between individuals, was undertaken. The origins of this concept were considered and an attempt was made to show its compatibility with other theory in social psychology. Methodologies were developed for measuring the extent of intersubjectivity in communication studies. These may be employed to test differences of dispersion or variability in semantic differential ratings. Subsequent investigations of mediated communication may benefit from this type of analysis.

Variation in person perception as a function of cultural differences between encoder and decoder. This investigation, composed of two studies, assessed variation in person perception occurring as a function of cultural differences between encoder and decoder. Understanding of such variation may be essential as cross-cultural mediated communication becomes more commonplace. A multicultural subject population of psychiatric nursing students was subdivided into categories either like or unlike the apparent cultural background of two encoders in a standardized person perception test. It was found that, as predicted, like decoders were more effective at classifying the encoders' nonverbal communicative acts than were unlike decoders. Moreover, like decoders formed more homogeneous impressions of the encoders' personalities. Implications for international teleconferences were considered.

Comparing social influence and intersubjectivity in three communication conditions. This quasi-experiment attempted to assess social influence and intersubjectivity in three dyadic conditions: (a) simulated-distance teleconference, (b) real-distance teleconference, and (c) face-to-face conference. Indexes of intersubjectivity but not social influence showed significant differences. There was greater communality of experience among face-to-face dyads than among dyads in either of the teleconference conditions. Differences between the two teleconference conditions were not evident. Further, this study considered some problems associated with employing rigorous experimental methodologies in settings which do not allow adequate experimental control.

An assessment of differential intersubjectivity in five communication conditions. In this experiment, several intersubjectivity analyses were performed on data from five communication conditions. Three were face-to-face dyadic interactions at distances of: (I) $\frac{3}{4}$ metre, (II) 2 metres, and (III) 3 metres. Two were audio-video mediated dyadic interactions with distances comparable to (IV) 2 metres, and (V) 3 metres. Communality of impressions formed of their discussions was assessed. It was found that, as predicted, greatest intersubjectivity coincided with greatest immediacy and social presence. The intersubjectivity analyses complemented and extended previous findings.

An assessment of intersubjectivity in equivalent groups. This study compared the homogeneity of impressions formed of two encoders by members of equivalent groups. The purpose was to demonstrate that differences do not necessarily emerge when an intersubjectivity analysis is performed. Both groups of subjects viewed a standardized person perception test and then rated the encoders' personalities using semantic differentials. Results showed no significant group differences in homogeneity of impressions formed of either encoder.

Chapter Four considers the way in which medium of communication can be responsible for the attenuation of social cues, and investigates this in two studies.

Consequences of reduced information rates for person perception in a video medium. This investigation attempted to determine optimal information rates for person perception in a video medium taking into account practical cost/effectiveness considerations for engineering and human factors, and theoretical issues for social psychology. The independent variable manipulation was created by a video frame rate continuum ranging from 30 frames per second (f.p.s.) to 15, 10, 5, 2 and 1 f.p.s. The first condition at full bandwidth was perceived as continuous motion while the last condition was perceived as frequently updated static images. A standardized person perception task was administered in each condition to separate experimental groups. It was found that (a) there was an optimal information rate at which intersubjective agreement in perception was maximal, (b) at 15 f.p.s. communication effectiveness was at least as great as that of 30 f.p.s., (c) at 10 f.p.s. there was a perpetual flicker that was disruptive to task performance, and (d) at 1 f.p.s. task performance was significantly better than chance or guess rate. Implications of these findings for both orientations were considered.

An effect of the absence of colour cues on person perception in the video medium. In an attempt to demonstrate an effect of the absence of colour as a social cue, a standardized person perception test was performed using black-and-white and colour video displays. The experimental task was to decode nonverbal communicative acts which were depicted by a male and a female encoder (19 acts each) and then to rate the encoders' personalities using a

semantic differential. It was predicted that colour as a social cue might function at two levels; the first contributing to decoders' interpretations of specific communicative acts and the second contributing to overall impressions formed of the two encoders by decoders. Evidence was found for the second effect but not for the first. Consequences of this finding for video mediated communication were considered.

Chapter Five contains a content analysis of two mediated communication studies.

Content analyses of cross-media studies. This investigation attempted to content analyse two studies which were reported earlier. One study compared leadership emergence in four-person groups which met either face-to-face or using an audio-video teleconference system. The other study compared negotiation outcomes in face-to-face, simulated-distance teleconferencing and real-distance teleconferencing dyads. Social psychological literature suggested a number of interpersonal communication variables which were considered: (a) verbal including frequency and duration of talking, interruptions, back channel responses and invited comment, (b) paraverbal including filled pauses, ritualized speech and sentence disfluences, and (c) nonverbal including frequency and duration of gaze, smiles, head movements, gestures and postural changes. There were more verbal utterances and gestures exchanged in face-to-face interactions; mediated communicators gazed more but interrupted each other less. Considering the number of dependent measures under investigation, significant media differences proved somewhat elusive. Nevertheless, interrelationships between dependent variables were sufficiently systematic to encourage further investigations using a multidimensional approach, and suggestions were offered for future content analyses in cross-media studies.

Chapter Six deals with some aspects and consequences of self-focused attention which may necessarily arise during mediated communication.

A demonstration of age-related differences in the preference to teleconference. This field study attempted to demonstrate an age-related difference in the preference to use a teleconference system. Visitors to a faculty of engineering's open house were classified into four age categories: (I) elementary

school, (II) secondary school, (III) university and junior career, and (IV) middle and senior career. The frequency and duration of teleconference system use were found to decrease across the four categories. The compatibility of these results with Duval and Wicklund's theory of objective self-awareness was considered.

Video feedback and self-assessment of communication effectiveness.

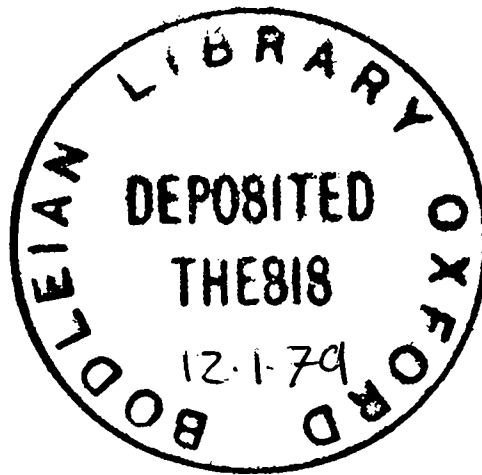
Two studies attempted to demonstrate a negative shift in self-assessment of communication task performance following video feedback. Both studies found that subjects typically perceived their task performance to be below their expectations of effectiveness. There was the suggestion that this reduced effectiveness was more personal than media-related (Study I), and that it was more of an enduring disability than a temporary one (Study II). Also, in the second study, personal performance was rated lower than peer performance of the same task. It seems likely that most video-based teleconference systems can evoke states of objective self-awareness among users and, in addition, many systems provide video feedback with the use of self-reference monitors. Experiences of self-focused attention, video feedback and subsequent negative self-attributions may bring about a reluctance to use teleconference systems.

Determining the effect of self-focused attention on communication task performance. In this experiment, an attempt was made to determine the disruptive influences of self-focused attention, a phenomenon which might be evoked in teleconference situations. Subjects performed a standardized person perception task and word perception task in one of three conditions: (I) high OSA created by the presence of a self-reference monitor and video camera, (II) medium OSA created by the presence of a video camera only, and (III) low OSA without a self-reference monitor or video camera. Three dependent measures, shown to discriminate conditions in communication studies, were employed. However, no evidence was found of reduced performance of the communication tasks.

Chapter Seven concludes the thesis, restating the findings according to three distinctions of methodology, application and theory. Suggestions about future contributions of social psychology to communications research are discussed.

Mediated Person-to-Person Communication:
A Social Psychological Perspective

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Note. References, tables and figures accompany the individual works in each chapter.

In the preparation of this thesis, the rules prescribed in Publication Manual of the American Psychological Association, second edition, were adhered to when possible.

Preface

The investigation of person-to-person mediated communication is the central aim of this thesis. Particular attention is given to interactions which involve audio-video links, often called "teleconferences", and their effect on interpersonal communication processes. Social psychological theories and methodologies are employed to investigate specific communication phenomenon. The following topics are considered when assessing mediated interactions, often in contrast to the familiar condition of face-to-face: (a) alterations to small group dynamics, (b) intersubjectivity or achievement of a state of shared impressions from conceptual and methodological perspectives, (c) possible communication medium factors affected by the attenuation of social cues, (d) content analyses of mediated communication studies, and (e) impact and consequences of self-focused attention which might arise in mediated interaction. The conclusion recapitulates the findings as they pertain to methodology, application and theory. Future contributions of social psychology to research in the field of mediated communication are considered.

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Chapter One

Introduction

Why, considering its pervasiveness, has telecommunications been so long neglected as a proper subject for study by social scientists? Unlike most of our other technological playthings, the telephone is actually interposed in the communication networks between people, between groups and between organizations. Without communication between individuals and groups, one could hardly expect that there would be social organization or culture, yet we have accepted the interposition within our communication networks of a mechanical device, which may alter the form or nature of our communications in various unidentified ways, without as much as a second thought.

(Short, Williams & Christie, 1976, p. 1)

Fundamental agreement with the opening quotation of this chapter is one reason for undertaking this thesis. Mediated person-to-person communication is of enormous significance to our everyday lives. The history of telecommunications is brief, spanning one hundred years at maximum (Pierce, 1972). However, its rapid progress in a relatively short span of time is remarkable indeed. If present accomplishments border on amazing, then the future promises to be astounding. Perhaps the greatest impact on our immediate lives will be made in the area of telecommunications. Yet, social psychologists have proceeded at a snail's pace in their investigation of this field.

Although the study of human interactions occupies a central place in a number of disciplines, the human aspects of person-person telecommunications have been curiously ignored. The well-organized platoons of the established disciplines have marched around, rather than across, this area of research. ...It is necessary to make the negative point that in all the huge body of experimental social psychology research, the question of communication by any media other than face-to-face has been virtually ignored...despite their obvious relevance to each other, the fields of social psychology and telecommunications engineering have made little contact. (Reid, 1971 in Dickson & Bowers, 1974, p. 101).

In the 1960s and early 1970s, social psychologists were anything but idle, however, their priorities lay elsewhere. Neither did communication engineers and technologists stay still, and they were occupied with the development of new communications systems such as audio-video, person-person teleconference facilities. Table 1 displays the magnitude of the investment into just one product by 1974, the video telephone. Purposes were sought for these products and they were promoted for a wide range of applications. For example, video telephones were encouraged for use in business meetings, interviews and similar interactions with the obvious benefit of being superior to ordinary telephone

Insert Table 1 about here

Table 1
Commercial Development of Animated Video Telephones by 1974

Country	Manufacturer	Device Name
USA	Western Electric (Bell System)	Picturephone
	Stromberg-Carlson	Vistaphone
	GTE	Pictel
Sweden	L. M. Ericsson	--
England	Post Office	Viewphone
	Pye	Videophone
	Plessy	--
Japan	Toshiba	--
	Fujitsu	--
	Nippon Electric	--
	Hitachi	--
Germany	Siemens	--
France	CIT-Alcatel	Visiophone
	Thomson-Brandt	--
	Matra	--
Netherlands	Philips	--

(Dickson & Bowers, 1974, p. 36)

conversations and, at the same time, alleviating the inconvenience and expense incurred by frequent travel. Certain companies and government agencies began to link remote branch offices in this manner. Another application termed "telemedicine" allowed doctors to operate isolated clinics and even to make preliminary diagnoses via audio-video links. Remote teaching experiments were tried and predictions were made about the start of a new era in media education.

However, some subscribers drew back from these mediated alternatives preferring to return to the familiar face-to-face methods of meeting and communicating. Promotion of video phones trailed off as it became apparent that the question of teleconferencing went deeper and had implications not yet given adequate consideration. Questions about where the deficiencies lay in these systems were raised and among suggested answers came the reply that perhaps a viable balance between technological and human factors did not exist.

Most new technological devices are not made in response to well researched studies of human needs and the comparative effectiveness of new technologies for satisfying these needs. Rather, most new products represent sophisticated consideration of technological and concomitant economic feasibility with only intuitive and often superficial assessment of human needs and comparative effectiveness. The video telephone appears to be no exception. The Picturephone, for example, was technologically ready for the market place before the question of effectiveness of video telecommunications was taken seriously. Although most large telecommunications administrations have social psychologists researching questions of human communications, these activities tend to follow technological feasibility rather than to guide the search for it, and most frequently involve issues that are more properly termed human engineering, matching the human-machine interface to the human senses and skills. (Dickson & Bowers, 1974, p. 101).

General objectives. In this investigation, there were four main objectives. The first was to demonstrate that theoretical and methodological contributions

of social psychology might serve a useful purpose when addressing questions related to mediated interaction. The bulk of research in social psychology has examined interpersonal processes as they occur in a face-to-face interaction. These findings might generalize to other communication circumstances and, yet if they did not, this too might be of interest to both the fields of communication studies and social psychology. Familiar research related to such social psychological phenomena as leadership role emergence, intimacy management and self-focused attention are among the theoretical concepts employed in the reported studies on mediated communication. The second objective was to develop research methods for use in communication investigations. Later in the thesis, a standardized test for assessing the effectiveness of person perception in the video medium is described. Also, a method for assessing communality of impressions, termed intersubjectivity, was created and used with considerable success in certain of the communication experiments. The third objective was to attempt to answer specific problems posed by telecommunications designers and evaluators. For example, systems engineers have been exploring the question of how much information is necessary to achieve successful audio-video interaction within cost effective limits. A more basic consideration, namely, whether or not nonverbal cues could be communicated as effectively through this medium, was given careful examination. Finally, the thesis attempted to identify the most revealing dependent variables for use in future experimental studies of mediated communication.

Four concepts embodied in the title of this thesis should now be clarified.

Mediated. This might be defined as connected not directly but through some intermediate agency. Its use in the present context will imply audio-video based links. Previous studies of medium effects have commonly compared audio-only, audio-video and face-to-face interactions (e.g., see Chapanis, 1975; Williams, 1977). Facilities at three locations were employed,

1. A two-node audio-video system developed at the Department of Experimental Social Psychology, University of Oxford which is described in Figure 1 of the study entitled "Distance, Gaze and the Intimacy Equilibrium

Model in Video-Mediated and Face-to-Face Dyads", and in Figures 1 and 2 in Appendix A.

2. The established four-node audio-video network of the Wired City Laboratory, Carleton University, described in Figure 1 in the study entitled "Teleconferencing and Leadership Emergence".

3. The audio-video system of NASA/Ames Research Centre, California, formed part of the satellite link described in the study entitled "Comparing Social Influences and Intersubjectivity in Three Communication Conditions".

Certain features of these facilities, such as video image size, audio quality and channel capacity, may have been superior in use to commercial video telephones, and in most of the important aspects were comparable to the video telephones (for examples of photographs and diagrams see Aagaard, van der Avoort & Vrijer, 1977; Dickson & Bowers, 1974; Duncanson & Williams, 1973; Falk, 1973; McManamon, 1975; Short, Williams & Christie, 1976).

Person-person. These words imply social interactions in contrast to, for example, man-machine interactions. Ongoing exchanges which permit mutual influence are characteristic of interactive communication (see Chapanis, 1975). In part, unidirectional communications between encoder and decoder were studied in order to simplify the communications problems under investigation. Nevertheless, the majority of the results had relevance for interactive communication.

Communication. This term is difficult to conceptualize, although numerous attempts have been made to define the word. Dance (1970) reported 95 definitions taken from various disciplines, some of which had surprisingly little common relevance that would gain universal acceptance. A definition suggested by Johnson (1973) comes closest to the intended meaning in this thesis. He stated that communication involves the effect that persons have on one another. This could take the form of altered perceptions, dispositions and expectations. Interpersonal communication he further defined as behaviour (including verbal and nonverbal) which is perceived by another person and normally implies that one person has transmitted a message with a conscious intent to influence

another's behaviour. Communication would be deemed effective if the receiver interpreted the message as it was intended.

A social psychological perspective. A viewpoint, one of many which could be anchored in social psychological theory is offered. The belief was held that theoretical social psychology has a contribution to make to telecommunications research. Among the most extensively employed perspectives were those of leadership emergence (Bales, 1953), Intimacy Equilibrium Model (Argyle & Dean, 1965) and the theory of objective self-awareness (Duval & Wicklund, 1972). Even for those studies that were directed by practical problems, theoretical footholds were first established. This thesis was predominantly experimental in methodology. It may appear to be a contradiction of aims to combine inspiration from applied problems, social psychological theory and experimental method. Chapanis, some thirty years ago, termed himself to be an "applied-experimental psychologist" (Chapanis, Garner & Morgan, 1949); he considered applied questions using experimental modes of study. However, Chapanis (1971) declared "that the best basic work in psychology starts not with psychological theory but with attempts to solve questions posed by the real world around us" (p. 950). On this last point, we differ; this thesis strongly favours the use of theoretical foundations for applied problems.

Orientations to research in mediated communication. Dominant paradigms have been slow to emerge from the study of mediated communication. Thus, specific research groups have devised and pursued their own approaches over several years of study. One distinctive orientation is found in the respected work of Chapanis and his colleagues at Johns Hopkins University, Maryland. His laboratory has recently directed its attention towards identifying efficient channels and modes for communication which involve man-computer systems, and have attempted to create models for such interactions (see Chapanis, 1975). In a problem-oriented approach, they have compared voice communications, typewriting, handwriting and video links with a view to improving the compatibility of human needs and technological capabilities.

Another sophisticated approach to communication studies can be seen in the work of Wish and his associates at the Special Communications Research

Department, Bell Laboratories, New Jersey. He has, for example, worked towards assessing persons' attitudes and opinions which are held implicitly about communication processes in the belief that such expectations will influence subsequent employment of communication systems. Among the salient, conceptual factors which have emerged from the work are (a) the modality of communication, e.g., face-to-face, audio-video or telephone, (b) the relationship that exists between communicators, e.g., supervisor to employee, and (c) the situational context or communication purpose, e.g., task aspects of communication (Wish, 1975). A substantial portion of Wish's work has involved the use of multidimensional scaling techniques for defining the underlying conceptual dimensions that the user brings into a communication situation (e.g., Wish & Kaplan, 1977).

A substantial corpus of research, having broad scope, has emerged from the Communications Studies Group, London. Much of their activities has centred around a telecommunications impact model. One of their primary concerns was to estimate the extent to which mediated forms of communication might be substituted for face-to-face interactions. The research appears to have placed considerable (and much needed) emphasis upon feasibility and viability assessments of both human factors and commercial considerations (see Short, Williams & Christie, 1976, pp. 21-32).

A thorough review of the literature related to mediated person-to-person communications is not undertaken in this chapter. Rather, the pertinent studies are considered together with specific questions investigated in Chapters Two to Six. Recent reviews of experimental studies in mediated communication can be found in Short, Williams and Christie (1976), and Williams (1977).

A model to guide investigations. In a general sense, the diagram in Figure 1 might be called a model. According to Sparkes (1976), "a model is a simplified representation of reality, created for a specific purpose" (p. 7). DuMas (1955) stated that a model is "a unique representation of something; an archetype" (p. 182) whereas Chapanis (1961) advised that "models are analogies. Scientific or engineering models are representations or likenesses, of certain aspects of complex events, structures, or systems, made by using symbols or objects which in some way resemble the thing being modelled" (p. 115).

Further to this, models are justified if they succeed in describing complex systems or events, assisting to learn complex skills, providing a framework for experiments, demonstrating new relationships, offering predictions when experiments are impossible and assisting with engineering design.

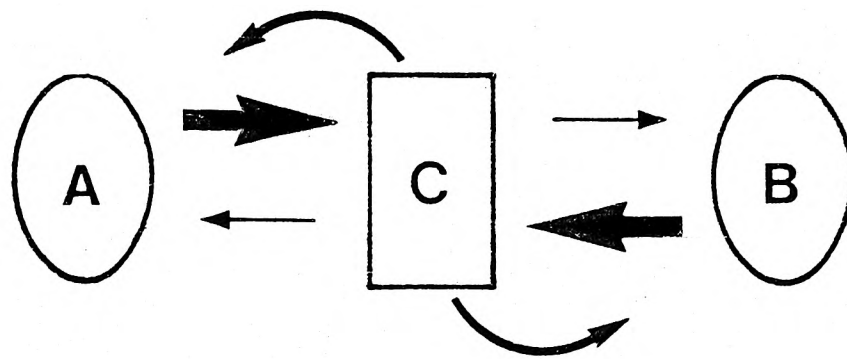
Insert Figure 1 about here

The model of communication was developed in order to structure and organize the present investigations. It was not intended to consider all possible factors and served as much to focus and confine present concerns as it did to indicate neglected or unexplored mediated phenomena. One aim of the model was to guide subsequent research and help articulate the relationships among studies. It depicts relationships that were translated into empirical analogues to be tested in experiments.

The model makes a special point of emphasizing a system of influences that function together in mediated communication. If individual components were to be considered separately, it is possible that they would not be appreciated for their mutual impact. Singleton (1974) stated that systems theory is most appropriate when used for structuring problems rather than finding the solutions to problems; it can sometimes suggest what should be considered in a complex interaction but normally will not say how it should be investigated. This holistic approach can give greater understanding than is possible by separating or reducing the processes into constituent parts.

Three basic elements labelled A, B and C compose the model. It simulates social interaction which in its simplest form involves two persons, A and B. In particular studies which follow, A represents human considerations from the perspective of self and B represents similar considerations but from the viewpoint of other. A and B must interact in some form of communication medium designated by C. The medium may be specified according to the channels or modalities for information exchange. Face-to-face interactions may be analysed in terms of their media qualities in a way similar to one that might be used to analyse telecommunication networks.

Figure 1. A Model for Mediated Communication.



Flow of information between A and B is represented by the arrows; output from one person moves through the medium and, in the process, becomes input to the other person. The symmetry of this relationship (seen by the arrows which move in both directions) implies that this model is representative of two-way interactions. The output of information is shown to be greater than the input received. Rarely is there a perfect or complete exchange of information and probably cannot be, even if it were possible to electrochemically communicate between brains directly. Organization of information is unique in individuals and, therefore, A and B will always have something about which to communicate.

The curved arrows in the diagram represent the operation of feedback in the system. Feedback can have consequences for output because it acts upon the receiver to alter subsequent communication. Social feedback would imply reactions from the other person; for example, encouragement or rejection of ideas. When audio-video mediated systems are employed, feedback can stem from viewing a self-reference monitor. This capability is commonly built into systems to enable the communicators to compose their output. Both types of feedback can be a source of influence during communication.

Many factors such as varied cognitive styles, use of semantic and semiotic codes, past learning, attitudes, perceptual skills and group membership can influence communication effectiveness between A and B in this model. Relations between communicators can affect their interaction; for example, acquaintanceship, age, sex and mutual regard, all in some measure, exert influence. The task or purpose of the interaction is a major consideration and, obviously, some tasks are better suited to particular combinations of A, B and C than are others. Some of the above potential influences would seem to be compatible with predictions made by Mehrabian and Reed (1968).

After enumerating benefits which may be derived from models, Chapanis (1961) advised that building models, if carried to extremes, could divert useful energy into nonproductive activity. Heeding this warning, the first empirical chapter of this thesis now follows.

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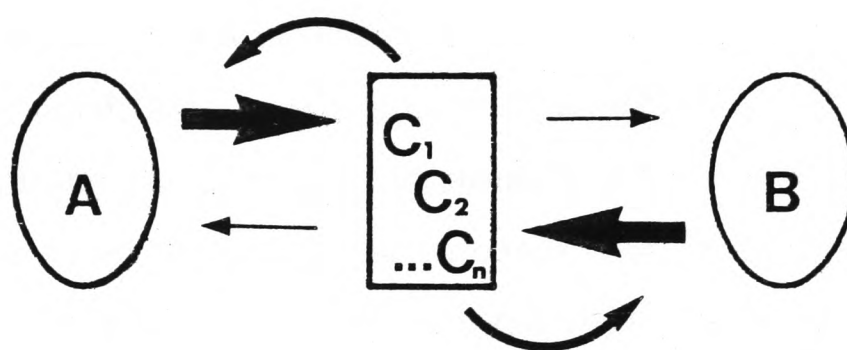
Chapter Two

Changes in Social Processes During Mediated Interaction

A social group is a collectivity that has psychological implications for the individual. Such groups can be characterized by the degree to which they provide social-emotional rewards for their members, and also by the degree to which they attempt to achieve well-defined group goals. The functioning of a group, and the place of the individual in that group, will be affected by the communication structure of the group, the nature of the group's leadership, and the processes involved in group decisions.

(Shaver, 1977, p. 529)

Many enduring theories in social psychology have been considered in only one medium of communication, namely, face-to-face. When the medium, C, is manipulated as an independent variable, typical group dynamics may be altered significantly. Investigations of the potential alterations focus on leadership emergence and intimacy management.



Reference

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Teleconferencing and Leadership Emergence

Abstract

An attempt was made to assess the role of medium of communication on leadership differentiation in discussion groups. Groups of undergraduates met on five different occasions to solve human relations problems, either in face-to-face discussion situations, or over video conferencing networks. In face-to-face conditions, development of leadership took almost a classic form, with sociometric measures systematically related to behavioural indexes; in the video (teleconference) conditions, role differentiation tendencies were sharply curtailed, and the relationship of sociometric indexes with indexes of verbal output were greatly diminished. Speculations about how mediated communication may affect differentiation processes are offered.

No lengthy documentation is needed to demonstrate that many of the important social psychological phenomena occur over periods of time longer or more frequent than the average laboratory experiment. Although the study of the dyad has its advantages in terms of control and manipulation, much of the "classic" social psychological experimentation (e.g., see Cartwright & Zander, 1953) has three features: (a) it has involved groups with more than two members, (b) these groups meet for more than one session, (c) the results seem to have more generality for "real world" events. One example of this sort of study involves the early work of Bales on the development of roles in problem-solving groups (for a summary, see Bales, 1958).

Early on, this work had clear implications for events outside the confines of the social psychological laboratory (e.g., Strodbeck & Mann, 1956). From its inception it also had a prominent process component (Bales, 1950). Finally, it seems to have stood the test of time more successfully than most social psychological research. This seems a particularly appropriate context, then, to examine effects of mediated communication on group dynamics.

Although they still represent but a small proportion of research in social psychology, studies of the effects of mediated communication seem to be appearing with accelerated frequency. Some of this work has had a frankly descriptive and applied orientation (e.g., Dickson & Bowers, 1973; Chapanis, 1975; Chapanis, Ochsman, Parrish & Weeks, 1972; Williams, 1974) in which the investigator generally focuses on changes in communications effectiveness that are attributable to changes in mode of communication (e.g., problem-solving in face-to-face interaction as opposed to audio, video, etc.). Another, somewhat smaller subset of studies has focused on why media effects often seem as strong as they do. This work has normally involved attention to such variables as nonverbal cues in interaction process (for reviews, see Duncan, 1969; Williams, 1977). No doubt, both the discovery of medium effects and specification of process variables will become more closely affiliated as opportunities for technologically mediated

communication become as ubiquitous as they promise to be.

As promising as much of this work appears, however, it tends to suffer certain drawbacks. One observes that most experiments in this context involve a situation in which a subject interacts with another (a subject, an experimenter, or a confederate) either face-to-face or in another mode, for the duration of an experimental session, at the end of which some sort of measurement is taken; thus studies have generally been limited to the dyad and are generally no more than a single session in duration. The potential advantages of an "evolutionary" focus on mediated group dynamics, in the sense that they are represented in the leadership development process discussed above, become appealing.

Leadership and Nonverbal Communication

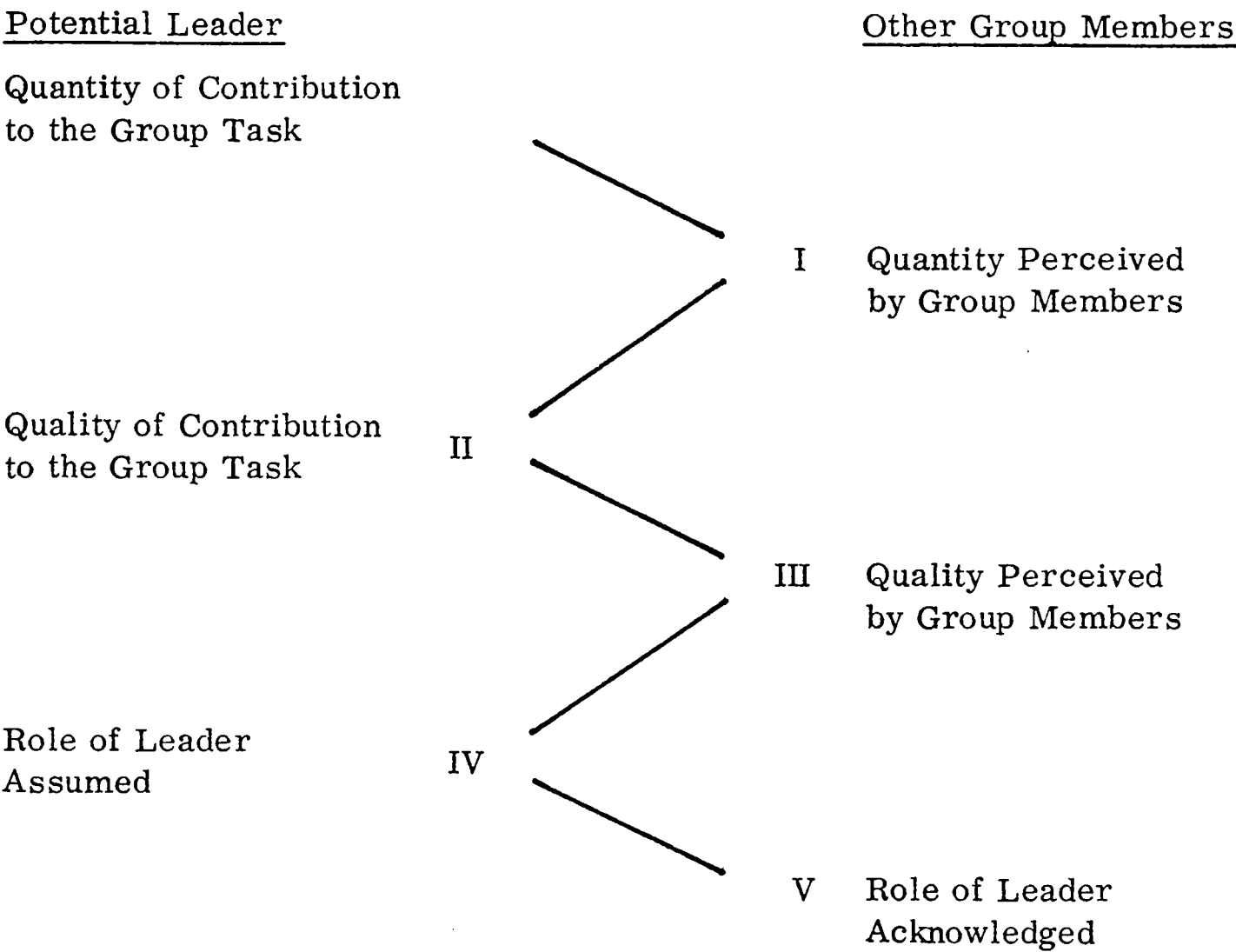
In an attempt to reflect the results of previous research, Table 1 depicts a chronology of "natural" leadership emergence in task-orientated

Insert Table 1 about here

groups. If the emphasis is placed upon mode of interaction between the emerging leader and other group members, one can infer why a difference between video-mediated and face-to-face groups would be predicted. Video-mediated group members would have visual contact with each other but would, because of camera placement, normally lack eye contact (see Figure 1). It is known that eye contact is an extremely important channel for interpersonal influence (Argyle & Cook, 1976; Kendon, 1967) and that it may play an important part in leadership emergence (Burroughs, Schultz & Autrey, 1973; Stein, 1975; Stein, Geis & Damarin, 1973). We suppose that without eye contact, a potential leader would have reduced social feedback in the form of nonverbal cues (NVC) and, thus, would not experience as much normally supportive reaction to his ideas. Moreover, reduced NVC among other group members might be expected to impair the evolution of consensus as to which group member is producing the best ideas. It has been demonstrated that when eye contact is possible, NVC may be effectively communicated via

Table 1

A Chronology of Natural Leader Emergence in Task-Oriented Groups



- I Early in a group's problem-solving experience, it is quantity of contribution that is most apparent to group members. If required to identify a leader at this point, quantity of ideas produced is the prime factor for discrimination (Bales, 1953; Bavelas, Hastorf, Gross & Kite, 1965; Kirscht, Lodahl & Haire, 1959; Morris & Hackman, 1969; Regula & Julian, 1973; Richardson, Mayhew & Gray, 1969; Slater, 1955; Sorrentino & Boutillier, 1975).
- II With their verbal and nonverbal feedback, the group communicates their acceptance of and support for the efforts of the most active member. The group reaction is perceived by this person (Pepinsky, Hemphill & Shevitz, 1958) and his response is to generate even more ideas (Oakes, Droge & August, 1960) which he states with greater confidence and power.

- III The contributions of the most effective group member, superior in both content and form, are perceived by the group (Stein, 1975; Stein, Geis & Damarin, 1973). Other members acknowledge the contributions via cues of social support, e.g., increased eye contact, and if required at this point to choose a leader, will use the quality of argument as a criterion for deciding leadership status (Burroughs, Schultz & Autrey, 1973).
- IV With the problem-solving task increasingly under his control (Bales, 1953; Bavelas, 1950; Howells & Becker, 1962), the most dominant group member assumes the role of leader.
- V Other group members are willing to acknowledge this role (Bavelas, Hastorf, Gross & Kite, 1965; Burroughs, Schultz & Autrey, 1973; Stein, 1975) and the process continues, gaining consensus and stability with an increase of task-related experience (Bavelas, Hastorf, Gross & Kite, 1965; Oakes, Droge & August, 1960).

video systems (Shea & Rosenfeld, 1976). However, other research has suggested that, even with a semblance of eye contact, subjects interacting via video systems may be less concerned about the influence attempts of others, and that this may occur because of a reduction in perceived interpersonal dominance, potency, and assertiveness when interaction is via video systems (Guild, 1978). One would expect this effect to be exaggerated when the video system does not permit eye contact; interactions with visual plus audio contact (but not eye contact) may be worse than audio contact alone, owing to a disruption of the regulatory function of gaze when visual cues are present but ambiguous (Short, Williams & Christie, 1976). Comparing face-to-face and telephone interactions, Stephenson, Ayling and Rutter (1976) concluded that without visual communication, interactions tend to be task-oriented and depersonalized. The present study yielded an occasion to make salient an important distinction between visual contact and eye contact (mutual gaze), the former showing greatest similarity to an audio-only link and the latter showing greatest similarity to face-to-face encounters.

Thus the major hypothesis of this study is the prediction that video-mediated groups would have less dramatic leadership emergence than would face-to-face groups, as reflected either in behavioural indexes, or in sociometric indexes, or in both. Moreover, it was expected that a lack of leadership stability would be found across experimental sessions in the teleconference groups, while stabilization of leadership emergence over sessions would appear in the face-to-face groups.

The present study employed a procedure that was partially patterned after that of Bales (1958). Groups met a number of times to try to reach solutions to some human relations problems; they met either face-to-face, or over video networks. Records were kept of certain behavioural measures, and an attempt was made to relate these to several sociometric measures.

Method

Subjects

Forty male undergraduates volunteered to take part in an experiment on "Group Problem Solving" in the Wired City Simulation Laboratory at

Carleton University. For their participation, subjects received course credit in an introductory psychology course and payment at the rate of \$3.00 per session hour.

Procedure

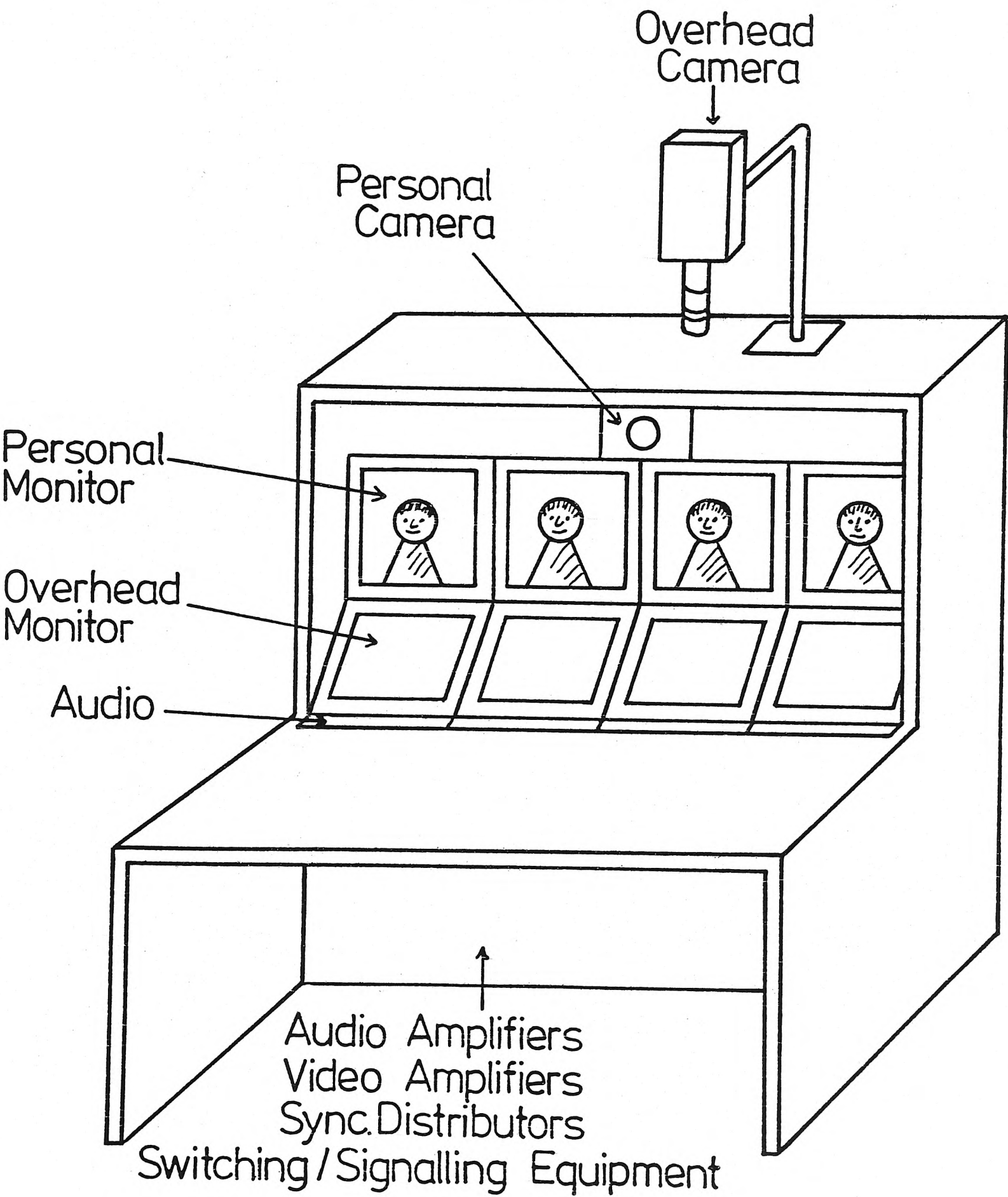
Subjects were assigned randomly to ten groups of four persons which met once a week, for five weeks. Five of these groups communicated face-to-face while seated around a 4' x 5' table. A television camera inconspicuously located across the room permitted the videotaping of these groups. The other five groups communicated in a teleconference condition, in which each group member was situated at one of four interactive communication nodes. From the node and over separate monitors, each subject had audio and video contact with each of the other members of his group. In each session, group members were assigned randomly to one of the four nodes. Since closed-circuit television was the medium of communication, it was a simple matter to videotape the discussions of each group and then replay the sessions later to monitor activity indices, that is, the frequency and duration of interaction attempts. Figure 1 depicts a communication node as used in this experiment.

Subjects in the face to face situation were randomly assigned to positions.

Insert Figure 1 about here

The task was for each group member to read a human relations problem and then to discuss it with other group members. The five problems were selected not because they had a single or accepted solution, but because they would spark lively interaction focusing on "true-to-life dilemmas". The order of presentation of these problems was randomly determined for each of the ten groups. In all cases, the group discussed one problem for about twenty to thirty minutes at each session. Following a discussion, group members anonymously ranked each other along the following dimensions: (a) the quantity of ideas in the just-completed discussion, (b) the quality of ideas in the just-completed discussion, (c) whom they would most like to work

Figure 1. Teleconference node.



with again on a similar problem. Both Turk (1961) and Marcus (1960) have long since pointed out the ambiguities which might arise from using "likeability" as this third index. Subjects did not receive feedback from the experimenter as to how their performance had been rated by their fellow members of the group.

Results

Two behavioural measures of interaction were employed: (a) frequency of interaction attempts, and (b) the duration of these attempts. These scores were calculated by coders who viewed videotapes of each session. Video-mediated participants tended to have lower scores on both measures, but the effects were not strong enough to meet the usual significance criteria. Video-mediated subjects spoke a mean of 5.5 minutes per session with a mean interaction frequency of 56.75, while face-to-face subjects spoke 7.26 minutes, with a mean frequency of 72.83. These differences fall just short of significance for both duration, $[F(1,38) = 3.14, p < .08]$, and frequency $[F(1,38) = 2.95, p < .09]$.

It was not meaningful to test for mean differences in the sociometric scores since these were based on ranks.

Degree of Role Differentiation

In order to assess the degree of role differentiation, the variance of the individual scores within each group was computed for each session. Analysis was then performed using these variances as the data points. The rationale for this measure might best be explained by illustrating it with the example of the speaking duration score. If a strong leadership hierarchy does emerge in a group and if leadership is dependent upon talking, some members will tend to monopolize the discussion while the lower-status members will remain relatively silent, leading to a high variance of interaction in that group. In a group with no role differentiation, the discussion time will be more equitably shared and the variance will be low.

A summary of the analysis of these role differentiation indicators is presented in Table 2. The direction of the difference was the same for all measures, i.e., less within group variance under mediated conditions. The effect was strong for both behavioural measures, but for only one of the

sociometric measures, namely, preferability. The possible significance of this pattern of results will be discussed below.

Insert Table 2 about here

Examination of Figure 2 shows how, in face-to-face conditions, graphs relating sociometric data to behavioural data closely resemble those displayed by Bales (1958). The resemblance seems not to be diminished because we employed four-man, not five-man groups, and because we employed "future partner preference" in place of "liking". These effects evidence a dramatic disappearance for the mediated communication groups.

Insert Figure 2 about here

Stability of Roles over Sessions

One may also ask whether or not any existing leadership hierarchy remains stable over time. This was assessed by computing a coefficient of concordance on the ranks of the members in each group over the five sessions. With five groups in each condition and five dependent measures to be assessed for stability, 25 values of $\underline{S}$ were computed for each condition. In face-to-face groups, 19 of the $\underline{S}$ values were significant (i.e., reached a critical value of 62.6 for $\underline{K} = 5$, $\underline{N} = 4$ and $\underline{p} < .05$) with an average value of 72.1. Of the video-mediated groups, only four reached this value with an average $\underline{S}$ value of 33.7. There is less session-to-session consistency in both performance of and attribution toward group members in the mediated communication treatment.

Insert Figure 3 about here

Table 2

Variances of Scores within Groups (Averaged over Sessions)

	Frequency	Duration	Quantity	Quality	Preferability
Mediated	5.27	2.97	3.88	3.65	2.91
Face-to-Face	13.78	8.80	4.96	4.01	4.24
F (1,8)	4.98	8.08	2.73	.47	7.03
p	.06	.02	.14	.51	.03

For this analysis, a variance score was computed for each group of subjects and became the datum for a one-way ANOVA, for each of the five dependent variables. F and p values shown are those associated with specific ANOVAs and, thus, do not represent a ratio of the average variances themselves.

Figure 2. Sociometric Leadership Indexes and interaction.

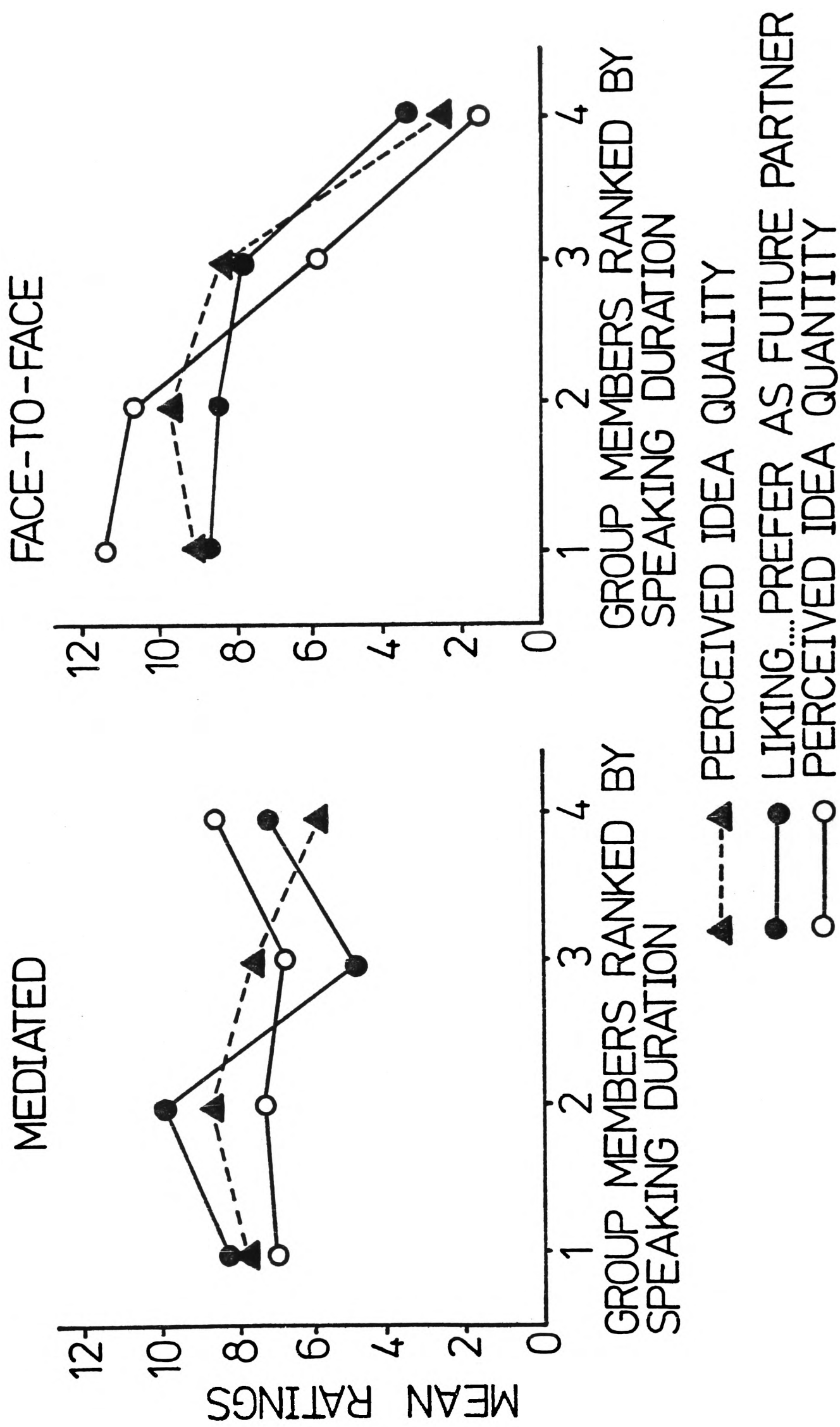


Figure 3. Variability in leadership indexes over sessions.

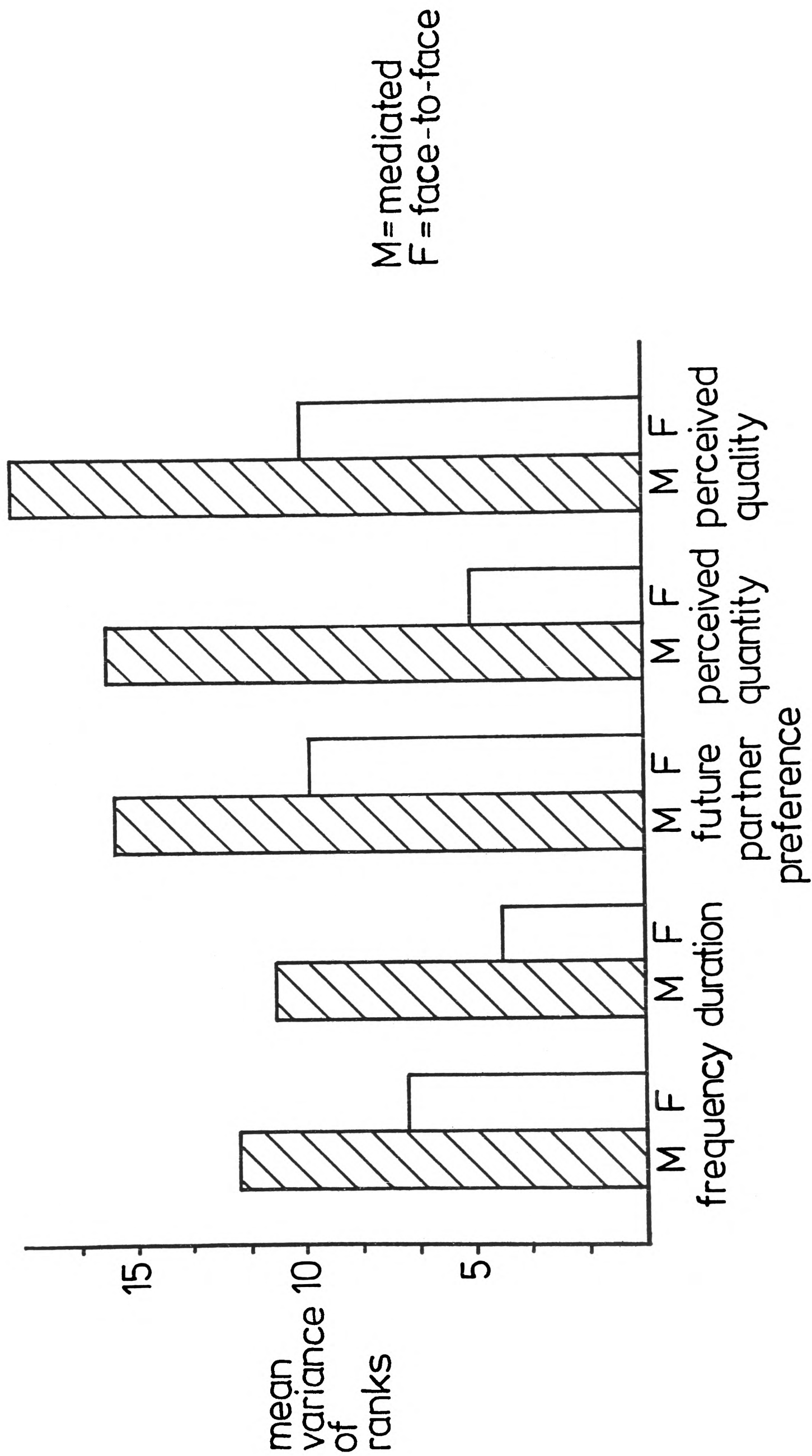


Figure 3 shows the mean variance in group member rankings over five sessions. Member performance varied more across sessions in the mediated groups than in the face-to-face groups. This was true for each of the five dependent variables. An overall "leadership score", a composite of rankings on the five measures, was calculated for each of the four subjects, in each group. The data were searched across variables and sessions to identify the overall "best" and "worst" group members, using this score. The differences between highest and lowest scores were examined for each session, as shown in Figure 4. Clearly, these differences were greater for face-to-face groups, and statistical analysis established that the differential was reliable (paired $t = 3.24$, $df = 4$, $p < .05$, two-tailed test). The figure also shows that the leadership role was reasonably stable and no more pronounced with increased group experience. In fact, there is a slight tendency towards a lowering of the "leadership index" in the fifth session, and this is in contradiction to step 5 of the "Chronology of Natural Leader Emergence in Task-Orientated Groups" (see Table 1). Since our index was derived from ordinally scaled data, Figure 4 provides no indication of possible absolute differences in leader performance.

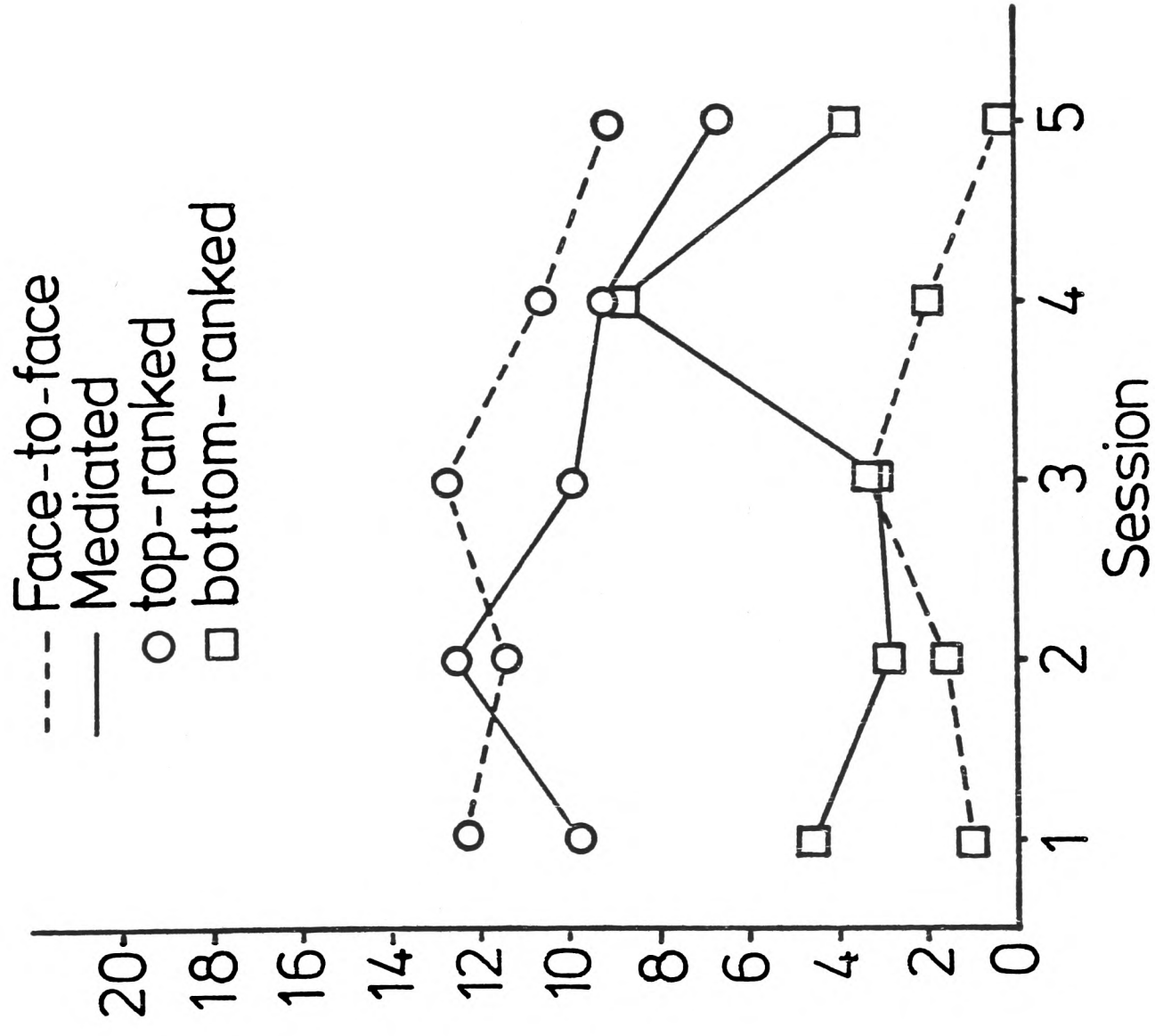
Insert Figure 4 about here

It was possible that a node effect might have accounted for the lack of stability in the hierarchy of video-mediated groups, since participants were assigned randomly to the nodes of the system at the start of each session. This possibility was also tested with coefficients of concordance. This time, however, rankings were assigned to the nodes rather than group members. Only two of the 25 analyses showed significant stability and it was not even the same node in both instances. Thus, it is possible to disregard a systematic node effect as an explanation for the results.

Intercorrelations of Measures

The final analysis was an assessment of estimated variance shared by the five dependent measures. The values of r^2 appear in Table 3 with face-

Figure 4. Average composite scores for top- and bottom-ranked subjects in each group.



to-face groups presented above the diagonal and mediated groups below the diagonal. A clear pattern is apparent. The behavioural measure shared more variance with the sociometric scores in the face-to-face groups, as shown in the first two rows above the diagonal. The communality is essentially missing in mediated groups, as indicated in columns 1 and 2 below the diagonal.

In the face-to-face situations, the "preference to work with the other again" shared the greatest variance with quality (74%) and not quantity of ideas (60%), which may suggest the higher-order evolution in the chronology of leader emergence in these groups than in mediated groups, where the "preference" index shared only a moderate but equal portion of the variance with perceived idea quality and quantity (26%). With the mediated groups, the communality of actual duration of interaction and perceived quantity of ideas was 50%, whereas with the face-to-face groups it was considerably stronger (72%). Speaker contribution to values of this index, while still discernible in the mediated interactions, was less obvious than in face-to-face situations. Perhaps of greatest significance, communality of variance between duration of participation and quality of ideas contributed was a respectable 62% in face-to-face conditions but only 8% in mediated conditions. With mediated interactions, the usual relationship between the amount spoken and the quality of contribution either was not apparent or did not exist. The degree of association among the sociometric indexes was generally much lower in mediated groups ($\bar{X}$ of 25%) as compared with face-to-face groups ($\bar{X}$ of 67%). In fact, the overall association strength among all dependent variables was merely 16% in mediated groups but 57% in face-to-face groups. This is taken to support the hypothesis that group consensus with respect to indexes of leader emergence was less formed in the mediated groups as compared with face-to-face.

Insert Table 3 about here

Table 3
Estimates of Variance Shared by Dependent Variables

	(1)	(2)	(3)	(4)	(5)
(1) Frequency of Interaction	-	.53	.55	.40	.36
(2) Duration of Interaction	.12	-	.72	.62	.52
(3) Perceived Idea Quantity	.06	.50	-	.66	.60
(4) Perceived Idea Quality	.00	.08	.23	-	.74
(5) Future Preferability	.04	.06	.26	.26	-

Values of r^2 for face-to-face groups appear above the diagonal; for mediated groups, they appear below.

Discussion

The results of this study may be summarized as follows:

1. A behavioural hierarchy emerged and maintained itself in face-to-face groups to a significantly greater extent than in mediated groups.
2. Attributions of idea quality and attractiveness were related to behavioural measures of interaction quantity in face-to-face groups but not in mediated groups.
3. Attributions of idea quantity, quality, and attractiveness, while related to one another in both conditions, were much stronger in the face-to-face conditions. Intragroup processes were strongly affected by the communication medium context.

At this point, any attempts to find a theoretical explanation for these results must, of necessity, be branded as highly speculative. Nevertheless, it may be worthwhile to offer some hypotheses as a guide to future research.

One possibility is that the context of mediated communication reduced the interpersonal cues (both verbal and nonverbal) to the extent that individuality of each group member is less salient to the participants. The chronology in Table 1, which has suggested the manner in which subtle interaction processes contribute to the evolution of a leader, may be usefully recalled here. Previous research has shown that if externally imposed restrictions are placed upon idea generation (e.g., structured turn-taking), the salience of participation differentiation is obscured. Potential leaders simply have less opportunity to have their superior contributions recognized (Richardson, Mayhew, Jr. & Gray, 1969). Moreover, the concept of "formality" (defined in terms of availability of social cues) in the use of communication systems may be pertinent (Morley & Stephenson, 1969, 1970). As an independent variable, "formality" has been manipulated both in terms of communication medium and restraints upon verbal interaction. Such restraints seem to increase the focus on task while decreasing attention to interpersonal processes. The video-mediated groups in the present study seemed to interact with similar restraints arising from the communication medium. To amplify this interpretation of our results, we draw attention

to (a) the apparent reduction of interpersonal consensus (with respect to leadership emergence) and (b) the apparent increase in focus upon the task (less time to arrive at a task solution). More recently, comparisons of face-to-face and telephone interactions have generated conclusions as follows: "...visual communication has three main effects upon the content of exchanges: it encourages spontaneity and, hence, a more wide-ranging discussion, while at the same time promoting the adaptation of conventional role relationships by the participants" (Stephenson, Ayling & Rutter, 1976). From the present study, we would suggest that this statement is most appropriate for visual communication that permits interpersonal social influence, especially by way of mutual gaze and nonverbal cues. Our mediated groups had visual contact, of course, but not eye contact among group members. Unless contributions and influence attempts are clearly associated with specific people, no hierarchy can result.

Finally, we should discuss one of the variables, examination of which was seen as an advantage of this study, namely, adaptation to the mediated situation over time. We find no evidence that the mediated groups changed their behaviour on any of our measures over sessions. This does not mean that adaptation cannot or does not occur. We may not have measured the relevant dimensions or provided enough experience with the system to allow the adaptation process to occur. Much longer and more sensitive studies are clearly required, particularly as the forecast improvements in video communication technology become actualities; however, it is clearly suggested here that the evolution of leadership structures, at least, may be radically affected by technological mediation of member interaction.

Acknowledgement

I wish to acknowledge the collaboration of Dr. L. H. Strickland, Dr. J. C. Barefoot and Mr. S. A. Paterson in the conduct of this study.

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Distance, Gaze and the Intimacy Equilibrium Model
in Video-Mediated and Face-to-Face Dyads.

Abstract

This experiment focused on the Argyle-Dean Intimacy Equilibrium Model, gaze and social distance in face-to-face and video-mediated dyads. It was found that, during video-mediated interaction, communicators did not experience the anticipated degree of interpersonal remoteness or separation. What was expected to act as a technological barrier appeared to affect social influence but not interpersonal or informational communication. Under video-mediated (teleconference) conditions, certain negative consequences of excessive intimacy (especially assertiveness or dominance) appeared less salient, while certain positive effects remained unchanged. Consequently, subjects in the video-mediated conditions liked each other to a greater degree, enjoyed the experiment to a greater extent, and perceived greater "closeness" than did subjects in face-to-face conditions. The levels of intradyadic gaze, which were significantly higher in the video-mediated dyads, may have increased perceived intimacy between communicators.

The investigation of group interactions occurring in some form of technological medium has, in recent years, attracted increased attention from social psychologists (e.g., Champness, 1973; Chapanis, 1975; Christie, 1975; Morley & Stephenson, 1969; Reid, 1973; Short, Williams & Christie, 1976; Turnbull, Strickland & Shaver, 1976). Apart from the studies concerned with media effects, closed-circuit television systems have established their worth in social psychological research as a means of simulating interactions, as a powerful feedback technique, and as a method of recording behaviour for later analysis (e.g., Enzle & Hansen, 1976; Putz, 1975; Scherwitz & Helmreich, 1973; Shea & Rosenfeld, 1976; Storms, 1973; Wickman, 1970).

Group interaction occurring via a two-way audio-video link, is often referred to as a "teleconference" (e.g., Coll, George, Strickland, Guild & Paterson, 1975; Duncanson & Williams, 1973; McManamon, 1975). Applications of man-machine communication systems have encouraged teleconference feasibility studies with a certain urgency. This urgency may generate what seem to be hasty conclusions concerning the essential characteristics of mediated social processes. Psychologists investigating communication questions might promote their understanding of technologically mediated group process through employment of certain enduring theoretical frameworks established in face-to-face situations. For example, the Intimacy Equilibrium Model (Argyle & Dean, 1965) has been widely used in experimental investigations to generate predictions related to the interaction of such variables as amount of gaze, physical proximity, and intimacy experienced in the small group situation. Argyle and Cook (1976) have summarized the extensive literature on gaze-related variables which can be studied in a setting of mediated communication. Kaplan and Greenberg (1976) have provided a theoretical outline of how the Intimacy Equilibrium Model may further studies in telecommunications.

In face-to-face dyadic interaction, gaze serves both interpersonal or social functions, and informational or task functions. It may act as a signal of attention, as a source of feedback, as a cue to facilitate smooth

interaction during discourse, and as an indicator of liking or approval (e.g., Argyle & Cook, 1976; Efran, 1968; Ellsworth & Ludwig, 1972; Exline & Messick, 1967; Kendon, 1967; Pellegrini, Hicks & Gordon, 1970).

Reduced levels of gaze may be attributable to dislike, distrust or disapproval, whereas too much gaze may be attributable to assertiveness, potency or excessive intimacy (Breed, 1972; Kleinke, Bustos, Meeker & Staneski, 1973; Strongman & Champness, 1968; Thayer, 1969). These counterinfluences, created by the desire to produce positive outcomes while avoiding the negative consequences, were recognized as the central processes underlying the affiliative conflict theory (Argyle & Dean, 1965).

The intimacy of mediated interaction. In any face-to-face dyadic interaction, there is an optimal distance at which the level of intimacy experienced is neither too high nor too low (Argyle & Dean, 1965; Goldberg, Kiesler & Collins, 1969; Mehrabian, 1968; Patterson & Sechrest, 1970; Scherer & Schiff, 1973). The optimal distance will vary depending on such things as degree of familiarity between communicators, and the type of experimental task. In mediated interaction, where physical distance is only one dimension of separation to be experienced, "immediacy" (Wiener & Mehrabian, 1968) may be a more useful concept to employ than distance. Predictions about changes in immediacy associated with different media of interaction have been outlined by Mehrabian (1971):

The concept of immediacy can describe best the effects of a given space on the people who meet and/or interact there. Immediacy refers to the extent of mutual sensory stimulation between two persons and is measured in terms of spatio-temporal proximity or the number of "communication channels" that are available. Communication channels are the means by which one conveys his thought and feelings to another...the closer two people are to one another, the more immediate their interaction... The greater immediacy associated with more channels for communication is illustrated as follows: telegrams and

letters are two of the least immediate ways of communicating, permitting the verbal channel alone. These are followed in order by telephone conversations (verbal and vocal channels), conversation on a picturephone (verbal, vocal and facial), and face-to-face meetings. (pp. 76-77)

Immediacy should be reduced when the capacity of communication channels is diminished qualitatively or quantitatively. As a function of increased immediacy of the communication medium, Ochsman and Chapanis (1974) seem to have shown increased efficiency in problem-solving tasks, and Wichman and Libby (1974) have observed greater cooperation during a Prisoner's Dilemma game. Similarly, Williams (1975) observed that more coalitions were formed in more immediate interaction circumstances. Putz (1975) found that performance on a vigilance task was related to immediacy as manipulated by the type of mediated supervision which the experimenter exercised over subjects. In a study comparing audio, audio plus video, and face-to-face modalities in a dyadic negotiation task, Turnbull, Strickland and Shaver (1976) observed that bargaining success was greatest when the medium was more immediate. Milgram (1974) reported greatest obedience to the experimenter when the immediacy was lowest between the teacher-subject and the learner-subject.

There seems to be a similarity between Mehrabian's notion of immediacy and "formality" which is defined by Morley and Stephenson (1969) in terms of "the number of social cues available". This latter parameter was manipulated by varying the channel of communication, and the results were consistent with the immediacy studies.

Typically manipulated as an independent variable, immediacy seems to imply a physical property of a medium that can be objectively quantified in terms of variables like communication channels, modalities, nonverbal cues and spacio-temporal proximity. Intimacy, on the other hand, may be thought of as a subjective experience of communicators. As a psychological phenomenon, intimacy may be inferred from such dependent variables as

reports of interpersonal attraction, and perceived psychological or social distance.

Short, Williams and Christie (1976) have discussed the concept of "social presence" as a characteristic of a medium that concerns the user's subjective attitude towards a communication experience. Their concept has been empirically defined by four items in a semantic differential. These are: "unsociable-sociable, insensitive-sensitive, cold-warm, impersonal-personal" (p.66). They suggested that:

...the use of television rather than audio-only communication makes for greater intimacy, other things being equal...In some cases, immediacy and Social Presence may vary together. For example, if a person has both a voice telephone and a picture telephone available, both immediacy and Social

Presence will be greater if he chooses the latter. (pp. 72-73)

A similar semantic differential component which is termed "social distance" and is defined by 13 bipolar adjectives was described by Guild (1974).

On the basis of the Intimacy Equilibrium Model, it was predicted that the influences of the physical medium properties, hence immediacy, would operate on intimacy in a manner consistent with other studies which have employed this model. Just as physical separation is a salient aspect of face-to-face immediacy (and thus a critical determinant of intimacy experienced), so the image size of the communicators in the mediated conditions was manipulated as a salient aspect of immediacy. It was predicted that mediated dyads would report less intimacy and greater social separation than those in the more immediate face-to-face conditions (Mehrabian, 1971). Moreover, a mediated 3 metre separation between communicators was expected to be interpersonally more remote than a mediated 2 metre separation; in the same way, a 3 metre face-to-face condition was expected to be experienced as more remote than a 2 metre face-to-face condition. These were straightforward predictions derived from the Intimacy Equilibrium Model, with the added assumption that

communicators would find any form of mediated interaction less personal than face-to-face interaction (Mehrabian, 1971).

Intradyadic gaze. Sanctions like smiles and frowns, which are thought to accompany gaze when face-to-face, may not be effectively communicated in mediated interaction. Even when the teleconference system provides a close semblance of eye contact (i.e., adjusting the camera and monitor angles so that mutual gaze appears natural), concern about excessive intimacy, assertiveness and potency may lose salience due to reduced immediacy through technological intervention. It was predicted that mediated communicators would exhibit a higher frequency and duration of gaze than their face-to-face counterparts. This assumes carry-over effects from passive television viewing (McLuhan, 1964). Furthermore, with reduced image size, it was expected that levels of gaze at a mediated 3 metre distance would exceed those at a mediated 2 metre distance.

In the face-to-face conditions, the reliable predictions of intimacy equilibrium theory were expected. Dyads separated by $\frac{3}{4}$ metre were expected to demonstrate the lowest levels of gaze followed by increased levels at a comfortable 2 metre distance, and still higher levels of gaze at the extreme 3 metre distance (Argyle & Ingham, 1972; Hall, 1966; Mehrabian, 1972; Patterson & Sechrest, 1970; Rosenfeld, 1965; Scherer & Schiff, 1973).

There has been evidence that during a teleconference, communicators can experience the conversations and the other person more positively than in similar face-to-face situations (Williams, 1972). These findings, while provocative, require further investigation. If communicators in mediated conditions engaged in higher than normal levels of gaze, then theoretical support for Williams's results may be found in studies similar to that of Cook and Smith (1975). This study suggests a linear relationship between the amount of gaze in a dyad and the favourability of impressions formed by subjects of each other. Similar relationships between the amount of eye contact in face-to-face conditions and affective responses (Ellsworth & Carlsmith, 1968; Exline & Winters, 1965; Goldberg, 1968; Kendon & Cook, 1969; Kleck &

Nuessle, 1968; Mehrabian, 1969; Stass & Willis, 1967; Thayer & Schiff, 1974), and between eye contact and physiological arousal (Kleinke & Pohlen, 1971; McBride, King & James, 1965; Nicholas & Champness, 1971) have also been found.

Video-mediated interaction should afford the opportunity to combine two social influences in a unique way. These are (a) a high level of interpersonal gaze, and (b) a high level of interpersonal separation. Should predictions with respect to intimacy during mediated interaction be adjusted because of these counterinfluences? It has been shown that an increase in gaze can cause an increase in the intimacy experienced, whereas an increase in distance (or decrease in immediacy) can reduce intimacy. Of these two opposing influences, the latter was expected to exert a stronger effect in the present experiment. That interaction over a teleconference system would create a less intimate experience than interaction face-to-face separated by three metres is partly an intuitive prediction. But, as stated earlier, the picturephone was thought to be a less immediate medium than face-to-face meetings (Mehrabian, 1971). Where decreased immediacy was created, one might expect reports of lower intimacy, less positive regard between communicators and, overall, a less positive assessment of the experiment.

Hypotheses

It was expected that:

1. There would be greater frequency and duration of gaze in video-mediated conditions than in face-to-face conditions.
2. Dyads interacting face-to-face at the $\frac{3}{4}$ metre distance would show the lowest levels of gaze, less than dyads at the 2 metre distance which, in turn, would be less than dyads interacting at the 3 metre distance.
3. Dyad members in the two video-mediated conditions would report lower levels of intimacy, less liking for each other and the task than face-to-face dyad members at the corresponding 2 and 3 metre distances.
4. Dyad members interacting at the 2 metre distance would report a higher level of intimacy than dyad members interacting at the 3 metre

distance; this was predicted for both face-to-face and video-mediated groups.

Method

Subjects

Forty members of the University of Oxford Psychology Department Subject Panel, about an equal number of nonstudents and undergraduates, were paid 50 pence per hour for participating in this experiment. Mixed sex dyads (20 males and 20 females) were unacquainted prior to the experiment, and had a mean age of approximately 20 years (range was 18 to 32 years).

Procedure

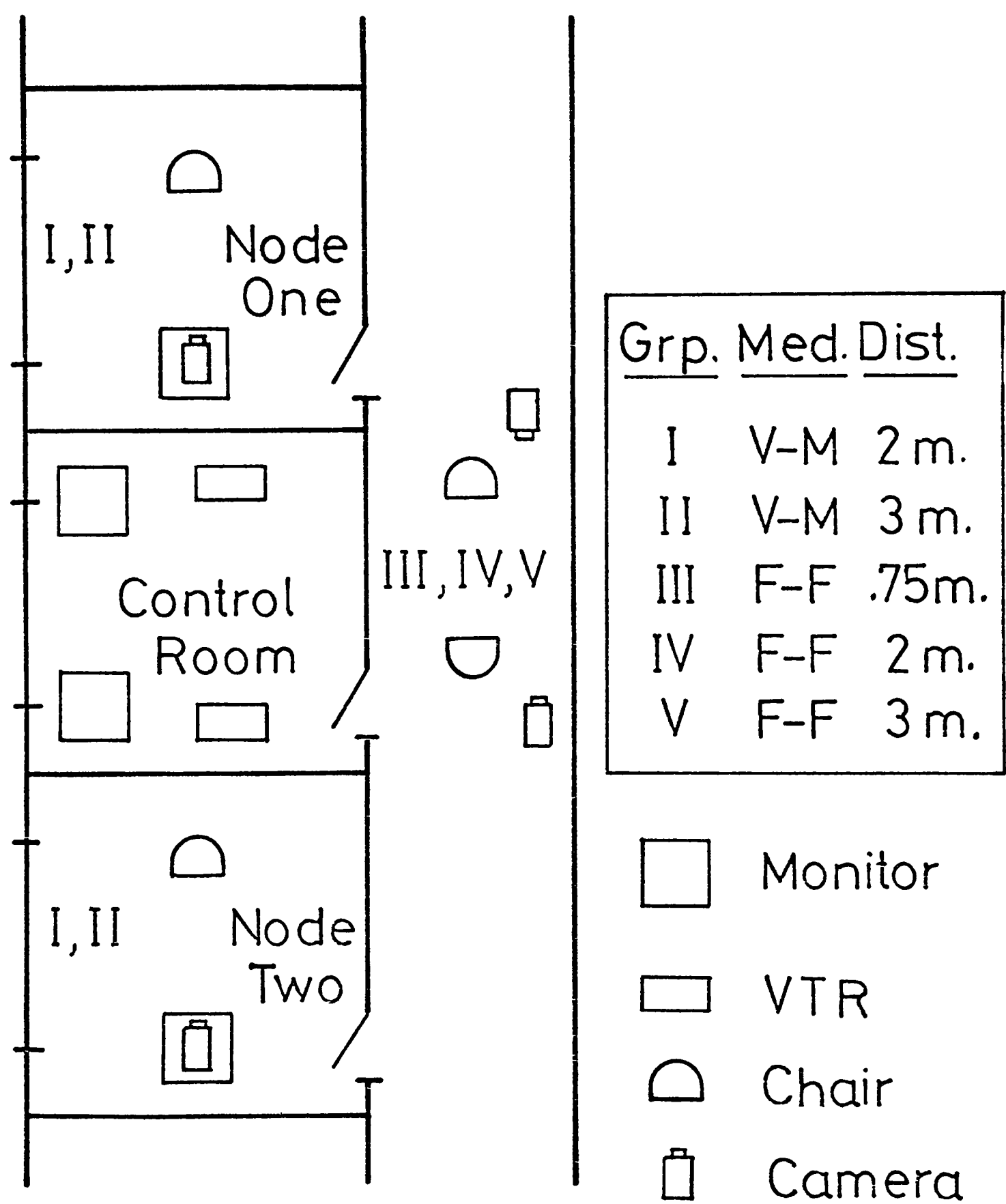
Identification numbers I to V were assigned to the groups in the experimental conditions as designated in Figure 1. An interactive audio-video link was established between three adjoining rooms such that the two extreme rooms were the communication nodes and the centre one was the control room. Subjects in the mediated conditions were seated in one of

Insert Figure 1 about here

the two communication nodes separately so that they did not know the distance between two rooms but were aware that both were in the laboratory. Subjects in the face-to-face conditions sat in chairs located in a wide corridor.

The communication link. In the mediated conditions, each subject was seated in a chair securely placed 1.7 metres from a 19 inch monochrome video monitor. A video camera was mounted above the monitor and pre-adjusted to give a head-and-shoulders image of the communicator with a reasonable semblance of eye contact. The distance-between-subjects manipulation was accomplished by changing the 25 mm lens of the video camera in the mediated 2 metre condition to a wider angle 16 mm lens in the mediated 3 metre condition. Previous tests established photographically which lenses would create a retinal image size equivalent to a 2 and 3 metre

Figure 1. Experimental Conditions.



distance. An audio-speaker was located below each monitor and each subject wore a neck microphone during the experiment. The audio was provided by a two-channel stereo tape recorder, one channel per node, and levels were adjusted to give a clearly audible voice link between nodes. Unobtrusive wiring fed into the control room where the experimenters (one male and one female) could monitor and record the problem-solving sessions. The duration of the sessions was controlled by playing the audiotape briefing to the subjects and allowing four minutes of discussion. Four human relations problems which encouraged discussion were employed. None had a "correct" solution. The order of presentation was randomly determined and held constant across all groups. Subjects were instructed to discuss each of the problems in turn and attempt to reach a mutually acceptable solution.

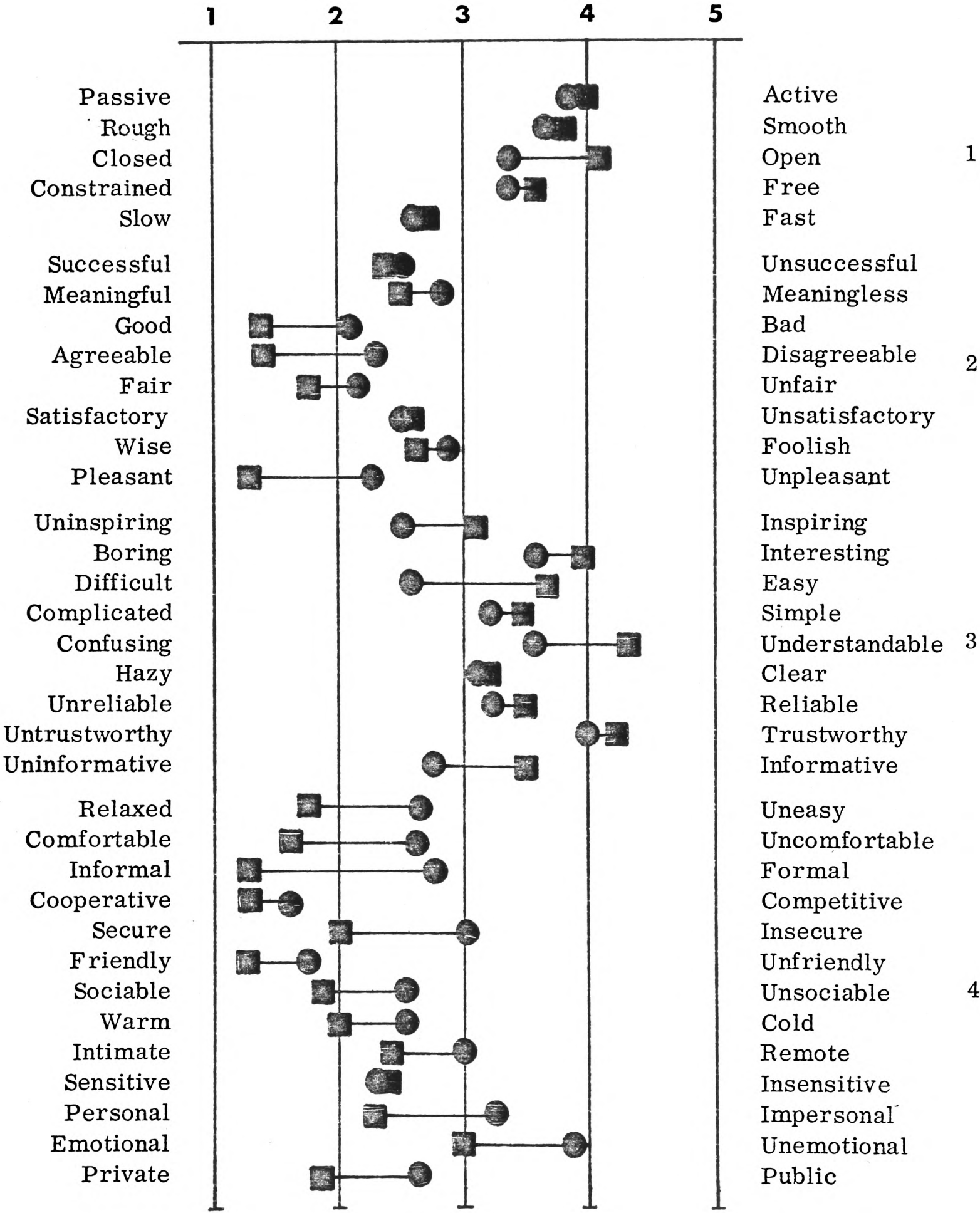
The same recording and briefing methods were used in the face-to-face conditions which were conducted in the corridor. Factors such as distance to the video camera, the wearing of neck microphones and the lighting levels were approximately the same as in the mediated conditions. The independent variable manipulation was produced by altering the seating distance between subjects. The chairs were fixed to the floor in all three conditions to ensure the desired intersubject distances of $\frac{3}{4}$, 2 and 3 metres.

The postexperiment questionnaire. Following the fourth problem-solving task, subjects adjourned to a central room and there completed a questionnaire. Assurance was given that the ratings would be confidential. The questionnaire provided the attitudinal indexes and subjective estimates of distancing between communicators during the experiment. In addition, a 35-item semantic differential containing a social distance component (see Figure 2) was employed (see Appendix A).

Insert Figure 2 about here

Other items in the questionnaire asked subjects to estimate the perceived distance between themselves and the other person in the dyad.

Figure 2. Ratings by V-M at 2m. (■)
Versus F-F at .75m. (●)



Semantic differential components are:

- 1. Activity.
- 2. Evaluative.
- 3. Communicative.
- 4. Social Distance.

This was considered in terms of both physical distance and psychological distance (5-point scales anchored "near-far") and as estimates in feet of the actual distance separating the communicators. The first two items were intended to tap subjective dimensions of distance and the last item, a more objective dimension.

Data analysis. The five experimental conditions produced comparable videotape recordings that were analysed by two independent coders in order to determine frequency and cumulative duration of gaze in the direction of the other's face, both while talking and while not talking. As well, the frequency and cumulative duration of talking were measured. An intercoder correlation of agreement of .92 was obtained and with such consistency, the mean of the two coders was used in the analyses. Previous research has found similar high agreement between coders (Exline, 1963).

Where a priori pairwise multiple comparisons were appropriate, these were performed using the t-test procedure. Where a posteriori multiple comparisons were necessary, Scheffé's S method was employed for nonpair-wise comparisons and Tukey's LSD for pairwise (Kirk, 1968).

Results

Behavioural indexes of gaze. A MANOVA shows that, considering all dependent variables at once, the five experimental groups differ multi-dimensionally (approximate F-statistic 1.99, p < .01). This test suggests that further univariate analyses are appropriate.

Insert Table 1 about here

Of the four univariate ANOVAs shown in Table 1, only in the case of "percentage of gaze while talking" is there a significant effect which differentiates the five conditions (F = 2.63, p < .05). Multiple comparisons among group means for this dependent variable reveal that the mediated 2 metre condition, with gaze 65.6% of the time during discussion, is significantly different from the $\frac{3}{4}$ metre face-to-face condition which shows

Table 1
Behavioural Indexes of Gaze

Dependent Variable of Gaze	Group Mean					F Ratio	ω^2
	I	II	III	IV	V		
Percentage Talking	65.6	50.5	38.6	38.6	55.4	2.63*	.14
Frequency Talking	88.3	89.4	58.8	95.6	77.3	1.52	.05
Percentage Not Talking	52.0	54.6	32.2	50.0	50.8	1.99	.09
Frequency Not Talking	80.4	92.1	63.0	69.9	90.4	1.24	.02

* $p < .05$.
 The strength of association between I, V, and D.V. is indicated by ω^2 .
 Group I = mediated 2 metre.
 Group II = mediated 3 metre.
 Group III = $\frac{3}{4}$ metre face-to-face.
 Group IV = 2 metre face-to-face.
 Group V = 3 metre face-to-face.

38.6% gaze ($p < .05$) and differs significantly from the 2 metre face-to-face condition which again shows 38.6% gaze while talking ($p < .05$). The rather low amount of gaze in the latter condition (closer to 60% in previous studies) may be related to the addition of the video camera. This possibility will be discussed later.

Recall that mediated dyads were expected to show the highest levels of gaze, while face-to-face conditions were expected to show the usual Intimacy Equilibrium Model findings (i.e., least gaze at $\frac{3}{4}$ metre distance; most gaze at the 3 metre distance). Although the univariate ANOVAs for the four behavioural indexes do not indicate that all of the expected differences have emerged, further nonparametric analysis using Kendall's coefficient of concordance demonstrates that, as far as the predicted rank-ordering of the five groups is concerned, Hypotheses 1 and 2 are supported ($W = .58$, $p < .05$). Rank-ordering (lowest to highest) of the five groups, according to the four gaze measures, occurs as follows (a) $\frac{3}{4}$ metre face-to-face condition, (b) 2 metre face-to-face condition, (c) 3 metre face-to-face condition, (d) mediated 2 metre condition, and (e) mediated 3 metre condition. Thus mediated dyads do exhibit the highest levels of gaze and, in the face-to-face conditions, the gaze index shows results consistent with the Intimacy Equilibrium Model.

Perceived separation of communicators. In the face-to-face conditions, the estimates (in feet) of the actual distance between pairs of communicators were reasonably accurate and consistent. This was not the case in the mediated conditions as the following variances for Groups I to V show: 35.23, 53.58, 0.74, 0.74 and 3.28 respectively. Clearly, Groups I and II (mediated 2 and 3 metre) have large intragroup differences in their manner of estimating the distance. When asked to explain their interpretation of the question, during debriefing, some subjects interpreted it as the 63 inch distance between themselves and the video monitor. Others calculated their estimates as twice the distance from the monitor, visualising the other subject's placement to be similar to their own. Still others estimated the distance based upon the image size shown on the monitor, implying a comparison with face-to-face distancing. Consequently, estimate of distance as a dependent variable is excluded from the overall MANOVA.

Insert Table 2 about here

Other sociometric questionnaire items related to interpersonal separation proved more useful in the overall analysis (see Table 2). Firstly, physical distance between the subjects is perceived to be "nearest" in the $\frac{3}{4}$ metre face-to-face condition ($\overline{X}_{III} = 1.88$ on the 5-point scale), followed, unexpectedly, by the mediated 2 and 3 metre conditions ($\overline{X}_I = 2.00$ and $\overline{X}_{II} = 2.25$). The 2 and 3 metre face-to-face conditions receive ratings slightly on the "far" side of the midpoint of 3 on the 5-point scale ($\overline{X}_{IV} = 3.13$ and $\overline{X}_V = 3.63$). A priori pairwise comparisons (t tests) show that Group III differs significantly from Group IV and V. In the face-to-face and mediated conditions, the relationship is as predicted ($\overline{X}_I$ $\overline{X}_{II}$ and $\overline{X}_{IV}$ $\overline{X}_V$). However, the mediated groups (combined $\overline{X} = 2.13$) are seen as less physically separated than their face-to-face counterparts (combined $\overline{X} = 3.38$); a significant difference ($p < .05$) suggesting that the medium separation effect does not operate as predicted in Hypothesis 3.

This evidence is supported by the results of the item concerning perceived psychological distance. The most psychologically distant conditions are found to be the 2 and 3 metre face-to-face conditions ($\overline{X}_{IV} = 3.00$ and $\overline{X}_V = 3.75$). In choosing the 2 metre distance, it was hoped to produce the optimum proximity for discussion; a distance perceived to be neither too close nor too far apart. The means of 3.13 (physical distance) and 3.00 (psychological distance) on 5-point scales suggest that this separation produced the desired effect. The 3 metre face-to-face condition is significantly different from the $\frac{3}{4}$ metre face-to-face condition ($\overline{X}_{III} = 2.50$) and the mediated 3 metre condition ($\overline{X}_{II} = 2.13$, $p < .05$). While the 2 metre face-to-face condition and the mediated 2 metre condition do not differ significantly ($\overline{X}_{IV} = 3.00$ and $\overline{X}_I = 2.63$), the direction of difference tends towards the latter being psychologically nearer. The overall mean for mediated conditions is 2.38; for the face-to-face conditions it is 3.38

Table 2
Sociometric Indexes of Intimacy

Dependent Variable of Intimacy	Group Mean					ω^2
	I	II	III	IV	V	
Social Distance Component of Semantic Differential	4.07	3.41	3.35	3.40	3.18	.21
Perceived Physical Distance	2.00	2.25	1.88	3.13	3.63	.32
Perceived Psychological Distance	2.63	2.13	2.50	3.00	3.75	.16
Preference to Work with Other Again	4.88	4.50	4.38	3.63	3.75	.16

* $p < .05$.

The strength of association between I. V. and D. V. is indicated by ω^2 .

Response scales were anchored:

Social Distance Component of Semantic Differential: Low distance = 5; High distance = 1.

Perceived Physical Distance: Near = 1; Far = 5.

Perceived Psychological Distance: Near = 1; Far = 5.

Preference to Work with Other Again: High preference = 5; Low preference = 1.

(NS, $p = .11$). Contrary to the prediction of Hypothesis 3, this too suggests that the video medium intervention produced paradoxical closeness.

Semantic differential index of intimacy. Employment of the bipolar adjective checklist follows extensive use of the same semantic differential in similar communication settings. Figure 2 demonstrates the lawfulness of results using this semantic differential. While there were four component ~~factors~~ (social distance, activity, evaluative and communicative), only the results for the social distance component are reported in detail here (see Table 2). Compared with all other conditions, the mediated 2 metre condition is significantly lowest in social distance ($p < .05$), while the 3 metre face-to-face condition is greatest in social distance ($p < .05$). The overall ordering of conditions, from low to high social distance is (a) mediated 2 metre ($\bar{X}_I = 4.07$), (b) mediated 3 metre ($\bar{X}_{II} = 3.41$), (c) 2 metre face-to-face ($\bar{X}_{IV} = 3.40$), (d) $\frac{3}{4}$ metre face-to-face ($\bar{X}_{III} = 3.35$), and (e) 3 metre face-to-face ($\bar{X}_V = 3.18$). All groups give ratings that are on the side of low social distance on the 5-point scale. Consistent with the other distancing indexes but inconsistent with predictions of immediacy, the mediated interaction is perceived to have less social distance (more social presence) than face-to-face interaction. Moreover, these results offer support for Hypothesis 4 in that the 2 and 3 metre conditions in both face-to-face and mediated differed ($p < .05$).

When Kendall's coefficient of concordance is applied to the rank-ordering of all 35 semantic differential items, it demonstrates the consistent arrangement of the five groups. The average rankings were as follows: Group I = 4.53, Group II = 3.04, Group III = 2.96, Group IV = 2.59 and Group V = 1.74 (Kendall's $\underline{W} = .46$, $p < .01$). In general, the results from the semantic differential analysis suggests that the mediated conditions experienced high interpersonal intimacy and positive evaluation of the interaction.

Preference to work with the other person again. The questionnaire item regarding "preference to work with the other person again" produces a significant difference (Table 2, $\underline{F} = 2.96$, $p < .05$). The mediated dyads are

shown to be most compatible ($\bar{X}_I = 4.88$, $\bar{X}_{II} = 4.50$). Multiple comparisons show that the mediated 2 metre and 3 metre conditions differ significantly from the 2 metre ($\bar{X}_{IV} = 3.63$) and 3 metre ($\bar{X}_V = 3.75$) face-to-face conditions (Scheffé, $p < .05$). Subjects in the $\frac{3}{4}$ metre face-to-face condition expressed a preference to work with each other again ($\bar{X}_{III} = 4.38$).

Also of interest is the relationship between immediacy and the preference to work with the other person again. Rank-ordering the five groups according to the predicted levels of immediacy and then correlating this with rank-ordering of the groups using this attraction index produces a Spearman's rank correlation coefficient of $-.60$. But, when the same attraction index is correlated with a perceived distancing index (actually, the combination of perceived physical and psychological distance), the resulting correlation is $.58$. The degree of negative agreement in the first correlation is about the same as the degree of positive agreement in the second. Both correlations are significant ($p < .05$).

Open-ended question. The general comments of the communicators, which were analysed in order to ascertain the frequency with which (a) the problem-solving task, (b) the experimental setting and/or apparatus, (c) both of these, and (d) neither of these were mentioned, do not suggest that their views of the experiment differed (i.e., the mediated conditions regarding it as a communications experiment, but the face-to-face conditions regarding it as a problem-solving task). The five conditions comment with approximately equal representation in all categories. This does not support the notion that different performance sets or experimental demands were operating across conditions.

The open-ended question does, however, provide the following two statements which seem compatible with the interpretation that is offered for these results. One comment: "(The mediated 3 metre condition) was probably more relaxed with the TV set-up than if we had both been in the same room" and, from the mediated 2 metre condition, this comment: "...you seem to be able to look more directly at the other person than when they are actually in the same room. By setting up one sort of barrier, the TV breaks down others." Both of these subjects state implicit comparisons between

interaction held "in the same room" as opposed to some other form of mediated interaction, such as a telephone link. They did this, not knowing what comparisons were being made in this experiment.

Discussion

Levels of interpersonal gaze. The evidence supports the hypothesis that video-mediated communicators gaze more at each other than do face-to-face communicators. In the mediated 2 metre condition, the level of gaze while talking is reliably higher than in the $\frac{3}{4}$ metre and 2 metre face-to-face conditions. This follows from the assumption that people familiar with passive viewing of television maintain a higher-than-normal degree of gaze in order to gain as much information as possible via the video channel. Why then is the effect not found in the "gaze while not talking" condition? Previous studies have used "gaze while listening" as a dependent variable (for review see Argyle & Cook, 1976). In the present study, it is difficult to judge the difference between gaze while listening and gaze while not talking, but relatively easy to differentiate gaze while talking from gaze while not talking. Employing this distinction, the present "not talking" measure includes a certain amount of time spent gazing in mutual silence.

Intimacy Equilibrium Model. As predicted, there is support for the Intimacy Equilibrium Model in the face-to-face conditions when all behavioural indexes of gaze are considered simultaneously. Where a high degree of interpersonal immediacy is expected ($\frac{3}{4}$ metre distance), this manipulation is effective. Communicators seated closely together report a high level of intimacy, which they see as stemming from their spacing. They offer moderately positive ratings on the semantic differential and show preferences to work with the other person again. It may be that subjects, experiencing awkward closeness, make the necessary intimacy adjustments, but once separated to complete the questionnaire, they choose to emphasize positive aspects of their intimate encounters.

When seated at the more optimal distance for discussion of 2 metres, proximity does not seem to be of great concern. The task is viewed positively, even slightly enjoyably. At the extreme 3 metre spacing, judgments offered by communicators must be interpreted as confirmation

that this condition is uncomfortably distant. Consequently, social interaction suffers and the task is rated more negatively. Rosenfeld (1965) found a similar distance to be "unfriendly" and Mehrabian (1969) found it to communicate "dislike".

Intimacy during teleconference. Perhaps the most interesting finding is one that was not expected. Contrary to predictions, video-mediated dyads perceived themselves to be physically nearer to one another and more socially present than their face-to-face counterparts. They enjoyed working in the experiment to a greater degree (semantic differential) and showed greater preference to work with their partner again. They also tended to perceive less psychological distance than the face-to-face dyads, though this was not statistically significant. These sociometric indexes are what subjects reported as their experiences. Perhaps a form of psychological reactance (Brehm, 1966) operated when subjects thought that a potential barrier to communicative freedom had been transcended. Or it may be that subjects were implying that the experience was not as remote as they had expected it to be. That is, they may have rated the communication experience against a rather negative tacit expectation.

Other possible response biases might be considered. For example, if subjects had deduced or been informed that the basis of comparison was between mediated and face-to-face encounters, demand characteristics (Orne, 1962) and social desirability pressures (Crowne & Marlowe, 1964) might have elicited negative reactions from the mediated subjects toward the communication experiment. On the other hand, if subjects had made an implicit comparison between the telephone as a medium of communication and the audio-video link they may have viewed the latter as an improvement. Statements in the "general comments" item of the questionnaire provide no evidence that the comparison had been teleconference versus telephone. Any of these response set interpretations of the differences between the face-to-face and mediated conditions would seem to be rather weak as attempts to explain why the various distance indexes were influenced as they were, or why the two mediated conditions were differentially influenced.

Objective self-awareness during teleconference. Consider the possibility that the video cameras may have introduced a bias. Duval and Wickland (1972) have shown how a state of objective self-awareness can be created by the presence of a video camera. The consequences of this phenomenon for any video communication system should not be underestimated. To assess the possible influence in the present communication context, a second experiment has been conducted to address the issue specifically. There may be a similar source of influence operating equivocally in the present study since communicators in the face-to-face and mediated conditions may have perceived the functions of the video cameras differently. The most obvious function of the cameras in the mediated conditions was to provide a communication link between the nodes. A secondary function, possibly less salient to subjects in these dyads, was to allow the experimenters to monitor and videotape the interaction. In the face-to-face conditions, there was no apparent function except to permit scientific eavesdropping. This may have created a nonspecific negative reaction or the specific perception of privacy invasion.

While this is a feature of video-mediated communication that deserves further investigation, it is doubtful that the presence of the cameras produced the systematic influence underlying the results of this experiment. It should be remembered that it was the mediated subjects who produced the extreme reactions in terms of a marked closeness and positiveness of evaluation. Moreover, in face-to-face groups there was apparently no interference with the expected differentiation along distancing and intimacy dimensions. Cameras were rendered as unobtrusive as possible and subjects could readily gaze at their partner without looking directly into the camera. Communicators seemed to be fully engaged with the experimental task and rarely acknowledged the camera's presence by glances. None of the comments, written or verbal, made by the subjects would suggest that the cameras diminished the level of intimacy. This issue of "function" may have been more apparent to this investigator than it was to the subjects.

Interpretation of intimacy during teleconference. What plausible explanation may be offered to account for the paradoxical closeness

experienced by the mediated dyads? The hypothesis that mediated communication creates an interpersonal barrier may be qualified in the light of the present results together with the extensive literature on the relationship between the amount of gaze and the favourableness of impressions formed. As anticipated with mediated dyads, the dependent measures of gaze duration were higher than with their face-to-face counterparts. The present study must stop short of stating that these higher measures of gaze were responsible for the feelings of closeness, but it has been shown that high amounts of gaze coincided with low estimates of social distance and positive ratings of both the other person and the experimental task.

One might further refine this notion of mediated social influence if one recalls the earlier statement that intimacy sanctions are not only difficult to impose, they may well be unnecessary. A person's concern for the negative consequences of intimacy (especially assertiveness, dominance and potency) may be diminished by the video mediation. If the affiliative motive remains strong in this social setting, communicators may feel free to enjoy the positive aspects without reserve which is instrumental in the avoidance of negative consequences.

This reaction may be amplified by the experience of arousal stimulated by this novel situation of interaction. In spite of care which was taken to lessen the visual impact of the electronic hardware, mediated subjects may have been more excited by the experimental task. There exists strong evidence that excited people will, at times, make erroneous inferences from situational cues to label their arousal states (Schachter, 1964). In the process of causal attribution for heightened arousal, communicators may seize upon various situational cues that are social rather than technical. Subjects are likely aware of the higher than usual exchange of gaze, the focus upon facial nonverbal cues and the smooth nonthreatening nature of the discussion. It is plausible that subjects would complete the inferential process by concluding that they have enjoyed the social experience. Other studies have shown that subjects will produce links in inference between gaze patterns, arousal levels and feelings of liking (Cook & Smith, 1975;

Ellsworth & Carlsmith, 1968; Exline & Winters, 1965; Goldberg, 1969; Kendon & Cook, 1969; Kleck & Nuesle, 1968; Kleinke & Pohlen, 1971; McBride, King & James, 1965; Mehrabian, 1969; Nicholas & Champness, 1971; Stass & Willis, 1967; Thayer & Schiff, 1974).

In one experimental condition, Williams (1972) found audio-video interactions rated more favourably than either face-to-face or audio conditions. Interpretations of this finding (Short, Williams & Christie, 1976; Williams, 1972) were made in terms of the Intimacy Equilibrium Model. A low-intimacy task (i.e., free discussion about the problems of modern life) did not yield the same positive evaluations from mediated dyads as those of the high-intimacy task (i.e., discussion on the same task but requiring a mutual decision). Their interpretation was that the increased intimacy of the second task was balanced by the level of social presence using closed-circuit television.

In the Williams (1972) study, both the level of acquaintanceship between subjects and the task intimacy were similar to that of the present study, and it may be of consequence that the evaluative ratings of both communication experiences were strikingly similar. The interpretation of the present study is assisted by the fact that mediated dyads reported specifically on the level of intimacy and social presence experienced. Moreover, the $\frac{3}{4}$ metre face-to-face dyads, while acknowledging the extreme closeness of their encounters, rated the experiment and their partner positively. In contrast, the 3 metre face-to-face condition was perceived to be distant. These results, together with the reactions of the mediated dyads, lead to the conclusion that mediated subjects experienced an increase in social presence.

Some mediated communication research seems to have equated or confused channel capacity and immediacy with intimacy and social presence. The distinction is an important one. Channel capacity refers to the quantitative and/or qualitative aspects of a communication medium. Systems engineers measure channel capacity by the number of "bits" of information that may be transmitted in a given unit of time; moreover, it is possible to define channel capacity in terms of the sensory modalities or types of information that may be transmitted (Kaplan & Greenberg, 1976). Any

communication system, whether it involves conversations at a distance of a few feet or the transmitting of telegrams, may be analysed along a channel capacity dimension. Such parameters as distance, transmission rate and type of information communicated, all objectively quantifiable factors, contribute to the delineation of channel capacity in a specific communication system or medium. The hypotheses of this experiment were stated in terms of expected differentiation along the channel capacity or immediacy dimension (i.e., from low to high, mediated 3 metre and 2 metre followed by 3 metre, 2 metre and $\frac{3}{4}$ metre face-to-face). However, these hypotheses were tested by measuring indexes which, while conceptually related, were not equivalent.

Sociometric indexes gave subjects an opportunity to describe their experience and to reflect their reactions to perceived interpersonal intimacy. Channel capacity would influence these perceptions, of course, but other psychological or experiential influences would be present as well. Familiarity with the medium, homeostatic social forces, application of social rules, communicators' acquaintanceship with each other and characteristics of the task, are typical factors which may interact with specific medium qualities to determine subjective reaction.

Some implications. If further investigations of mediated communication processes confirm that paradoxical closeness and low-threat intimacy are reliable and typical experiences, the results of this experiment may have implications for several spheres of concern. With regard to applied communications research, there is the suggestion that the subjective experience of intimacy must be assessed separately from a consideration of the channel capacity of a medium. Moreover, there may be the rudiments of an answer to the question of why certain man-machine combinations have failed to gain user approval. Sinaiko (1974), for example, has observed that it is often high status users such as executives and military commanders who find teleconference systems inadequate as substitutes for face-to-face encounters. These users may sense an inability to influence, persuade, or dominate others. One can imagine other situations in which this low-threat intimacy between people may be used to

advantage. For example, in social skills training it may be feasible to use interactive video links in order to relieve a trainee of social anxieties. Together with the self-feedback capabilities of video replay, the trainee may be guided toward confident face-to-face encounters.

Perhaps of theoretical consequence to social psychology, this study supports previous research which has concluded that gaze is an extremely powerful modality of communication. Regarding the Intimacy Equilibrium Model, there is some indication of what occurs with respect to the intimacy-balancing and affiliative-motive mechanisms when social influence is diluted. More empirical work is necessary to further explore the concepts of social distance, intimacy and immediacy during mediated interactions.

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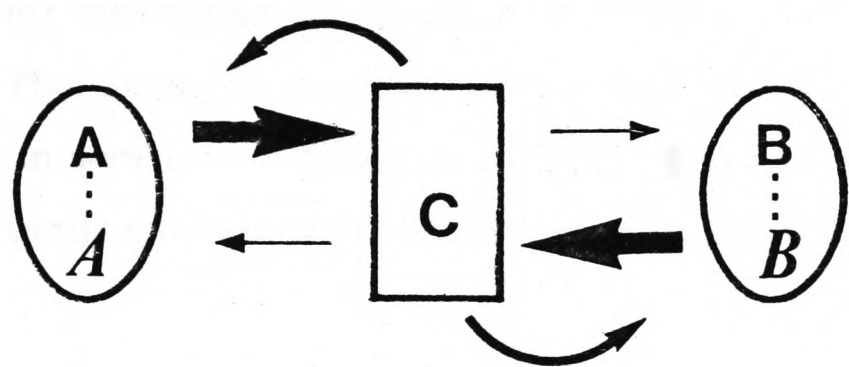
Chapter Three

Intersubjectivity and Studies of Mediated Communication

Communication can take place only between people with a common aim, a common problem, a common curiosity, a common interest; in other words, something in common is meaningful and important or fascinating to both.... Communication in everyday use is a process of adjusting understandings and attitudes, of making them congruent or of ascertaining how and where they agree or disagree. A common language is of extreme advantage in our efforts to communicate, but it is not as important as a common interest and some degree of common understanding.

(Pierce, 1972, p. 36)

Variations in communication effectiveness may be demonstrated by assessing the extent of similarity in perceptions made by A and B. Methods for assessing communality of judgment are conceptually and methodologically advanced. Several communication determinants are considered, for example, the immediacy of media and the similarity among communicators.



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Intersubjectivity: A Concept and Methodology for Communication Studies

Abstract

A theoretical study of intersubjectivity, a condition of shared impressions or communality of experience between individuals, was undertaken. The origins of this concept were considered and an attempt was made to show its compatibility with other theory in social psychology. Methodologies were developed for measuring the extent of intersubjectivity in communication studies. These may be employed to test differences of dispersion or variability in semantic differential ratings. Subsequent investigations of mediated communication may benefit from this type of analysis.

Intersubjective, the adjective, is defined as "existing between conscious minds" and intersubjectivity, the noun, as "the fact or state of being intersubjective". In the 1976 Supplement to the Oxford Dictionary there are eleven references to the term intersubjectivity as it has appeared in largely philosophical writings between the years 1899 and 1963 (e.g., Holzapfel, 1938). It seems implicit that states of intersubjectivity are achieved through some form of communication. In fact, Turner (1925) made direct references to "intersubjective communication". Perhaps it was Feigl (1945) who first used the term in psychological literature to imply experience or understanding shared between persons. Although intersubjectivity is not among the thousands of concepts and research topics currently catalogued in Psychological Abstracts, a dictionary of psychological terms offers the following: "subjective experience (perception, for example) becomes intersubjectivity when several individuals experience the same thing, e.g., report the same experience, or experimental results" (Eysenck, Arnold & Meili, 1972).

As a social phenomenon, intersubjectivity might be studied as a condition of shared impressions or communality of experience between two or more individuals. Indeed, it could be argued that such a phenomenon is implicit in a great deal of social psychological theory, and related to such concepts and topics as social perception, impression formation, stereotyping, implicit personality theory, social influence, conformity, risky shift, social facilitation and attraction. There is reason to suppose that communication studies will find intersubjectivity a useful concept and that methods can be developed in order to empirically test for qualitative and quantitative differences in the level of shared experience in various communication circumstances.

In recent years, a number of developmental psychologists have referred to the intersubjectivity of parent-child communication (Newson & Newson, 1975; Richer, 1975; Shotter, in press; Trevarthen, 1974). The emphasis in much of this research has been on the intimate social processes by which shared meaning and understanding is negotiated for words, nonverbal cues and other symbols used in social interaction.

Such processes have also been of interest to sociolinguists. To paraphrase Rommetveit (1976), communication aims at transcendence of the private worlds of the participants; at states of intersubjectivity. The act of verbal communication is based upon a reciprocally endorsed and spontaneously fulfilled contract of complementarity. Encoding is tacitly assumed to involve participatory decoding; it is taken for granted that speech is continuously listener-oriented and monitored in accordance with assumptions concerning a shared social world and convergent strategies of categorization. Decoding is tacitly assumed to be speaker-oriented, aiming at a reconstruction of what the speaker intends to make known. Intersubjectivity has thus in some sense to be taken for granted in order to be achieved; it is based on mutual faith in a shared social world.

Intersubjectivity may be used in interpersonal communication studies to imply a state in which persons share ideas, home-in on each other's understanding and shape each other's cognitive, perceptual, affective and/or behavioural experiences. Generally, such a process suggests an active negotiation of meaning. To be considered as an intersubjective experience, is it necessary that the phenomenon should exist in a real-time setting as a two-way interaction? While this is typically the way in which intersubjectivity is established, this author believes that these conditions are not all requisites. Passive reception of social information involves tuning-in to the communicator; this is possible because social conventions for communication already exist between transmitter and receiver. We are able to build upon these established conventions just as actors do when they strive to create empathic reactions in their audiences. Communality of experience or shared understanding can occur when no interaction is currently underway.

Such an expansion of the concept of intersubjectivity might then be illustrated by the mother-child interaction study of Abramovitch (1977). She has demonstrated that pre-school children (with a mean age of 4 years, 5 months), when presented with videotaped recordings of their own mothers were able to correctly guess whether they were interacting with a friend or a stranger and whether that person was of the same or the opposite sex. The

children were unable to do this for persons other than their own mothers. Although unable to articulate the means by which such discriminations were made, pre-schoolers could comprehend subtle interpersonal cues communicated by their mothers during social interaction. Clearly, this is an example of special understanding shared between persons -- a state of intersubjectivity.

Mehrabian and Reed (1968) have offered a number of independent variables which they felt may determine accuracy in communication. These were attributes of (a) the communicator, (b) the addressee, (c) the channel, (d) the communication, and (e) the referent. They speculated that modification to these independent variables might alter communication accuracy. Intersubjectivity, as well, may be influenced by an interaction between those independent variables. This is not to equate intersubjectivity with communication accuracy because, first, communication accuracy need not be derived from a process of social negotiation and, secondly, because intersubjectivity is not assessed against some absolute objective criteria (e.g., such dimensions as "accurate - inaccurate" or "appropriate - inappropriate") but rather against some relative, subjective criteria (e.g., such dimensions as "shared - unshared" or "common - unique").

Two types of determinants of intersubjectivity, characteristics of the communicators and of the medium of interaction, will be considered.

A characteristic of the communicators: Cognitive similarity.

Triandis (1960a, 1960b) considered the effect of cognitive similarity on effectiveness of dyadic communication. He stated:

If two persons A and B categorize events, objects, concepts, etc., in similar ways, they should be able to communicate more effectively. Similarity in categorization implies that A and B use the same or similar dimensions when they judge whether concepts $X_1, X_2, X_3 \dots X_n$ belong together, or do not belong together.... To the extent that A and B are cognitively similar (orient towards significant aspects in their environment in similar ways)

and there is an opportunity for communication (e.g., propinquity), communication should be effective, the relationship between A and B should be more rewarding, and the interaction should lead to increased liking of A for B and B for A (sociometric choice). Increased liking should result in higher rates of interaction between A and B and this, in turn, should produce greater cognitive similarity, thus starting the cycle all over again. (1960 a, p. 175)

It may be possible to demonstrate that where a high degree of cognitive similarity exists or is allowed to develop between persons, there is increased intersubjectivity.

A characteristic of the medium: Immediacy. Intersubjectivity may be related to the concept of immediacy as introduced by Mehrabian (1971).

Immediacy refers to:

the extent of mutual sensory stimulation between two persons and is measured in terms of spacio-temporal proximity or by the number of communication channels that are available. Communication channels are the means by which one conveys his thoughts and feelings to another....The closer two people are to one another, the more immediate their interaction....The greater immediacy associated with more channels for communications is illustrated as follows: telegrams and letters are two of the least immediate ways of communicating, permitting the verbal channels alone. These are followed in order by telephone conversations (verbal and vocal channels), conversations on a Picturephone (verbal, vocal and visual channels), face-to-face meetings. (p.12)

This may be seen in a study by Weston and Kristen (1973) who reported that communicators interacting over an audio-only channel felt that their ideas were less well understood and accepted by their partners as compared with communicators in face-to-face and audio-video mediated dyads. There is evidence that mediated communication is most successful (and, it might be expected, intersubjectivity greatest) when the communicators are previously acquainted and when their mutual task is uncomplicated (Williams, 1977). In subsequent studies, medium effects were examined by the present author as possible determinants of intersubjectivity.

The semantic differential in communication studies. The semantic differential has been frequently employed in communication studies where users' self-reports and attitude assessments have been under investigation (see Short, Williams & Christie, 1976), though other more sophisticated, descriptive methods such as multidimensional scaling (MDS) have also been used (e.g., Wish, 1975). One advantage of the semantic differential is its simplicity; subjects can understand the task without difficulty and the technique is easily administered. The data produced are computationally and conceptually straightforward. This is in contrast to other methods such as reportory grid and MDS for which the same cannot be said. Taking into account the numerous studies employing the semantic differential (see Osgood, Suci & Tannenbaum, 1957) and the general refinement of rating scales for social perception studies, it can be stated that the semantic differential remains an attractive tool.

The technique, however, is not without its shortcomings. A variety of response strategies (see Wyer, 1974) may influence a subject's use of the semantic differential.

1. Responses may be oriented from the midpoint (4) of a 7-point scale, if it is reasoned that 4 should be the mean for all the stimuli to be judged.
2. Since the rating scale clearly defines the two extremes of 1 and 7 and, knowing that all stimuli will fall between them, the task may be perceived as one of interpolation between the two extremes.
3. It may be reasoned that the seven response categories should be employed about equally, thus yielding a rectangular distribution of responses.

4. A normal or skewed distribution may be seen to underlie the classification task; for example, on the "good - bad" item, there may be a preference to classify all stimulus people toward the "good" end of the continuum.

5. Extreme responses may be offered in an attempt to demonstrate decisiveness of judgment.

6. Conversely, to minimize incorrect or atypical classification, use of the middle portion of the scale may result.

7. Unpredictable influences such as social desirability, demand characteristics and evaluation apprehension may operate to produce systematic bias in responses (Crowne & Marlowe, 1964; Orne, 1969; Rosenberg, 1969).

The aforementioned is not intended to be an exhaustive consideration of possible scale response biases. However, it may offer rationale for the use of a covariate of central tendency--a control variable to estimate the influence of some of these systematic biases. This central index is similar to Cronbach's (1955) concept of elevation.

At the risk of overgeneralization, it might be said that the majority of previous studies employing the semantic differential have focused on either individual or group differences in the location of responses on the scale; that is, they have considered mean response differences (e.g., Cronbach & Gleser, 1953). As well, it is possible to consider dispersion or stability differences.

There has long been concern for the stability of semantic differential rating. For example, Norman (1959) considered three metrics of stability over time and subjects. They were (a) correlation of scale items which he referred to as the traditional stability index, (b) percent MUD which he derived to reflect interprofile scale unit-discrepancy, and (c) the same-word D-value, a difference score employed by Osgood and Suci (1952) as a measure of the degree of similarity between profiles. Any of these indexes would seem appropriate where the extent of intradyadic difference is of interest but the last might be favoured because it is straightforward both conceptually and computationally.

Some methods for demonstrating intersubjectivity. Four methods are described which have been developed to test for communality of impressions

in communication studies. All employ semantic differential ratings of either a person or an interpersonal event. The methods are introduced using an example and fictitious data as shown in Table 1.

Insert Table 1 about here

Method A. This technique which tests between group differences in variability involves an item-wise assessment of homogeneity of impression. It is similar to the type of analysis used in the past for Profile Analysis (e.g., Cronbach & Gleser, 1953) except that the emphasis is on variance instead of mean scores. Group variance scores are produced for each item of the semantic differential, creating a variance profile for each condition in an experiment. Between group differences in profiles are then analysed using a matched t test, ANOVA or ANOCOV. With the latter two, the item effect may be partitioned in addition to the treatment effect. This produces a sensitive test of group variance differences but has the disadvantage that it may violate the assumption of independence of observations. In other words, a group's variance on, for example, the "good - bad" dimension may be correlated with the variance on "cold - warm", "artificial - natural" or "sensitive - insensitive". Such dependence may not be as logically apparent as might interdependence among the group means for those same bipolar adjective dimensions. Typically, there is a slight positive correlation among the variances (approx. $\underline{r} = .10$ with $\underline{n} = 20$) which is clearly nonsignificant. Nevertheless, this bias may tend to produce somewhat exaggerated variance profile differences. As a result, a more conservative analysis (such as Method B) might be employed along with Method A to test homogeneity of variance.

It may be advantageous if two dependent variables were considered in this analysis, the variance score index and the central tendency index. The former would be the average group variance on the semantic differential items. The latter would be a control variable, representing an average

Table 1
Fictitious Data and ANOCOV Summary
for Intersubjectivity Method A

Group	S.D. ^a Item	Raw Score for Subject						$\bar{x}$	s^2	$\bar{y}$
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>			
I	good-bad	1	4	1	5	2	3	2.67	2.67	1.67
	cold-warm	6	5	3	1	7	5	4.50	4.70	1.83
	artificial-natural	3	6	5	3	6	5	4.67	1.87	1.33
	sensitive-insensitive	3	2	2	5	5	1	3.00	2.80	1.67
II	good-bad	2	2	5	4	1	2	2.67	2.27	1.67
	cold-warm	4	2	6	6	5	4	4.50	2.30	1.17
	artificial-natural	4	3	5	5	6	5	4.67	1.07	1.00
	sensitive-insensitive	3	2	3	2	4	4	3.00	0.80	1.00

^aSemantic Differential

ANOCOV for Method A: An Item-Wise Test
for Homogeneity of Impressions

Source of Variance	df	$SS_{\bar{y}}$	$F_{\bar{y}}$	SP	$SS(s^2)$	$F(s^2)$	Residuals		
							<u>df</u>	$SS(\hat{s}^2)$	$F(\hat{s}^2)$
Treatment	1	0.34	4.76	1.16	3.92	3.81	1	0.06	0.11
Within Groups	6	0.43		1.22	6.17		5	2.76	
Total		0.78		2.38	10.09			2.83	

$\bar{x}$ = Mean score.
 s^2 = Variance score.
 $\bar{y}$ = Average central tendency.

distance from the midpoint of the rating scales. Use of these indexes together reflects the same concern for the relationship between location and dispersion that is conventionally shown in inferential statistics. It is customary to consider group mean differences after establishing homogeneity of variance (Thorngate, 1974). The essence of the present analysis would be to do the reverse; namely, to consider variance differences while mean location differences are controlled. If different groups tend to produce ratings which straddle the midpoint of the rating scale to the same degree, no effect would be found on the central tendency index. If one group were consistently more extreme in their ratings than another, a mutual dependency between the central tendency and variance score indexes could be identified and sometimes isolated in a subsequent analysis of covariance (see Kirk, 1968). A difference on the variance score index which disappears when mutual dependency is partitioned in ANOCOV would not necessarily be artifactual, rather the dispersion difference would be known to relate systematically to extremity of ratings.

Following the example, in order to eliminate group differences in central tendency responding on these scales, scores are derived for each item to reflect the amount of deviation from the midpoint of 4 on the 7-point scale. In Table 1, note the relationship between the central tendency index, the mean and the variance scores for each group. Clearly, the mean and the central tendency indexes are measuring different things and this is also true for the mean and variance scores. However, there is a strong dependence between the variance score and central tendency indexes. This is not surprising since extreme responses on the scale would contribute to the variance score unless all members of the group happened to make the same extreme responses. It is possible, nevertheless, to have a significant difference on the variance score which is independent of the central tendency index, and vice versa. Returning to the fictitious data of the example, Table 1 shows the ANOCOV, which simultaneously tests the central tendency and variance score differences between groups and, finally, tests the variance score differences independent of central tendency.

Method B. This method for demonstrating intersubjectivity focuses on intradyadic differences in scale responses. In situations where two persons have performed a communication task together, the average absolute difference between their ratings of some common event or object may be calculated and used to test for group differences in dyadic agreement. Variations of this type of analysis are common in the literature and have been based on correlation techniques, coefficients of pattern similarity or various distance measures (e.g., Cronbach & Gleser, 1953; Norman, 1959).

In the data shown in Table 2, it is now assumed that subjects 1 and 2, 3 and 4, 5 and 6 in each group comprise dyads and the average amount of disagreement between them is expressed as an absolute unit distance (i.e., similar to D-values of Osgood & Suci, 1952). With this index one may test a hypothesis that the degree of communality of impressions in dyads of one group differs from that of another group. Data generated for this type of analysis are, of course, independent and suffer little, if at all, from central tendency differences. However, this is not an economical analysis since for every dyadic pair in a given experimental condition only a single difference score is used in the analysis. Independent t tests or ANOVA may be used to test for group differences.

Insert Table 2 about here

Method C. This technique is based on a statistical method devised by O'Brien (1976). Recently, a number of statisticians in psychology have called for greater consideration for analysis of variability. Many have be-moaned the lack of inferential methods for testing homogeneity of variance in multifactor experiments. Now, suitable statistical techniques are begin-ning to appear (e.g., Levy, 1975; O'Brien, 1976; Overall & Woodward, 1974; Thorngate, 1974). Method C uses the O'Brien technique, the so-called spread observation, because, although slightly conservative, this procedure has been shown to be robust to departures from normality, readily understandable, easy to compute and interpret, relatively powerful and appropriate for use in

Table 2

Ficititious Data and Analysis
for Intersubjectivity Method B

Group	S.D. ^a Item	Derived Score for Dyad		
		<u>1</u>	<u>2</u>	<u>3</u>
I	good-bad	3	4	1
	cold-warm	1	2	2
	artificial-natural	3	2	1
	sensitive-insensitive	1	3	4
Average Derived Score		2	2.8	2
II	good-bad	2	1	1
	cold-warm	2	0	1
	artificial-natural	1	0	1
	sensitive-insensitive	1	1	0
Average Derived Score		1.5	.5	.8

Method B tests absolute difference within dyads of semantic differential ratings (paired $t = 2.63$, $p = .04$).

^aSemantic Differential.

multifactorial designs.

"Spread scores" are derived using the following formula:

$$q_{ijk} = \left[n_{ij} (x_{ijk} - x_{ij})^2 - s_{ij}^2 \right] / (n_{ij} - 2),$$

where n_{ij} equals the cell size; x_{ijk} is the individual raw score; x_{ij} equals the cell mean; s_{ij}^2 is the cell variance (O'Brien, 1976).

When the raw scores from the rating scales are transformed into "spread scores", an average spread is calculated (see Table 3). For each subject, this index represents an estimate of the degree of departure from the typical group rating. These average spread observations then become data in an independent t test, ANOVA or ANOCOV. With this method, one might test the hypothesis that there is more subject-wise homogeneity of impressions in one experimental condition than in another.

Insert Table 3 about here

Method D. The last intersubjectivity technique is used to test for the stability within groups of individual differences in spread observations. If it is expected that certain members of experimental groups are continually either "close to" or "far from" the usual perception of their own group, this technique may be appropriate for testing such an effect. The derived spread score for each semantic differential item is entered into an analysis of variance so that subjects are treated as levels of a single independent variable. If a significant F ratio is found, multiple comparisons will show which subjects are either "in step" or "out of step" with the usual impression of their own group (see Gage & Cronbach, 1955). In Table 3 note that systematic individual differences in Group I produce a marginally significant effect and account for 26% of the variance, while in Group II the effect is clearly nonsignificant.

In summary, the concept of intersubjectivity was potentially useful for communication studies. Effectiveness of communication may be assessed in terms of a relative sharing of perceptions or communality of experience rather than in terms of some absolute accuracy criterion. Four

Table 3

Fictitious Data and Analysis
for Intersubjectivity Methods C and D

Group	S.D. ^a Item	Derived Spread Score for Subject					
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
I	good-bad	3.52	1.99	3.52	7.48	0.01	-.05
	cold-warm	2.95	-.05	2.95	17.95	8.95	-.05
	artificial-natural	3.48	1.95	-.54	3.48	1.95	1.54
	sensitive-insensitive	-.70	0.80	0.80	5.30	5.30	5.30
Average Spread Score ($\bar{q}$)		2.31	1.17	1.68	8.55	4.05	1.05
II	good-bad	0.11	0.11	7.58	2.09	3.62	0.11
	cold-warm	-.20	8.80	2.80	2.80	-.20	-.20
	artificial-natural	0.41	3.92	-.10	-.10	2.39	-.10
	sensitive-insensitive	-.20	1.30	1.30	1.30	1.30	1.30
Average Spread Score ($\bar{q}$)		0.03	3.53	2.52	1.52	1.78	0.28

^aSemantic Differential.

Method C provides a subject-wise test of homogeneity of impressions. This method uses derived scores suggested by O'Brien (1977) for the analysis of spread (Test shows no difference, $t = 1.18$, $p = .19$).

Method D tests within group individual differences (ANOVA performed on raw spread scores from Method C yields $F_I = 2.67$, $p = .06$, $\hat{\omega}^2 = 26\%$ and $F_{II} = 1.29$, $p = .31$, $\hat{\omega}^2 = 6\%$).

methods were described which might prove useful for testing differences in homogeneity of impressions. In a given circumstance, knowledge concerning intersubjectivity could be extended by employing more than one analysis.

Although direct references to intersubjectivity are rare, it has been shown that the concept is a familiar one. In current social psychological literature related notions are given consideration. Two examples can be found in the area of conversation analysis. Kendon (1978) has stated that it may be profitable to examine the role of "the participants' understanding of each other's current communicational intentions" (p.24). Kent, Davis and Shapiro (1978) have suggested that "the achievement of orderly social interaction rests in part...on consensual knowledge of the social world and its interaction rules" (p.13). Perhaps there is a place in social psychology for the old concept and new methodologies of intersubjectivity.

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Variation in Person Perception as a Function of Cultural Differences Between Encoder and Decoder

Abstract

This investigation, composed of two studies, assessed variation in person perception occurring as a function of cultural differences between encoder and decoder. Understanding of such variation may be essential as cross-cultural mediated communication becomes more commonplace. A multi-cultural subject population of psychiatric nursing students was subdivided into categories either like or unlike the apparent cultural background of two encoders in a standardized person perception test. It was found that, as predicted, like decoders were more effective at classifying the encoders' nonverbal communicative acts than were unlike decoders. Moreover, like decoders formed more homogeneous impressions of the encoders' personalities. Implications for international teleconferences were considered.

Mediated social interactions are more common in this decade than ever before, with long-distance communication systems transcending ethnic and cultural borders every day. By the mid-1970s, the frequency of overseas telephone calls was approximately twenty times that of the mid-1950s (Pierce, 1972). INTELSAT, a well-known international satellite system, has recently been developed in order that an 87-member consortium of worldwide users could interact (Rubin, 1975). International and, hence, cross-cultural communication may introduce new, important variables into the processes of mediated social interaction.

It is likely that cross-cultural communication will be somewhat less efficient than intracultural communication. When persons of varied cultures interact without shared communication styles or conventions, their mutual understanding may be limited. Language is an example of a social convention in communication; naturally, persons exchange verbal information with greater ease if they share a common language (e.g., Smith, 1971). Other cultural differences may also enter into mutual understanding. Research in social psychology has demonstrated cultural differences in styles of nonverbal communication (e.g., Collett, 1971). Can it be shown whether these are subtle differences detectable only through the rigour of controlled experiments or if they are salient differences which could alter the interpretation of non-verbal communicative acts during teleconferences? This is the central question under investigation here.

Cross-cultural studies of facial expression. In the behavioural sciences, the cross-cultural study of expression in the human face has long been a topic for inquiry. Social psychologists have investigated whether certain facial expressions are understood and employed across all cultural, ethnic and racial boundaries or, conversely, whether there are cultural differences in facial expression which are not universally understood. At times, researchers had expected to find cultural differences but instead found significant cultural similarities (Vinacke, 1949; Vinacke & Fong, 1955). Ekman, Friesen and Ellsworth's (1972) review of related social, psychological literature has led to the conclusion that cross-cultural universals of facial expression do exist.

"Together these findings provide conclusive evidence of a pan-cultural element in facial behaviour and emotion" (p. 166). Many of those researchers who have found evidence of pan-cultural consistencies agree that human facial expression is classified most consistently when the encoder and decoder are of the same cultural or racial group (e.g., Cuceloglu, 1970; Ekman & Friesen, 1971; Ekman, Sorensen & Friesen, 1969). Studies on discrimination or recognition of faces from same and different racial origins have shown that we tend to differentiate and recognize best faces of persons from the same racial origin as our own (Galper, 1973; Malpass, Lavigne & Weldon, 1973).

Three explanations have been offered by Ekman, Friesen and Ellsworth (1972) which reflect the etiological debate on the existence of universal behaviours for expressing emotions. First is the possibility that all humans evolved these behaviours together and that the expressions of emotion may be linked to specific muscular responses just as with walking. Secondly, it may be that humans have innate neurological "programmes" for this type of non-verbal communication. Thirdly, there may be learning experiences common to all human development so that persons may learn to send and receive more or less the same facial expressions. That the ability to discriminate faces of persons of other races may be improved with practice has been shown (e.g., Elliott, Wills & Goldstein, 1973; Galper, 1973). Other forms of nonverbal communication such as gestures have a component of cultural specificity which reflects the operation of learned social conventions for emotional expression (for a review, see Argyle, 1975).

Regarding nonuniversal characteristics of facial affect displays, Ekman, Friesen and Ellsworth have stated that cultural differences might be expected to emerge "in the circumstances which evoke an emotion in the consequences of an emotion and in the display rules which govern the management of facial behaviour in particular settings" (p. 166). This statement again emphasizes the importance of social learning and cultural context as determinants of facial affect display. Ultimately, it may prove possible to subsume many of what have been termed as racial differences under cultural differences in

nonverbal communication.

Subject populations for cross-cultural studies. Serious methodological constraints have often hampered cross-cultural studies of emotional expression principally because it is difficult to guarantee equivalent sampling procedures for different cultural groups. Unequivalent educational experience may be responsible for differences in familiarity with psychological testing procedures and experimental tasks. Travel to various cultural locations results in unavoidable changes to the experimental setting. Estimating or controlling the degree of contact between cultures may present problems. Yet, the selection of subjects from a single multicultural population such as a class of psychiatric student nurses might allow for control over various factors. The amount of intercultural contact, language competence, scholastic aptitude, familiarity with psychological testing, task performance motivation and even a common setting and administrator for an experimental task would be similar for such a population. Thus, there would be an increased likelihood that cross-cultural differences in the classification of nonverbal communicative acts might be identified.

Media for stimulus display. Previous studies on classification of emotion and facial recognition have typically presented stimulus material as black-and-white static photographs (e.g., Ekman & Friesen, 1969, 1971; Elliott, Wills & Goldstein, 1973; Galper, 1973) although colour displays of static images (e.g., Malpass & Kravitz, 1969) and abstract line drawings of faces (e.g., Cuceloglu, 1970) have also been employed, as have videotapes of affective displays (e.g., Graham, Ricci Bitti & Argyle, 1975; Shimoda, Argyle & Ricci Bitti, 1978). Stimulus material in the present study, chosen to simulate the transmission of nonverbal communicative acts in a teleconference, was displayed in videotape format (for procedure see Appendix B and Coll, George, Strickland, Guild & Paterson, 1975). The emotional reactions depicted by the two encoders were in response to imaginary events supposedly communicated to them via a teleconference link. The typical teleconference situation provide limited contextual or situational information. Thus, the encoders were seated at a communication console which displayed only the upper half of the body and a neutral background, avoiding anything

that might contribute to the interpretation of the emotions being expressed (e.g., Fridja, 1958).

It could be argued that if the intention of the present study was to investigate genuine emotional expression, actors might render the nonverbal communicative acts unnatural or contrived. However, the stimulus material was intended to allow the study of typical classification of those nonverbal communicative acts as may be expressed in daily life. Deliberate communicative displays may be more common than expressions of genuine emotion. Social norms may operate to suppress or disguise the display of real emotion, however, norms actually direct the use of nonverbal cues to communicate affective reactions or attitudes. That it is possible to reliably differentiate facial behaviours evoked by a true affective experience from those which are deliberate and voluntarily controlled acts has yet to be shown. Perhaps it is genuine emotional expression that tends to be universally expressed across cultures while the controlled communicative acts are more under the influence of social rules and normative conventions and, hence, are more culture-specific.

Origins of specific hypotheses. Mehrabian and Reed (1968) have offered the hypothesis that communication accuracy should be related to the degree to which a communicator's implicit or explicit coding rules deviate from the consensual ones employed by his subculture. They advised that the accuracy of communication between two individuals should be positively correlated with the degree of similarity between the coding rules which they employ. A corollary of this hypothesis was that the accuracy of a communication should be positively correlated with the degree of correspondence between the encoders' and decoders' modes of cognizing the referents about which they are communicating. Further, Mehrabian and Reed suggested that the accuracy of communication between two persons should be positively related to the degree of correspondence of their subcultures. For the purpose of the present study, we may assume that the encoders' behaviours were representative of a particular culture or subculture because the accuracy criterion for scoring their nonverbal acts was established so as to reflect consensual perceptions of judges from a particular culture. However, when

persons from different cultures or subcultures viewed these nonverbal communicative acts, one would expect less correspondence between their perceptions and those made by the original judges.

Gage and Cronbach (1955) have considered several effects of similarity between encoders and decoders on person perception. They have suggested that decoders who are typical of a particular group should have a higher accuracy when judging encoders of that group. A number of accuracy components were identified for consideration in person perception studies which employ rating scales. Three of their components which seemed relevant for the present study were (a) elevation, reflecting the way in which a decoder employs a rating scale (i.e., central tendency in responding on rating scales), (b) stereotype accuracy reflecting the decoder's perceptions of how typical an encoder is with respect to apparent subcultural or group of which the encoder is a member (i.e., requiring familiarity with the norms of that group of persons), and (c) differential accuracy reflecting a decoder's ability to perceive interpersonal differences; namely, to differentiate between encoders of a particular group.

In the present study no predictions would be made with respect to the elevation variable but rather this index would be used as a covariate to control for possible response bias. Predictions were made, however, concerning stereotype and differential accuracy. If a common underlying stereotype is used more by members of one group than another, one would expect more homogeneity of impressions formed of the encoders by members of the former group. Gage and Cronbach (1955) have stated:

A person who is similar to the group, and who predicts that the group will in general give responses similar to his own, will almost certainly have high stereotype accuracy. A person who is atypical will have low stereotype accuracy if he assumes that other people give the same responses he does. If he assumes that others are different from himself, he may have either high or low stereotype accuracy, depending upon what differences actually occur. (p. 418)

If decoders are apparently similar to encoders, one would expect greater differential accuracy in their perceptions of the two target persons.

STUDY I

Hypotheses

The purpose of the present study was to demonstrate that cultural differences between encoder and decoder can influence the effectiveness of interpersonal communication.

1. It was predicted that when decoders are apparently of like cultural origin as encoders who depict certain communicative acts, the decoders would classify these acts in a more consistent way than would decoders of cultural origin apparently unlike that of the encoders.

2. It was predicted that there would be greater homogeneity of impressions formed of the two encoders' personalities by like decoders than by unlike decoders.

3. It was predicted that the like decoders would perceive the two encoders' personalities with a greater degree of differentiation than would unlike decoders.

Method

Subjects

A class of third-year psychiatric nursing students (about an equal number of males and females) in the Department of Psychiatry at St. George's Hospital Medical School, London, participated in the study. The students were of various cultural and racial origins; approximately one-half were Caucasians born and raised in the United Kingdom, and one-half were from Commonwealth countries in the West Indies or Southeast Asia.

Procedure

Prior to the experiment, each subject completed a short questionnaire asking for responses to 11 demographic variables. One of the questions requested subjects to specify their race, nationality and place of upbringing. Two of the experimental conditions were determined on the basis of these responses. Eight Caucasian subjects formed the like group and eight non-

Caucasian subjects, four Blacks and four Asians, formed the unlike group. The experimental task was administered to the students by a course instructor in their classroom during a course. Subjects were seated randomly so that all could view a video monitor which displayed the stimulus material, and were asked neither to influence nor be influenced by each other's performance. The briefing was given according to the instructions' page of the response questionnaire (see Appendix B). A videotape of the person perception test (PPT) was played without interruption to the subjects who viewed each stimulus segment and classified the nonverbal communicative acts in turn. This completed, subjects were asked to rate the personalities of the male and female encoders using a 21-item semantic differential: the order in which the encoders were rated was randomized. The final step involved administering the word perception test (WPT) according to the instructions provided. Subjects attempted to locate words embedded in five by six letter matrices and provide the appropriate responses.

Data Analysis

Separate analyses were performed on data from (a) the classification of the nonverbal communicative acts in the PPT, (b) the accuracy rate on the WPT, (c) the homogeneity of impressions formed of the two encoders (Method A), (d) the index of average central tendency responding on the semantic differential rating scales, (e) the subject-wise test for homogeneity of impressions formed of the two encoders (Method C), (f) the individual difference analysis (Method B), and (g) the mean group differentiation between the two encoders' ratings calculated as item-wise difference scores. With the first dependent measure, an overall score per subject was calculated which was the percent accuracy in classification of the 38 stimulus segments of the PPT. Accuracy was defined by the a priori standardized scoring method. A secondary analysis was performed using a modal accuracy criterion established independently for each group. It measured the extent of group-wise communality in classification of the nonverbal communicative acts. An analysis of covariance was performed using the WPT scores as a covariate and the PPT scores as the main dependent variable. This way, any system-

atic differences in motivation, reading ability or language proficiency which might underlie performance on both the PPT and WPT may be isolated. A second analysis of covariance was performed using the central tendency index as a covariate and the homogeneity of variance score as the main dependent variable. It was hoped that this would yield an analysis of group differences in homogeneity of impressions formed of the encoders that would not be biased by possible cultural differences in the extremity of judgments offered on the semantic differential ratings. Separate ANOCOVs were performed on the data from the ratings of the male and female encoders.

Results

On the PPT, the average score for the like group is 71.38% while the unlike group score is 60.13%. As shown in Table 1, this is a statistically significant difference ($F = 11.31, p = .005$). Likewise on the WPT, the like group score an average of 78.75% and the unlike group score 47.50%. This, too, is a reliable difference ($F = 18.94, p = .001$). When the covariance of these two dependent variables is removed, there remains a significant difference on the PPT scores ($F = 6.53, p = .03$). Thus, Hypothesis 1 is supported (see Figure 1).

Insert Table 1 and Figure 1 about here

Further comparisons of the performance on the PPT are made using an a priori distinction made when the PPT was standardized; unambiguous items were the 19 items most consistently perceived by the judges and ambiguous items were those least consistently perceived. On the unambiguous items, the average for the like group is 75.75% and for the unlike group 62.50%, a significant different ($t = 3.39, df = 14, p = .004$). On the ambiguous items, the averages are 68.83% for the like group and 58.13% for the unlike group, also a significant difference ($t = 2.52, df = 14, p = .02$). The like group score is significantly higher on unambiguous test items than on ambiguous test items ($t = 2.40, df = 7, p = .05$). However, the unlike group does not score significantly better on unambiguous items than on ambiguous items

Table 1

Accuracy on Person Perception and Word Perception Tests:

ANOCOV Summary for Like and Unlike Groups in Study I

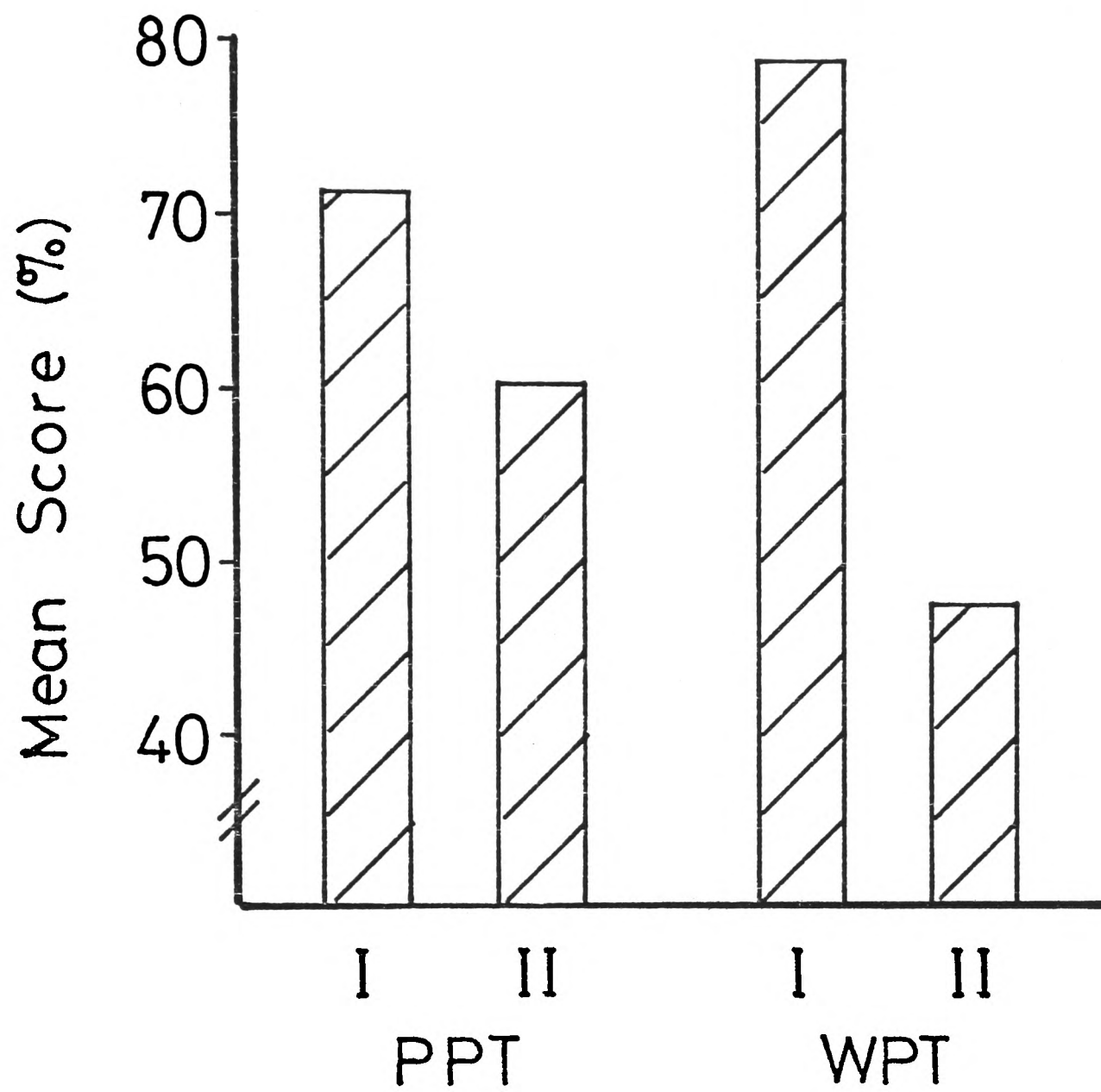
Source	df	SSa	Fa	SP	SSb	Fb	Residuals				
							$\underline{SS\hat{b}}$	$\underline{MS\hat{b}}$	$\underline{F\hat{b}}$	p	$\underline{\hat{\omega}^2}$
Treatment	1	3906.25	18.94	1406.25	506.25	11.31	307.78	307.78	6.53	.03	.27
Error	14	2887.50		-203.75	626.75		612.37	47.11			
Total	15	6793.75		1202.50	1133.00		920.16				

a = Score on word perception test.

b = Score on person perception test.

$\hat{\omega}^2$ = Strength of association between the independent variable and dependent variable.

Figure 1. Accuracy on PPT and WPT : Study I.



I = Like Decoders

II = Unlike Decoders

($t = 1.39$, $df = 7$, $p = .15$). Since both categories were about equally ambiguous for the unlike group, evidently the unambiguous category was not appropriately defined for this group. An average 10% of the time, the unlike group responded to indicate uncertainty about what was demonstrated in the scene (i.e., ??? on the response questionnaire) whereas the like group used this response 4.3% of the time. Because of this difference, adjustments were made so that reduced response rate was not responsible for the lower accuracy described earlier.

The first test of homogeneity of impressions formed of the two encoders (Method A), examined in analyses of covariance, is shown in Table 2. The central tendency variable does not produce a significant difference between the two groups in the ratings of the male encoder ($F < 1$). This means that less variability on semantic differential ratings of the male is not due to a tendency towards midscale responding. There is a strong effect related to variance score differences on these ratings ($F = 5.93$, $p = .02$). After the central tendency index is partitioned, the variance score differences remain significant ($F = 5.31$, $p = .03$). Similar results are found in the analysis of covariance summary table for the female encoder. It shows a marginal difference on the central tendency index ($F = 2.96$, $p = .10$). Again, the variance scores are greater for the unlike group than the like group before the covariate adjustment ($F = 6.35$, $p = .02$) and after ($F = 3.85$, $p = .07$). This gives support for Hypothesis 2 (see Figure 2).

Insert Table 2 and Figure 2 about here

The second test of homogeneity of impressions formed of the two encoders is based on subject-wise spread observations. For each subject, an average spread score is computed together with an index of central tendency responding on the rating scales (Method C). While the average spread score for members in the like group is lower ($\bar{q} = 1.90$ for male and 1.34 for female encoder) than the average spread score for members of the unlike group ($\bar{q} = 2.84$ for male and 1.85 for female encoder), the analysis

Table 2

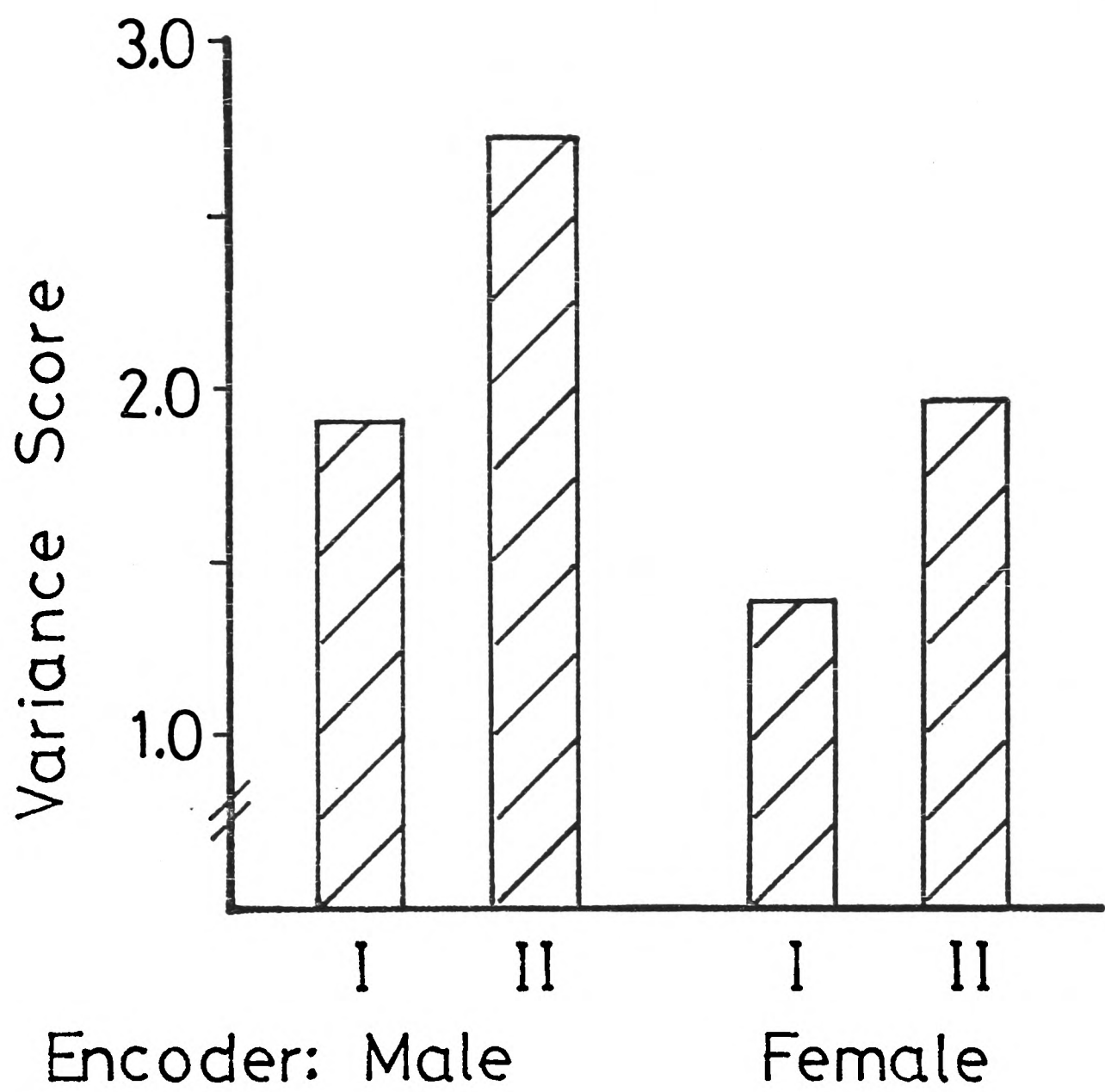
Homogeneity of Impressions Formed of Male and Female Encoders:
ANOCOV Summary for Like and Unlike Groups in Study I

		Residuals									
Encoder	Source	df	$\overline{SS\bar{Y}}$	$\overline{F\bar{Y}}$	$\overline{SP}$	$\overline{SS(s)^2}$	$\overline{F(s)^2}$	$\overline{SS(\hat{s})^2}$	$\overline{MS(\hat{s})^2}$	$\overline{F(\hat{s})^2}$	p
Male	Treatment Effect	1	.09	.32	-.82	6.88	5.93	6.32	6.32	5.31	.03
	Item Effect	20	3.01	.54	-.92	18.87	.81	18.63	.93	.78	.71
	Error	20	5.59		-1.78	23.25		22.65	1.19		
	Total	41	8.69		-3.52	49.00		47.58			
Female	Treatment Effect	1	.63	2.96	-1.47	3.49	6.35	2.08	2.08	3.85	.07
	Item Effect	20	7.32	1.72	-3.08	8.37	0.76	6.05	.30	.56	.90
	Error	20	4.26		-2.74	10.92		10.28	.54		
	Total	41	12.21		-7.29	22.78		18.41			

$\bar{y}_2$ = Central tendency.
 s^2_2 = Variance score.
 $\hat{\omega}_2$ = Strength of association between the independent variable and dependent variable.

This analysis employs intersubjectivity Method A.

Figure 2. Intersubjectivity
Method A: Study I.



I = Like Decoders
II = Unlike Decoders

of covariance does not yield significant differences (in both cases $\underline{F} < 1$).

Within group analyses of individual differences in spread scores (Method D) reveals that in both the like and unlike groups there were generally two persons who were atypically "out of tune" with their group's perceptions and one who was atypically close to the group's average perception. These are strong individual differences and may in part account for the failure of the subject-wise spread score analysis to yield the expected differences (see Table 3).

Insert Table 3 about here

A final analysis performed on the mean difference scores calculated from the average group semantic differential ratings of the two encoders' personalities shows a clearly nonsignificant effect in the extent of differentiation in these ratings by the like and unlike groups ($\underline{F} < 1$). Thus, Hypothesis 3 is not supported.

Discussion

Psychiatric nursing students of like culture as the encoders of the non-verbal communicative acts interpreted those acts with greater agreement than did the students of cultural origin unlike that of the encoders. Previous research using the PPT with a population of like culture as the encoders yielded comparable scores of approximately 75%. The differences in the present study would seem to be accounted for by less accurate performance on the test by students of unlike culture. Also as expected, the impressions of the encoders' personalities were less homogeneous when decoders were of cultural origin unlike that of the encoders. These findings would seem to be consistent with the notions of Gage and Cronbach (1955) and of Mehrabian and Reed (1968) that there should be a correspondence between communication accuracy and the similarity of coding rules, cognitive styles, cultural norms of nonverbal expression and stereotypes.

It had been assumed that English language proficiency and reading ability would not be a factor in task performance since all subjects had met admission standards to an English institute of higher learning. The unlike

Table 3

Individual Subject Differences in Perceptions
of Personalities of Male and Female Encoders in Study I

Decoders	Encoder	Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>	$\hat{\omega}^2$	<u>S_Δ</u>
Like		Treatment	313.26	5	62.65	9.37	.001	.26	3
		Error	802.44	120	6.69				
		Total	1115.70	125					
Unlike	Male	Treatment	888.28	5	177.66	17.66	.001	.40	2
		Error	1207.31	120	10.06				
		Total	2095.59	125					
Like		Treatment	97.26	7	13.89	5.81	.001	.17	3
		Error	382.47	160	2.39				
		Total	479.74	167					
Unlike	Female	Treatment	329.13	7	47.02	8.52	.001	.24	3
		Error	882.69	160	5.52				
		Total	1211.81	167					

S_Δ = Number of subjects different from their own group.
This analysis employs intersubjectivity Method D.

group of decoders performed less proficiently on the WPT than did decoders in the like group. An intervening factor in this performance may have been order of presentations since the WPT always followed the PPT. If subjects realized that they were ineffective or disadvantaged in their performance of the PPT, their motivation to perform well on the second task, the WPT, may have been diminished. A subsequent investigation was conducted in which presentation was counterbalanced.

STUDY II

Hypotheses

In general greater effectiveness of person perception was predicted for decoders who were of like cultural background as encoders when compared with decoders of unlike cultural background. It was predicted that compared with unlike decoders, like decoders would:

1. classify the nonverbal communicative acts presented by encoders in the person perception test (PPT) with greater accuracy and consistency.
2. show this increased accuracy and consistency on the PPT independent of systematic superiority in the word perception test (WPT) performance.
3. form the most homogeneous impressions of the personalities of the encoders.
4. show greatest differentiation in perceptions of the two encoders.
5. show fewer stable individual deviations from modal intragroup perceptions of the encoders.

Method

Subjects

A class of third-year psychiatric nursing students, similar to the one described in the previous study, participated here. One like group was comprised of subjects with a cultural background like that of the encoders. Two unlike groups were comprised of (a) unlike-A group: Asian students from Commonwealth countries in Southeast Asia, principally Sri Lanka, and (b) unlike-B group: Black students from Commonwealth countries in the West Indies, principally Trinidad and Jamaica. There were 12 subjects per group with approximately an equal number of males and females in each.

Procedure

The experimental tasks of PPT and WPT were administered as in the previous study. One variation in the procedure was that the order of presentation was counterbalanced.

Results

As expected, the like group scored highest on the PPT with 72.00%, followed by a score of 62.75% for the unlike-A group and 64.33% for the unlike-B group (see Figure 3). This is a statistically reliable difference ($F = 4.42$, $p = .02$), and Dunnett's multiple comparison statistic reveals that the like group is not equal to either of the other two groups ($p < .05$). As Table 4 shows, this difference is independent of the performance on the WPT ($F = 3.66$, $p = .04$). The three groups do not differ in performance on the WPT ($F < 1$). Further evidence that performance on the PPT is not linked to performance on the WPT is seen in the correlation coefficient for these two variables; the like group correlated .14, the unlike-A group .06 and the unlike-B group .29. With the unlike-B group there may be a hint of mutual dependency between the two variables.

Insert Table 4 and Figure 3 about here

It is possible that use of the a priori standardized accuracy criterion (as generated by like culture judges) is responsible for differential performance on the PPT. Thus, modal accuracy criteria were established for the unlike groups in order to demonstrate possible, similar intragroup consistency of judgment. For each subject, the percentage of group-wise modal judgments were produced to reflect the consensus in judgments shared by the majority of group members. For the like group, 78.50% of the judgments are shown to be modal with 73.68% for the unlike-B group and 72.37% for the unlike-A group. This is not a statistically significant difference ($F < 1$) although the 5% or 6% greater intragroup consistency among the like group offers no positive support for the notion that unique group-related consensus criteria were employed by the unlike groups.

Table 4

Accuracy of Person Perception and Word Perception Tests:
ANOCOV Summary for Like and Unlike Groups in Study II

Source	df	<u>SSa</u>	<u>Fa</u>	<u>SP</u>	<u>SSb</u>	<u>Fb</u>	<u>SSb</u> [^]	<u>MSb</u> [^]	<u>Fb</u> [^]	p	<u>ω²</u> [^]
Treatment	2	609.71	.77	597.78	587.39	4.42	489.58	244.79	3.66	.04	.07
Error	33	13064.58		847.92	2194.92		2139.89	66.87			
Total	35	13674.31		1445.69	2782.31		2629.46				

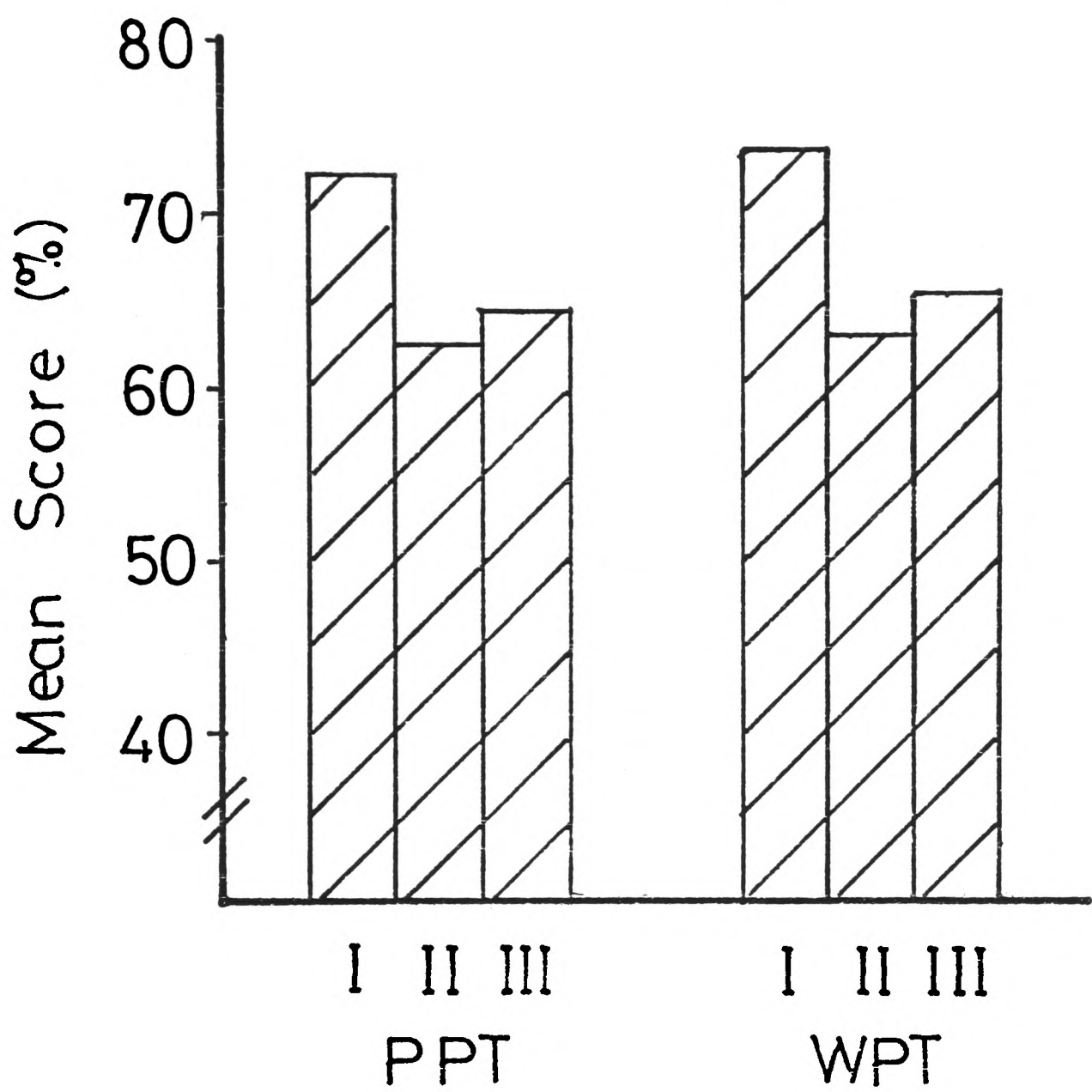
a = Score on word perception test.

b = Score on person perception test.

ω² = Strength of association between the independent variable and dependent variable.

Dunnett's multiple comparison statistic (.05/2, 2, 32) reveals Like ≠ Unlike-A and ≠ Unlike-B.

Figure 3. Accuracy on PPT and WPT : Study II.



I = Like Decoders
II = Unlike-A Decoders
III = Unlike-B Decoders

That decoders in the like group classified the nonverbal communicative acts with greater consistency or modal accuracy than did decoders in the unlike-A and unlike-B groups, and that no systematic difference was found between the three groups in performance on the WPT, gives support to Hypotheses 1 and 2.

The impressions formed of the male encoder's personality are more homogeneous in the like group than in either the unlike-A or unlike-B groups (Method A) with mean variance scores of 1.68, 2.93 and 3.51 respectively. Table 5 shows the item-wise analysis of covariance for testing homogeneity of impressions formed of the male encoder. There is a nonsignificant effect related to central tendency responding ($F = 2.39$, $p = .12$) but a very striking difference between the three groups in the item-wise variance score ($F = 15.43$, $p < .001$). This variance score difference remains after the effect of the covariate is partitioned ($F = 22.70$, $p = .001$). A similar analysis performed on the variance scores for impressions of the female encoder produce a similar effect (see Figure 4). The like group forms a more homogeneous impression with an average variance score of 1.32 than do either the unlike-A group with 2.32 or the unlike-B group with 2.88. The three groups do not differ with respect to central tendency responding ($F < 1$) but do differ in the magnitude of average variance on the 21-item semantic differential ($F = 6.63$, $p = .001$). This difference again remains when the covariate is partitioned ($F = 14.02$, $p < .001$). Dunnett's multiple comparison statistic reveals that for both encoders' ratings the like group is different from both the unlike-A and unlike-B groups ($p < .05$).

Insert Table 5 and Figure 4 about here

The intergroup homogeneity of impressions index shows that the three groups differed very strikingly in the amount of item-wise variability on the semantic differential scale items and this is shown graphically in Figures 5 and 6. Thus, support is found for Hypothesis 3.

Insert Figure 5 and Figure 6 about here

Table 5

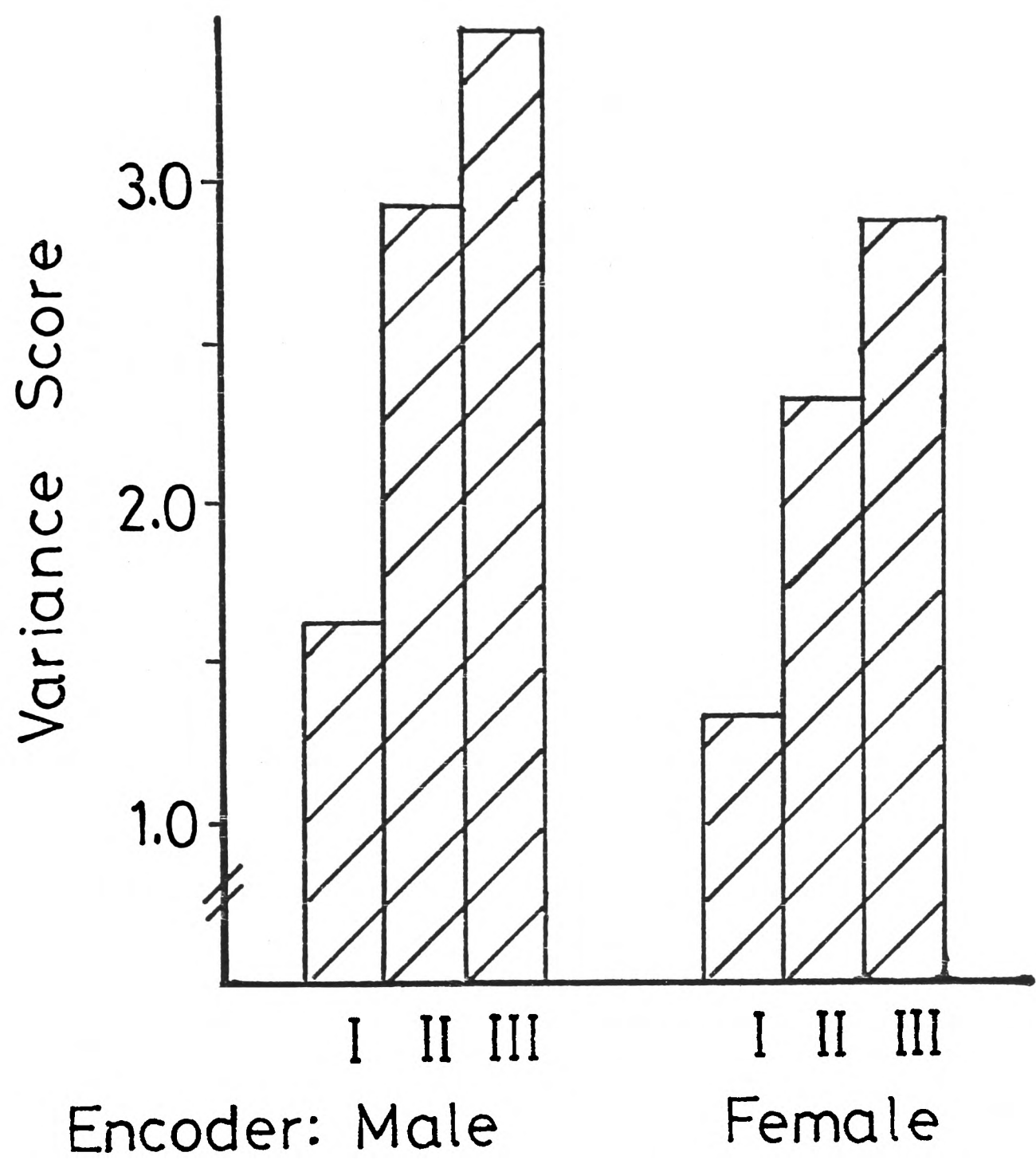
Homogeneity of Impressions Formed of Male and Female Encoders:
ANOCOV Summary for Like and Unlike Groups in Study II

Encoder	Source	df	$\overline{SSY}$	$\overline{FY}$	$\overline{SP}$	$\overline{SS(s)}$	$\overline{F(s)}$	$\overline{SS(s)}$	Residuals			
									$\overline{MS(s)}$	$\overline{F(s)}$	p	$\hat{\omega}^2$
Male	Treatment Effect	2	.88	2.39	4.63	36.64	15.43	42.23	21.12	22.70	.001	.54
	Item Effect	20	8.43	2.29	-6.29	16.56	.70	15.24	.76	.82	NS	.00
	Error	20	3.68		-3.17	23.74		17.68	.93			
	Total	62	12.99		-4.82	76.94		75.15				
Female	Treatment Effect	2	.51	.93	2.68	25.56	6.63	40.69	20.35	14.02	.001	.53
	Item Effect	20	13.37	2.40	-13.85	27.37	.71	13.14	.66	.45	NS	.00
	Error	20	5.57		-8.02	38.57		27.57	1.45			
	Total	62	19.45		-19.18	91.50		72.58				

$\bar{y}_2$ = Central tendency.
 s^2 = Variance score.
 $\hat{\omega}^2$ = Strength of association between the independent variable and dependent variable.

Dunnett's multiple comparison statistic (.05/2, 2, 32) Like ≠ Unlike-A and ≠ Unlike-B for male and female encoders.

Figure 4. Intersubjectivity
Method A: Study II.



I = Like Decoders
II = Unlike-A Decoders
III = Unlike-B Decoders

Figure 5. Variance Profiles for
Three Culture Groups:
Male Encoder.

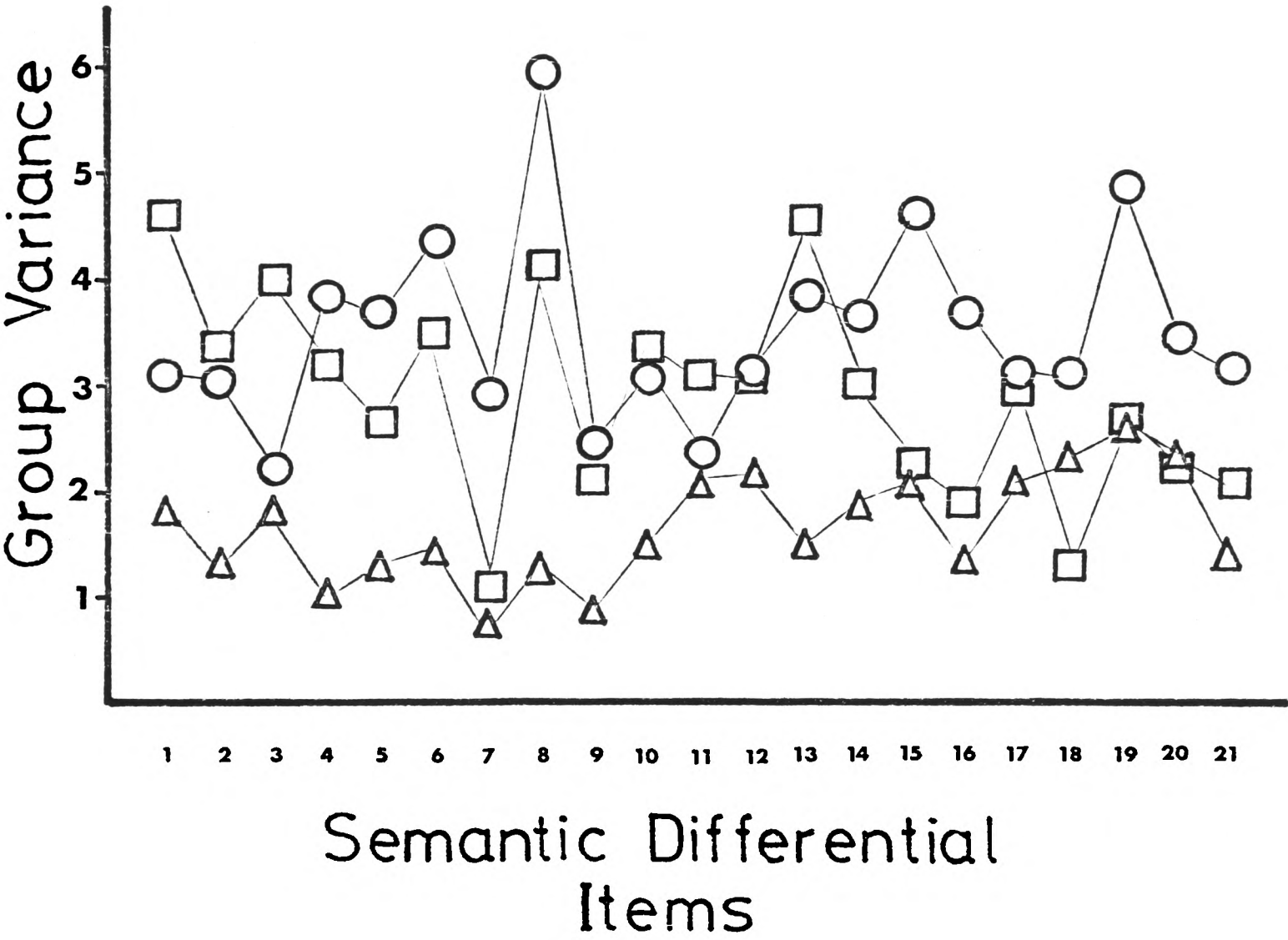
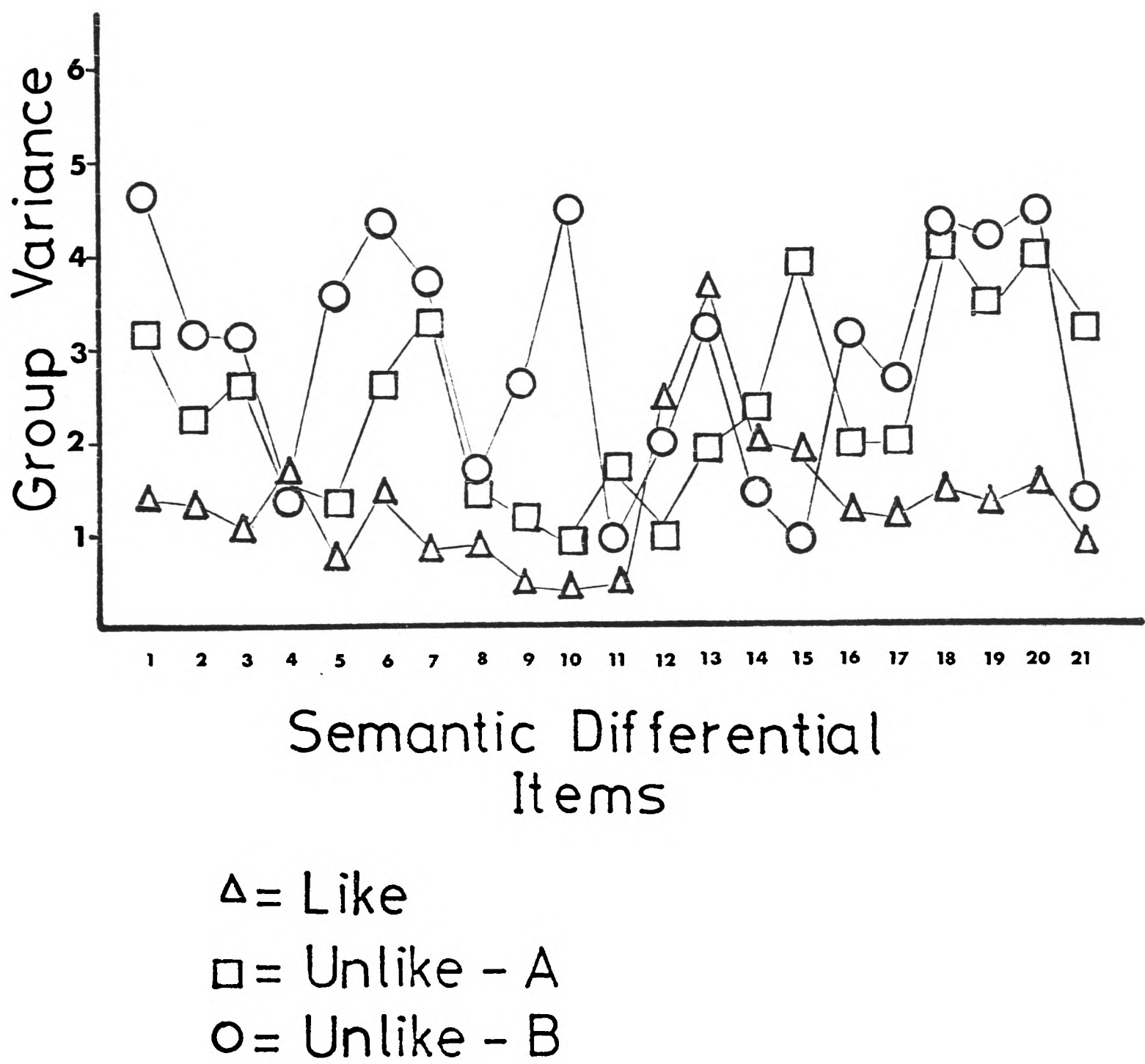


Figure 6. Variance Profiles for
Three Culture Groups:
Female Encoder.



For analysing subject-wise homogeneity of impressions, a mean spread score ($\bar{q}$) is computed for each subject in the experiment (Method C). Spread scores show how disparate each subject is with respect to his own group and can be used to test group differences in homogeneity of variance in semantic differential ratings. When averaged, group variances for this analysis produce the same means as in the previous technique (see Figure 4). Also with this analysis a more conservative test is possible. Considering first the spread of impressions formed of the male encoder, the like group again appears to be more consistent in their impressions than do either the unlike-A or unlike-B groups ($\underline{F} = 3.31, \underline{p} = .05$). Multiple comparisons reveal this to be a reliable difference between the like group and unlike-B group ($\underline{p} < .05$). There is a strong trend towards group differences in central tendency responding ($\underline{F} = 2.60, \underline{p} = .09$). Moreover, when this central tendency effect is removed, the spread score difference is no longer significant ($\underline{F} = 1$). Table 6 also shows that impressions formed of the female encoder tend to be less homogeneous in the two unlike groups ($\underline{F} = 2.44, \underline{p} = .10$) but there is a marginally significant effect on the central tendency index ($\underline{F} = 2.91, \underline{p} = .07$). As with the ratings of the male encoder, this marginal effect on the central tendency index is due to one or two decoders in the unlike-B group who continually used extreme judgments and avoided the middle of the scale in their semantic differential ratings. When this central tendency index is partitioned, the spread score analysis produces a clearly nonsignificant effect ($\underline{F} < 1$). The like group and the unlike-A group use the centre and extremes of the rating scales in approximately the same way. When the spread scores for these two groups are analysed separately, the expected differences are found. The like group forms more homogeneous impressions than does the unlike-A group when rating the male encoder ($\underline{F} = 5.66, \underline{p} = .03$) and the female encoder ($\underline{F} = 4.76, \underline{p} = .04$). This gives further support to Hypothesis 3.

Insert Table 6 about here

Table 6

Subject-wise Analysis of Homogeneity of Impressions Formed
by Encoders by Like and Unlike Groups in Study II

Encoder	Source	df	$\overline{SSY}$	$\overline{FY}$	$\overline{SP}$	$\overline{SS(q)}$	$\overline{F(q)}$	Residuals		
								$\overline{SS(q)}$	$\overline{MS(q)}$	$\hat{F(q)}$
Male	Treatment	2	642.06	2.60	115.70	20.94	3.31*	.91	.45	.64
	Error	33	4075.58		577.96	104.50		22.54	.70	
	Total	35	4717.64		693.66	125.44		23.45		
Female	Treatment	2	738.50	2.91	95.99	12.55	2.44**	.49	.25	.20
	Error	33	4183.50		436.03	85.00		39.56	1.24	
	Total	35	4922.00		532.02	97.56		40.05		

$\overline{y}$ = Central tendency.

$\overline{q}$ = Mean spread score.

* p = .05.

** p = .10.

Multiple comparisons (t statistic) reveal Like $\neq$ Unlike-B.

This analysis employs intersubjectivity Method C.

The index of differential accuracy does not yield the expected differences ($F = 2.16$, NS); there is no greater differentiation between ratings of the two encoders in any of the three groups. Thus, Hypothesis 4 receives no support. However, correlations between differential accuracy and scores on the PPT are .48 in the like group but only .19 and .15 in the unlike-A group and unlike-B group respectively, a finding which is at least suggestive.

Subject differences in the extremity of variance (Method D) produces striking effects in all the experimental groups (see Table 7). In the like group, the proportion of variance explained is 13% for the impressions of the male encoder and 16% for the impressions of the female encoder. For the unlike-A group, the figures are 11% for the male and 6% for the female but for the unlike-B group, the significant subject effect accounts for 25% for the male and 23% for the female. This atests not only to the stability of the homogeneity of impressions variable within individuals but also reaffirms the earlier finding that certain subjects in the unlike-B group employed particularly idiosyncratic styles in their ratings. However, there is no conclusive support for Hypothesis 5. About the same number of subjects in each group were "out of touch" with the usual perceptions of their own group.

Insert Table 7 about here

Discussion

It has been shown again that decoders of like cultural background to the encoders of nonverbal communicative acts interpret those acts with greater consistency than do decoders of unlike cultural background. The present study employed groups of psychiatric nursing students according to their cultural upbringing. A like culture group was comprised entirely of Caucasian students raised in Great Britain; the majority being from England but some from Ireland and Scotland. One unlike culture group was comprised of students from Southeast Asia, primarily Sri Lanka and the other unlike culture group was of students raised in the West Indies, mainly Trinidad and Jamaica. It was assumed that the three groups would be somewhat distinct due to varied cultural upbringing although all had spent at least the last three

Table 7
Individual Subject Differences in Perceptions
of Personalities of Male and Female Encoders in Study II

Decoders	Encoder	Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>	<u>$\hat{\omega}^2$</u>	<u>S_A</u>
Like		Treatment	223.02	11	20.27	4.20	.001	.13	5
		Error	1157.90	240	4.82				
		Total	1380.93	251					
Unlike-A	Male	Treatment	500.24	11	45.48	3.87	.001	.11	3
		Error	2818.32	240	11.74				
		Total	3318.56	251					
Unlike-B		Treatment	1403.33	11	127.58	8.61	.001	.25	4
		Error	3557.88	240	14.82				
		Total	4961.21	251					
Like		Treatment	272.04	11	24.73	5.18	.001	.16	2
		Error	1146.64	240	4.78				
		Total	1418.68	251					
Unlike-A	Female	Treatment	266.71	11	24.25	2.42	.01	.06	2
		Error	2408.93	240	10.04				
		Total	2675.64	251					
Unlike-B		Treatment	1210.63	11	110.06	7.59	.001	.23	3
		Error	3478.76	240	14.49				
		Total	4689.39	251					

S_A = Number of subjects different from their own group.
This analysis employs intersubjectivity Method D.

years living in London. That the three groups were approximately equivalent in English language proficiency and reading ability seems to have been a justified assumption since none of the groups differed in performance on the WPT.

Study II produced a successful replication of the findings of Study I. Not only were the major hypotheses again supported, there was a noteworthy similarity between the group means for the PPT: like decoders scored 71.38% in Study I and 72.00% in Study II; unlike decoders scored 60.13% in Study I and 62.75% and 64.32% in Study II. These and other similarities in the intersubjectivity analyses make this replication seem more credible.

When the unlike decoders were given their own modal accuracy criteria for the scoring of the PPT (based on the most frequent group judgments), the statistical difference between them and the like decoders disappeared. Although not directly supported by evidence, the unlike decoders may have had their own internally consistent, shared understandings of the nonverbal communicative acts. These understandings may, however, have been partially diluted or been under transition after the years spent in a mixed cultural and academic setting in Great Britain.

Differences in the homogeneity of impressions formed of the two encoders were found as predicted. Groups of nursing students of like cultural background as the encoders formed more homogeneous impressions of the encoders than did groups of nursing students of unlike cultural background. This was expected on the grounds that the like decoders were advantaged through correspondence of cultures; they employed similar coding rules and modes of cognizing the expression of nonverbal social cues (Mehrabian & Reed, 1968). The like decoders showed greater stereotype accuracy (as suggested by Gage & Cronbach, 1955) in intersubjectivity analyses. However, no systematic differences in differential accuracy were found using the method of assessing the absolute differences between the groups' mean ratings of the two encoders.

The analysis which sought to show greater idiosyncratic perceptions by certain members of the unlike groups did not yield expected differences. While individual differences were highly significant according to this inter-

subjectivity analysis (Method D), there was not a larger proportion of subjects among the unlike decoders who held relatively unique impressions of the two encoders than there was among the like decoders.

A social information processing explanation might be offered to account for certain intercultural misunderstanding, although this is not a novel idea to cross-cultural studies. Accepting that it is more difficult to comprehend nonverbal behaviours expressed by persons of other cultures, ambiguity and uncertainty may engender lack of tolerance or outright prejudice. However, as there appears to be a substantial learning component to person perception, this phenomenon may be relieved through increased familiarity. This has at least been implied in past research (e.g., Collett, 1971; Elliott, Wills & Goldstein, 1973; Galper, 1973; Malpass & Kravitz, 1969). "Universals" of nonverbal communication may be extended by broadening cross-cultural interactions.

Today, telecommunication may contribute to contact among cultures to a degree never before possible. Yet, simply providing technological links is not sufficient to guarantee effective use of communication systems; human factors are all important. Practice and experience are required in order to adapt to such social encounters. On a related point, Dickson and Bowers (1974) have offered the following caution about intercultural communication:

The audio telephone is actually a slightly positive instrument of antidiscrimination because, on the basis of voice alone, it is usually not possible to establish a person's colour, religion or ethnic background without an additional clue of a name, an accent or a dialect. However, on a video telephone some of these distinguishing characteristics are visible. Although a video telephone will reveal some non-verbal communication cues, it will probably prove easier to say "no" over a video telephone than in person. Consequently, there lurks the danger that subtle, difficult to establish discrimination could be fostered by video telephones

if they were used for initial employment screening,
in real estate transactions, and in similar activities
where discrimination has been a problem (p. 110).

To this sobering prediction one might optimistically add that perhaps mediated communication can help to alleviate such discrimination. Different cultures may be integrated via telecommunication with increased mutual understanding the important result. Improved communication may make it difficult for cultures to distance themselves from problems, disputes and disasters occurring elsewhere in the world. The appreciation of the viability of such an optimistic notion rests in future communication developments.

Certainly, there are conclusions which cannot be drawn from the present investigations. For example, no evidence has been offered to suggest that U.K. -raised Caucasian psychiatric nursing students are better at deciphering nonverbal communicative acts than are their peers not raised in the United Kingdom. It may be a shortcoming of the two studies that Asian and Black encoders were not included in the person perception test. Had this been done, *it is possible* that the performances of the group would have been reversed as the advantage of like cultural background shifted. As it stands, this person perception test suffers a similar limitation of cultural specificity that has plagued I. Q. testing for many years.

Moreover, there is no reason to suppose that Asian and Black psychiatric nursing students would perform their clinical duties less skilfully even if all their patients were from cultures unlike their own. Psychotics often display inappropriate affective behaviours, thus, nurses who are too rigidly set to perceive and interpret nonverbal communicative acts against stereotype or "normal" standards of behaviour may have greatest difficulty in communicating with the patients. In contrast, psychiatric nurses who possess a tolerance for ambiguity and inconsistency in social behaviour may prove better able to synthesize a variety of information which they have been taught to interpret, and to do this without excessive emphasis upon potentially misleading cues.

Finally, there would seem to be methodological implications to be drawn from these investigations. The standardized experimental tasks

consisting of the person perception and word perception tests, have been employed together to advantage. The WPT scores provided a covariate to control for certain aptitude, perception or motivation biases which were largely irrelevant to experimental purpose. A multifaceted approach to intersubjectivity has also been a worthwhile strategy. The item-wise analysis of group variance profiles revealed striking differences between groups; this technique when combined with the more conservative subject-wise spread analysis, yields a comprehensive probe of homogeneity in semantic differential ratings. Perhaps more useful than comparisons of person perception performance between various cultural groups in psychiatric settings would be the employment of intersubjectivity methodologies pedagogically. It may be feasible to assess and then adjust teaching procedures by comparing homogeneity of impressions formed by groups of students with those of their teachers and, perhaps, even with impressions of certain patient groups. Feedback from intersubjectivity analyses might direct subsequent teaching with the aim of aligning understandings and shaping communality of impressions.

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Comparing Social Influence and Intersubjectivity in Three Communication Conditions

Abstract

This quasi-experiment attempted to assess social influence and intersubjectivity in three dyadic conditions: (a) simulated-distance teleconference, (b) real-distance teleconference, and (c) face-to-face conference. Indexes of intersubjectivity but not social influence showed significant differences. There was greater communality of experience among face-to-face dyads than among dyads in either of the teleconference conditions. Differences between the two teleconference conditions were not evident. Further, this study considered some problems associated with employing rigorous experimental methodologies in settings which do not allow adequate experimental control.

The objectives of this quasi-experiment were two-fold. The first was to examine social influence and intersubjectivity in three communication conditions: (a) simulated-distance teleconference using the CCTV system of the Wired City Laboratory, Carleton University, Ottawa, (b) real-distance teleconference using a satellite link between the Wired City Laboratory, Ottawa and NASA/Ames Research Centre, California, and (c) face-to-face negotiation conducted at NASA/Ames Research Centre, California. The notion under investigation was that with increased personal contact between communicators one would find evidence of greater mutual influence and common experience. A second objective was to consider the choice of dependent measures in communication studies especially where cross-media comparisons are involved.

In the majority of studies on mediated communication, interpersonal distance is simulated rather than experimentally manipulated. The setting for research by Chapanis (1975) has consisted of two interconnecting sound-proof rooms with the number and type of communication modalities experimentally controlled. Such a procedure represents not only many of Chapanis's experimental procedures but a great many other communication studies (e.g., Champness, 1973; Coll, George, Strickland, Guild & Paterson, 1975; Strickland, Guild, Barefoot & Paterson, 1978; Turnbull, Strickland & Shaver, 1976; Williams, 1975). This is not to suggest that studies of mediated communication have never involved real distance. Duncanson and Williams (1973), for example, conducted a user attitude assessment of an audio-video teleconference system involving regular users who interacted over a distance of 35 miles. Short, Williams and Christie (1976) have reviewed other examples of real-distance teleconferences.

Owing to technological factors, there would necessarily be perceptible differences between the proposed simulated-distance and real-distance teleconferences. First, a transmission-reception delay of about .20 seconds would result as the signals were beamed from one ground station to the satellite and back to the other ground station. There would be no delay in the simulated condition. Secondly, because of compression to the video

bandwidth or the channel capacity in the satellite link, the image of the distant negotiator on the video monitor would appear slightly less resolved than in the closed-circuit video link which would operate at full video bandwidth.

Recently, Turnbull, Strickland and Shaver (1976) conducted an experiment in which dyads representing two fictitious nations negotiated for a nuclear disarmament. The bargaining sessions were conducted in three media settings: (a) face-to-face, (b) audio-video link, and (c) audio-only link. Their findings as related to this study were that the reduction in nuclear arms (ICBMs) differed according to the media conditions. The greatest reduction was found in face-to-face dyads (42.2%) followed by the audio-video condition (38.2%) and then the audio-only condition (27.9%); the former two conditions did not differ. They reasoned that the face-to-face and audio-video conditions may have allowed greatest agreement between negotiators because of the added nonverbal information transmitted in these modes. Also, a greater sense of immediacy and increased psychological closeness may have occurred.

An earlier study by Wickman (1970) examined the effects of isolation and communication modality on the level of cooperation in a two-person game. Four experimental conditions were created: (a) dyads in isolation, (b) dyads that could see but not hear each other, (c) dyads that could hear but not see each other, and (d) dyads that could both see and hear each other. Dyads in each of these conditions played the Prisoner's Dilemma game and the results indicated that there was an increasing amount of cooperation between players as the number of communication channels was increased. He concluded that the high degree of competitiveness may have been a function of isolation between players. The inclusion of the audio channel appeared to have greatest effect on cooperation between players.

Short, Williams and Christie (1976), reviewing some of their research, described certain effects of medium of communication on resolving a conflict of opinion. The experimental conditions were: (a) face-to-face, (b) audio-video, and (c) audio-only. Subjects attempted to agree on 19 statements dealing with current public issues. Pre- and postdiscussion opinions were measured. Somewhat surprisingly, the authors reported that the least amount

of opinion change was in face-to-face followed by audio-video, with audio-only showing the greatest opinion change. They suggested that these findings would seem to fly in the face of theoretical predictions and common sense.

Considering the number of media studies which have compared different modalities of communication, there has been a paucity of significant findings. Several explanations for this could be offered. First is the unlikely possibility that there are no measureable differences which would be of consequence; some researchers have found it tempting to draw such conclusions (e.g., Young, 1976). Secondly, loose experimental paradigms and lack of rigour in methodology may have lead to excessive error variance in dependent measures and to null results. Thirdly, perhaps not the most discerning questions have been asked in some cross-media investigations; selection of dependent variables can determine whether or not differences are found. Fourthly, various subject response dispositions may have been introduced unknowingly into experimental procedures again fostering uninterpretable results. The last point will be considered briefly.

The social psychology of the communication experiment. In an unpublished paper (Guild, 1972) this author considered various sources of experimental artifact. Rosenthal and Fode (1963) concluded that an experimenter could sometimes communicate biases or expectations to the subject and so contribute to the attainment of expected results. Orne (1969) argued convincingly that often subjects attempted to structure the meaning of an experimental procedure in a way that permitted them to behave like "good subjects". In other words, even if the true purpose of an experiment is disguised, subjects may attempt to interpret demands and act in accordance with them in order to confirm implicit hypotheses. Following a similar argument, Rosenberg (1969) has suggested that subjects are, at times, motivated by a concern to demonstrate their maturity and emotional adequacy in the performance of experimental tasks. He has stated that subjects may work to receive positive evaluations from the experimenter or, at least, to avoid negative ones. According to Adair and Schacter (1972) subjects' behaviour may be altered as a function of how explicitly the

experimental hypotheses are stated and how obedient, yet true to themselves, the subjects feel they are expected to be. The total impact of all subject response sets may add to the complexities of social interactions in communication studies.

The choice of dependent variables. A variety of dependent variables have been employed in past cross-media studies. Researchers have measured such things as the amount of time required to solve a mutual task (e.g., Chapanis, 1975), jointly determined outcomes of two-person games (e.g., Wickman, 1970), simulated negotiation outcomes (e.g., Morley & Stephenson, 1969; Short, 1974; Turnbull, Strickland & Shaver, 1976), coalitions formed and ideas generated during brainstorming meetings (e.g., Williams, 1975), and attitude ratings (e.g., Champness, 1973; Christie, 1974; Duncanson & Williams, 1973). The diverseness of dependent variables is a strong feature in this research.

Although previous research has often failed to find differences between face-to-face and audio-video experimental conditions (e.g., Champness, 1971; Short, 1974; Short, Williams & Christie, 1976; Turnbull, Strickland & Shaver, 1976; Williams, 1975), the intention of this study was to look closely for differences between face-to-face and two mediated conditions on dependent measures of social influence and intersubjectivity. For the purpose of this investigation, social influence might be thought of as change in attitude and/or behaviour arising directly from interpersonal encounters. Although studied in various ways, social influence might, for example, be inferred from negotiation outcomes. During face-to-face interactions, social influence may be difficult to resist. Teleconference interactions, being less immediate (Mehrabian, 1971), may permit less potent social influence. Even less power to influence might be expected from real-distance teleconference because, in addition to a psychological barrier of vast interpersonal distance, there would be technological compromises in audio-video transmissions between negotiators. With intersubjectivity assessments, a similar line of reasoning may apply. Intersubjectivity has been defined as a condition of shared impressions or communality of experience between individuals. To measure intersubjectivity, methods have been devised which assess the extent of agreement in semantic differential ratings of a common event, object or target person.

Hypotheses

It was predicted that face-to-face dyads would show the greatest degree of social influence and intersubjectivity followed by simulated-distance teleconference dyads and real-distance teleconference dyads in that order.

A secondary intention was to explore the notion that the variables least susceptible to subject response dispositions (i.e., the intersubjectivity analyses) would be the most discriminating and those most susceptible (i.e., the subjective judgments) would be least discriminating.

Method

Subjects

The subjects were 48 male undergraduates from a technical college near Palo Alto, California (20 males) and from Carleton University, Ottawa (28 males). For their participation, subjects were paid \$3.00 per hour.

Procedure

Dyads in the face-to-face condition (F-F) sat opposite each other across a table at a distance of 2 metres. This condition was conducted at the NASA/Ames Research Centre. Dyads in the simulated-distance teleconference condition (CCTV) sat at the communication nodes of the Wired City Laboratory, Carleton University. Dyads in the real-distance teleconference condition (Satellite) were comprised of subjects from both locations using both facilities. In the original study plan, it had been intended that half of the F-F dyadic interactions and half of the CCTV dyadic interactions would be conducted at each location. However, constraints on facility scheduling made this impossible.

Dyads in all conditions were asked to role-play the part of a chief disarmament negotiator for a world super power, either Nation A or Nation B (for procedure see Appendix C). It was felt that the experimental task (an adaptation of Turnbull, Strickland & Shaver, 1976) would offer an engaging and somewhat competitive focus for interaction; it had already been used effectively in the same communication facility. At the beginning of the session, an audio cassette recording briefed the two negotiators who followed along in their "Negotiation Booklets". Dyads then completed the prenegotiation questionnaire in the booklets and proceeded to negotiate for about 15

minutes. During this time, the two negotiators attempted to reach a mutually satisfactory percentage reduction of ICBMs. After the negotiation session, dyads completed the postnegotiation questionnaire found in their booklets. All conditions were videotaped for subsequent content analysis which is reported later on.

Data Analysis

The dependent variables considered were based on the subjects' responses to questions in the negotiation booklet (see Appendix C).

1. Indexes of intersubjectivity. This set of variables was derived to measure communality of impressions formed of the communication medium/setting. This was accomplished by considering variability in semantic differential ratings (pp. 6, 10 & 11). It was expected that these measures would be minimally influenced by various subject response dispositions. The first variable was an index of intragroup consistency in the variance profiles of the semantic differential ratings of the negotiators' common event, the communication medium/setting in which they negotiated (Method A). The second variable was an index of intradyadic difference score derived from the semantic differential ratings (Method B). The third variable was an index of postnegotiation mutual perceptions of each other's nation (Method B).

2. Indexes of social influence. Three dependent variables in this category were employed in order to demonstrate postnegotiation change in attitude or persuasion. The first index was the straightforward percentage reduction of ICBMs. A second index was derived from the units of within dyad difference on the semantic differential ratings reflecting any change in the perceptions of each other's nation. The third index was derived from the absolute difference between the predicted (prenegotiation) ICBM reduction level and the actual (postnegotiation) percent reduction. For the most part, these indexes were mutually determined by the dyad members but, perhaps, open to a certain amount of subject response bias as well.

3. Indexes of subjective judgment. Eight questionnaire items were included in this category. These items, designed to measure attitude towards the communication medium/setting, are found in the negotiation booklet (p. 12). Item 6(b) was deleted from the analysis as it was inappropriate

for one condition. The assumption was that these judgments would be influenced not only by the subjects' reactions to the communication medium/setting but also by such response dispositions as evaluation apprehension and demand characteristics.

Results

Due to the exploratory and descriptive nature of this study, separate univariate one-way ANOVAs were performed on the data for each independent variable. A more conservative treatment of the results, for example the use of MANOVA, would have been used if the hypotheses could have been tested in a true experimental manner.

1. Indexes of intersubjectivity. First, intersubjectivity as measured by the group homogeneity of impressions formed of the communication medium/setting, reveals that there is less variability in the group variance profiles of the face-to-face condition compared with either of the mediated conditions. Table 1 shows that the face-to-face condition has greater group consensus of impressions of the communication experience (by about 70%) than has either of the mediated conditions. This finding is graphically depicted in Figure 1. There is no significant difference between CCTV and Satellite conditions.

Insert Table 1 and Figure 1 about here

The index of intradyadic agreement in perceptions of the communication medium/setting, the second intersubjectivity index, shows greatest consistency in the face-to-face condition again, by about 70% ($F = 5.45, p = .02$). Multiple comparisons reveal that face-to-face dyads are significantly different from dyads in both mediated conditions; again, the latter two do not differ. This is taken as further evidence of increased intersubjectivity in the face-to-face condition (see Figure 2). The third index of intersubjectivity, the unit differences of within dyad mutual perceptions of the two nations, does not yield a significant difference ($F < 1$).

Insert Figure 2 about here

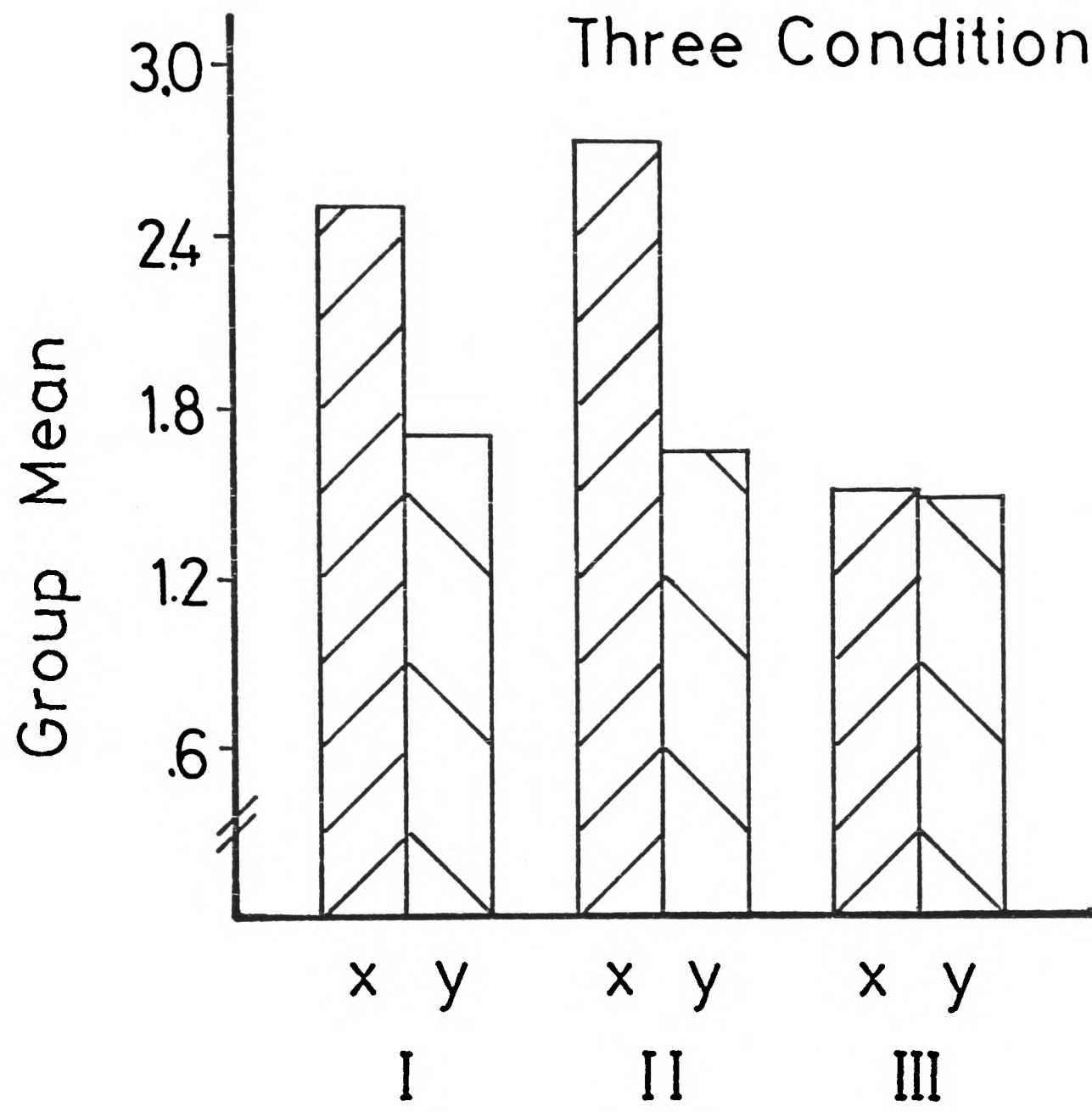
Table 1
Three Indexes of Intersubjectivity
in Three Communication Conditions

Index	Face-to-face	CCTV	Satellite	<u>F</u> ratio	P
I	Mean	2.77	2.51	10.21	.001 ^a
	Standard Deviation	1.17	0.95	($\hat{\omega}^2 = .20$)	
II	Mean	1.87	1.83	5.45	.02 ^a
	Standard Deviation	0.53	0.61	($\hat{\omega}^2 = .33$)	
III	Mean	1.13	1.18	<1	NSD
	Standard Deviation	0.43	0.42	($\hat{\omega}^2 = .00$)	

I = Item-wise assessment of homogeneity of variance on the semantic differential ratings of the communication experience.
 II = Intradynamic units of disagreement in the semantic differential ratings of the communication medium/setting.
 III = Mean intradynamic differences (scale units) in mutual perception of each other's nation.
 $\hat{\omega}^2$ = Estimate of strength of association between the independent variable and the dependent variable.

^a Multiple comparisons show that F-F ≠ CCTV; F-F ≠ Satellite.

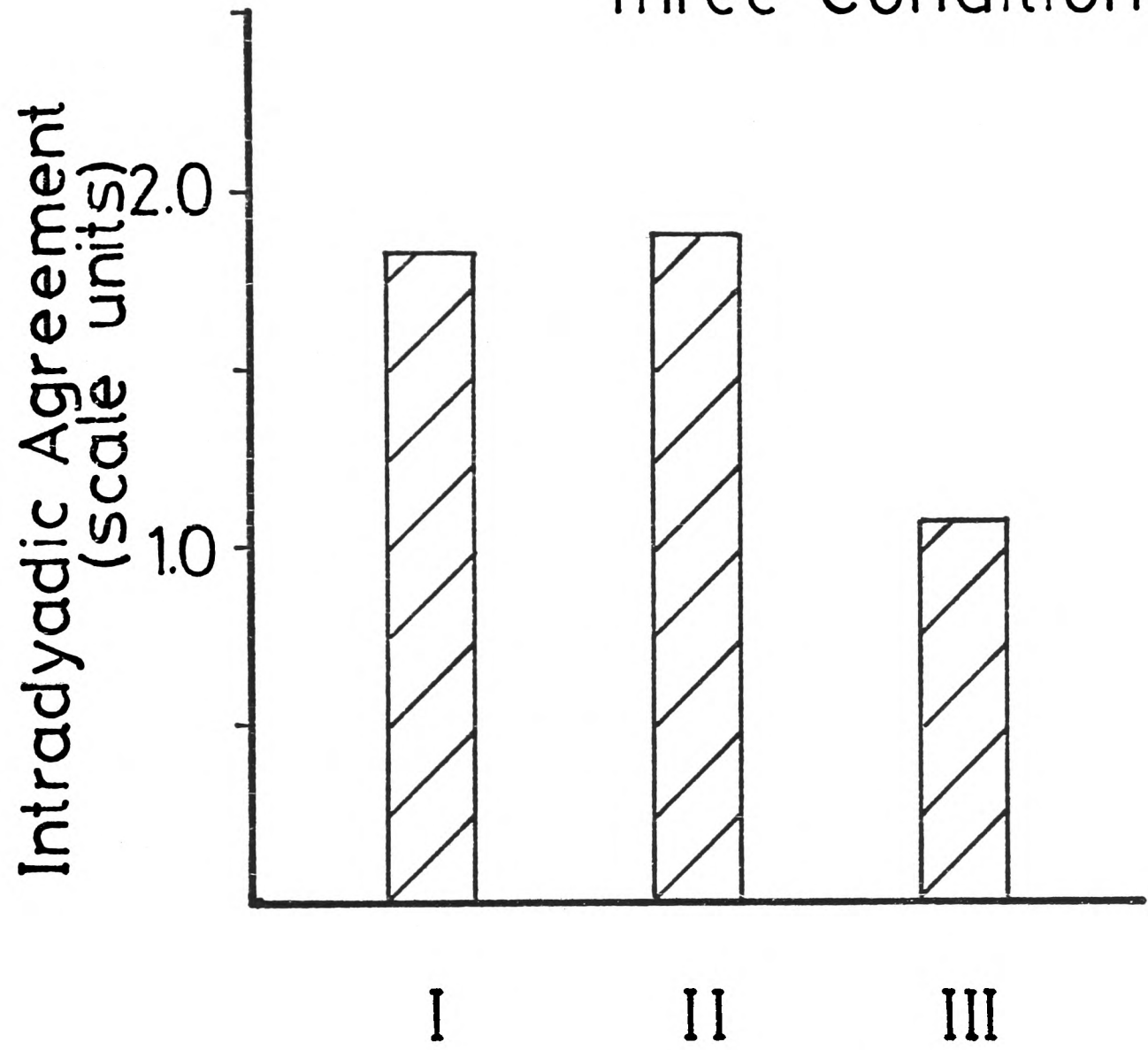
Figure 1. Intersubjectivity
Method A in
Three Conditions.



x = variance score
y = central tendency

I = Satellite
II = CCTV
III = F-F

Figure 2. Intersubjectivity
Method B in
Three Conditions.



I = Satellite
II = CCTV
III = F-F

2. Indexes of social influence. As shown in Table 2, none of the three dependent variables of social influence discriminated the three conditions. There is about the same amount of change in the semantic differential ratings of "the other negotiator" (pre-to postnegotiation difference) in each condition. The absolute difference between the predicted and the actual percent reduction of ICBMs is about the same in all three conditions. Moreover, the percentage of ICBM reductions is not different in the three conditions.

Insert Table 2 about here

3. Indexes of subjective judgment. None of the eight questionnaire items in this dependent variable category showed any tendency to discriminate systematically the three communication conditions. Seven of the eight items produced F ratios of less than one; item 6(b) produced an F ratio of 1.49 which is clearly nonsignificant. A test for systematic rank orderings of the three conditions on the eight questionnaire items reveals a stability which is only marginally significant (Kendall's coefficient of concordance, W = .33, p = .08). The mean group rankings are F-F = 1.50; CCTV = 1.88; Satellite = 2.63. This order is compatible with earlier results.

Discussion

As predicted, face-to-face dyads shared more common perceptions of the communication medium/setting than did dyads in either mediated condition. Also, the greatest intradyadic agreement in ratings of the communication experience was found in the face-to-face dyads. This result would seem to be consistent with the notions of intersubjectivity developed earlier and with the assumption that increased communality of experience would coincide with heightened immediacy of the communicators.

Even with a wide range of dependent variables, there was nothing to suggest systematic differences between simulated- and real-distance teleconferences. Uncontrolled factors appear to have intervened in these dependent measures. Any conclusions of no difference between these conditions would certainly be unfounded but the results offer little to consider in the way

Table 2

Three Indexes of Social Influence
in Three Communication Conditions

Index		Face-to-Face	CCTV	Satellite	F ratio	p
I	Mean	35.52	38.51	33.61	<1	NSD
	Standard Deviation	21.33	20.81	29.66		
II	Mean	22.17	23.44	22.35	<1	NSD
	Standard Deviation	21.72	20.70	20.84		
III	Mean	15.85	19.92	18.46	<1	NSD
	Standard Deviation	16.12	15.65	18.69		

I = Percentage of ICBMs reduced following negotiation.
 II = Pre-to postnegotiation change in semantic differential ratings of other nation (total scale units).
 III = Absolute difference between predicted reduction of ICBMs and the actual negotiation outcomes.

of positive findings. At first glance, these nonsignificant outcomes may seem reminiscent of the null result reported by Turnbull, Strickland and Shaver (1976) in their comparisons of face-to-face and audio-video mediated interactions. Procedurally, the present CCTV condition was similar to their audio-video condition and the resulting ICBM reductions were nearly the same, 38.2% in their study and 38.5% in the CCTV condition. The previous study found greatest ICBM reductions in face-to-face (42.2%) but the present face-to-face condition showed only 35.5%. Turnbull, Strickland and Shaver (1976) had the advantage of using a single randomly assigned subject population. The present study, while attempting to use equivalent groups of undergraduate males, may have introduced a bias because of the group compositions which were taken from two separate locations. A subsequent content analysis of the videotaped interactions in all conditions may reveal differences between the subject populations.

Practical considerations discourage real-distance teleconference investigations. Most simulation laboratories are not equipped with the technical facilities to enable long-distance transmission. Even if transmission problems were circumvented, it may be difficult to guarantee comparable technical facilities at both ends of a communication link. Differences in the quality of the audio-video modalities may arise due to signal processing requirements, "noise" picked up during transmission or delay between transmission and reception. Of a psychological nature, there may be additional inequalities between real and simulated teleconferences. It is often not feasible to randomly assign subjects to conditions. If unacquainted persons communicate over a long distance, their behaviour may be influenced by the fact that they are unlikely ever to meet face-to-face. On the other hand, there may be positive reactivity on the part of communicators having overcome distance in this way. Also, because it was their choice to participate in a mediated communications study, volunteer subjects may introduce a self-selection bias. These are but a few examples of how unpredictable technological and human factors may be of consequence in real-distance investigations. While such factors do not place experimental rigour out of reach, they may instead encourage more descriptive and exploratory quasi-experiments.

The social psychology of a communication experiment may be responsible for certain perplexing findings in cross-media studies. Consider the subject who is asked to judge the adequacy of two communication systems, one relatively rich in social information and another relatively impoverished. It may be naive to expect that the subject could provide an objective assessment without being influenced by implicit demands. As well, the questions asked of the subject could evoke biased responses. Two ways of minimizing subject response dispositions might be (a) to provide engaging tasks which give a strong focus of attention in their own right while de-emphasizing cross-media comparisons, and (b) to select dependent variables which are not laden with implied demands. Other researchers have called for more discerning methodologies in communication studies. "Efficient comparisons among alternative communication modalities (e.g., telephone, Picturephone, face-to-face communication) require a determination of the most important dimensions to measure and procedures for measuring dimensions" (Wish, 1977, p. 1).

It has been argued that subjective judgments may be most susceptible to biases from demand characteristics. Then too, if negotiators are to be measured on indexes of social influence, it should be remembered that while they may be striving to manipulate the attitudes and/or behaviour of their partners, they are simultaneously resisting similar influences which are being exerted on them. Typically, when assessing social influence these countertendencies are collapsed into a single analysis. Intersubjectivity analyses, however, seem less susceptible to biases arising from response disposition and deliberate resistance. What point would there be in avoiding common understanding, perceptions or experiences while striving to effectively communicate? Unless a person were to generate entirely random rating scale responses, it would seem unlikely that these mutually determined indexes could be disguised.

In future, it may be possible to move beyond exploration and description in order to identify communication factors which contribute to shared understanding and communality of impressions. In other applications, intersubjectivity analyses might be used to predict negotiation outcomes. A divergence

of perceptions may signal the need for further discussion between negotiators; a convergence may identify the point at which to attempt a compromise.

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An Assessment of Differential Intersubjectivity
in Five Communication Conditions

Abstract

In this experiment, several intersubjectivity analyses were performed on data from five communication conditions. Three were face-to-face dyadic interactions at distances of (I) $\frac{3}{4}$ metre, (II) 2 metres, and (III) 3 metres. Two were audio-video mediated dyadic interactions with distances comparable to (IV) 2 metres, and (V) 3 metres. Communality of impressions formed of their discussions was assessed. It was found that, as predicted, greatest intersubjectivity coincided with greatest immediacy and social presence. The intersubjectivity analyses complemented and extended previous findings.

One strategy for assessing intersubjectivity or communality of impressions is to employ in a single experiment more than one of the methods discussed earlier (see pp. 38-67). For the most part, these methods test aspects of intersubjectivity which although conceptually related are somewhat different. For example, one method assesses consistency between conditions by comparing homogeneity of variance profiles of a semantic differential while another compares intradyadic rating agreement. Several of these methods were used to determine the degree of intersubjectivity in five communication conditions.

An experiment reported earlier investigated intimacy, gaze and social distance in three face-to-face and two audio-video mediated conditions (see pp. 70-87). It found that during mediated interaction, communicators did not experience the predicted degree of interpersonal remoteness or separation. It appeared that certain negative consequences of excessive intimacy, especially assertiveness and dominance, were less salient to mediated dyads and that certain positive aspects remained unchecked. This was inferred from the results which showed the mediated dyads liking each other more, enjoying the experiment to a greater extent and actually perceiving greater "closeness" than did face-to-face dyads. An important intervening variable may have been the levels of intradyadic gaze which were significantly higher in mediated dyads and which may have contributed to their perceived intimacy.

The hypotheses of the present study might be thought of as corollaries of the original hypotheses. Recall that there has been evidence in face-to-face interactions that a distance of 2 metres separating communicators is most comfortable, neither too close nor too far, for discussion (e.g., Argyle & Dean, 1965; Goldberg, Kiesler & Collins, 1969; Mehrabian, 1968). There remained the question of whether the interactions at this optimal separation yield greatest intersubjectivity when compared with interactions at the too intimate $\frac{3}{4}$ metre and too remote 3 metre conditions. If interaction was too intimate for comfort, were shared perceptions or communality of experience diminished when intimacy was adjusted? One might expect that

communicators at the $\frac{3}{4}$ metre distance would find concentration on their task more difficult due to the distraction of intimacy management. In mediated conditions, did increased image size of the communicators coincide with increased intersubjectivity? This assumes that a larger video image of a person would provide greater opportunity for informational monitoring of that person. Did the less immediate mediated conditions allow less intersubjectivity than the more immediate face-to-face conditions? The present study afforded the opportunity to compare degrees of intersubjectivity at various levels of media immediacy (Mehrabian, 1971). Would the dependent variables which were previously found to discriminate the experimental conditions be correlated with the indexes of shared perceptions of the communication task? For example, one dependent variable was "preference to work with the other person again". Examples can be found in the literature of positive relationships between indexes of attraction and similarities in cognitive style (e.g., Triandis, 1960), attitudes (e.g., Byrne, 1961) and task performance (e.g., Senn, 1971). Correlations would be used to explore statistical dependencies between intradyadic agreement in semantic differential rating and the following:

1. preference to work with the other person again.
2. percentage of gaze while talking.
3. perceived psychological distance.
4. perceived physical distance.
5. evaluative component of the semantic differential.
6. social distance component of the semantic differential.

Basically, two types of intersubjectivity analyses would be considered. The intradyadic difference analysis (Method B) would be used to test the extent of agreement between communicators in the discussion ratings. In this way, each dyad would produce a single datum of mean agreement and this would become the conceptual unit of analysis. Within group dispersion differences in the semantic differential ratings (Method A) would be used to assess shared perceptions of the discussion. Now the group variance score for each semantic differential item would be the conceptual unit of analysis.

A similar but more conservative test of within group homogeneity of impressions (Method C) would assess individual's mean spread of rating relative to his/her group membership. With several aspects of intersubjectivity under consideration, the predictions of difference between experimental conditions would remain the same.

Hypotheses

1. In face-to-face interactions, the 2 metre condition was expected to show greater intersubjectivity (i.e., consensus of impressions formed of discussions) than either the $\frac{3}{4}$ metre or 3 metre conditions.
2. Intersubjectivity in face-to-face conditions (2 and 3 metres) was expected to be greater than in mediated conditions.
3. In the mediated conditions, the larger image size was expected to permit greatest intersubjectivity.
4. In general, it was expected that significant correlations would be found between the intersubjectivity index (i.e., intradyadic agreement) and dependent variables previously found to discriminate the experimental conditions.

Method

Subjects

Forty members of the University of Oxford, Department of Psychology Subject Panel, about an equal number of nonstudents and undergraduates, were paid 50 pence per hour for their participation. Unacquainted, mixed sex dyads were formed and had an average age of 20 years (range of 18 to 32 years).

Procedure

In the mediated conditions, an interactive audio-video link was established between three adjoining rooms in the psychology laboratory. The two extreme rooms served as communication nodes while the centre one was used as the control room from which the experimenters monitored and recorded the experimental session. Subjects were seated in front of a 19 inch black-and-white video monitor above which a video camera was mounted, and below an audio speaker was located. Camera lenses were altered to create image size manipulations: (a) a 25 mm lens to produce a retinal image size similar to a 2 metre face-to-face separation, and (b) a 19 mm lens to produce a

retinal image size similar to a 3 metre face-to-face separation.

The experimental task for the face-to-face dyads was similar to the above mentioned. Three distances of interpersonal separation created the typical Intimacy Equilibrium Model conditions: (a) a $\frac{3}{4}$ metre too intimate separation, (b) a 2 metre optimal separation, and (c) a 3 metre too remote separation. Again, the interactions were videotaped. Following the problem-solving task, subjects completed the same questionnaire as did the mediated subjects.

Dyads discussed four human relations problems for about five minutes each, with instructions to attempt to reach a mutually acceptable solution. Briefings were given by audiotape recordings. Following the session, subjects completed a questionnaire, which included a 35-item semantic differential to rate their discussions. These were rated because the discussions were for all dyads the mutually shared event (for procedure see Appendix A).

Results

The first intersubjectivity analysis thought to be most appropriate for this study is the intradyadic difference technique (Method B) used to test if dyads in various conditions differ in the degree of agreement in discussion ratings. This analysis does not yield a significant difference between the five conditions ($F = 2.17$, $p = .12$). This is a relatively low-powered test and with the number of observations per cell less than the number of treatment levels such a result may not be too surprising.

Next, the homogeneity of group impressions of the discussions is considered. An item-wise analysis of homogeneity of variance (Method A) is performed on the semantic differential profiles for the five groups. In an analysis of covariance, the medium effect and a semantic differential item effect is partitioned with the central tendency covariate used to control for possible extremity of response bias in ratings. Table 1 shows that the five conditions differ in their homogeneity of impressions of the discussions ($F = 9.81$, $p < .001$) and this difference remains when the covariate effect is partitioned ($F = 9.56$, $p < .001$). The main independent variable manipulation,

the medium effect, accounts for 13% of the variance in the intersubjectivity index, whereas the block effect (i.e., variance due to semantic differential items) accounts for 23%. The groups differ in their tendency to respond near the midpoint of the scale ($F = 15.96, p < .001$). Evidently, more extreme ratings were made in some conditions. The most extreme responses being in the mediated 2 metre condition and the least extreme in the 3 metre face-to-face condition (Kendall's $W = .46, p < .001$).

Insert Table 1 about here

Multiple comparisons (Tukey's LSD) reveal that, as predicted, the greatest consistency of impressions is formed in the 2 metre face-to-face group. This condition is statistically different from $\frac{3}{4}$ metre ($p < .05$) and 3 metre ($p < .01$) face-to-face conditions and is taken as support for Hypothesis One. Optimal interpersonal spacing yields optimal intersubjectivity while excessive closeness or remoteness results in a lowering of same (see Figure 1).

Insert Figure 1 about here

Mediated conditions appear to have greater intersubjectivity than was expected. Recalling the prediction that face-to-face conditions should allow greater communality of impressions than mediated conditions, the combined mean variance of the 2 and 3 metre face-to-face groups (.90) is not significantly lower than the mean of the mediated groups (1.00). That the optimal face-to-face condition does yield greater intersubjectivity than either of the mediated conditions ($p < .01$), gives partial support for Hypothesis Two. Note the similarity in the means of the mediated 3 metre and 3 metre face-to-face conditions, a result counter to Hypothesis Two.

An internal analysis reveals that intersubjectivity in the mediated 2 metre condition is reliably greater than in the mediated 3 metre condition (Tukey's LSD, $p < .05$). The larger image size of the communicator pro-

Table 1

ANOCOV for Intersubjectivity
in Five Communication Conditions

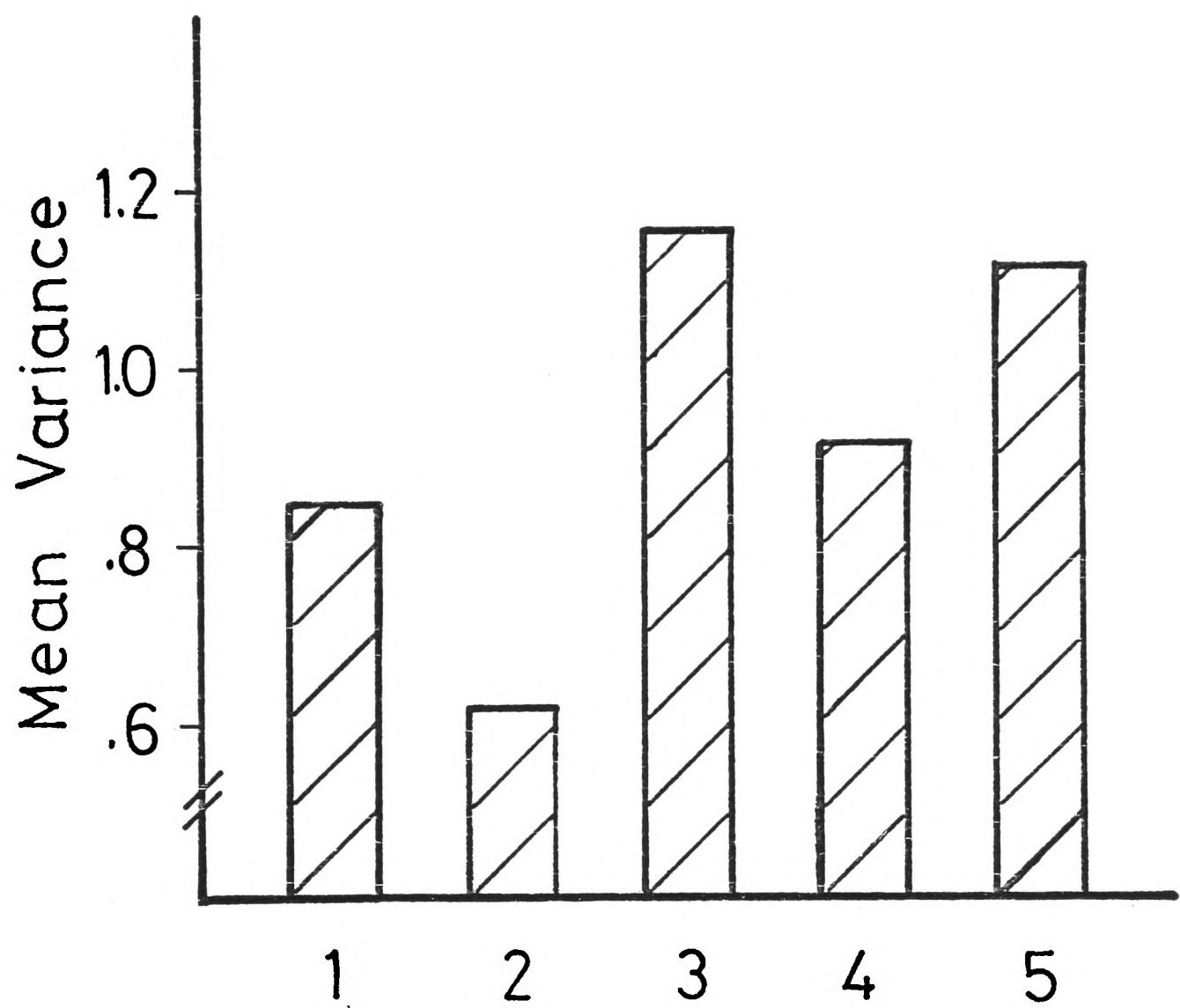
Source	df	$\underline{SS\bar{y}}$	$\underline{F\bar{y}}$	$\underline{SP}$	$\underline{SS(s)^2}$	$\underline{F(s)^2}$	Residuals			
							$\underline{SS(\hat{s})^2}$	$\underline{MS(\hat{s})^2}$	$\underline{F(\hat{s})^2}$	$\underline{p}$
Treatment Effect	4	4.97	15.96	-1.86	7.19	9.81	6.49	1.62	9.56	.001
Item Effect	34	15.62	5.90	-5.46	18.47	2.96	16.60	.49	2.88	.001
Error	136	10.59		-4.63	24.92		22.90	.17		
Total	174	31.17		-11.95	50.58		45.99			

$\bar{y}$ = Mean central tendency.

s^2 = Variance score.

ω^2 = Strength of association between the independent variable and the dependent variable.

Figure 1. Intersubjectivity
in Five Conditions.



- 1 = F-F and .75 m.
- 2 = F-F and 2 m.
- 3 = F-F and 3 m.
- 4 = V-M and 2 m.
- 5 = V-M and 3 m.

duces more consistent within group impressions of the discussions. This gives support to Hypothesis Three.

Next, a correlational analysis is used to assess relationships between the intersubjectivity index and the dependent variables previously found to differentiate experimental conditions. Recall that it was expected that high intradyadic agreement in the discussion ratings (manifest as low difference scores) would show a mutual dependency with preference to work with the other person again, perceived interpersonal closeness, higher levels of gaze and positive feelings about the experiment. This relationship appears strongest in the case of perceived social distance (a component on the semantic differential) with a correlation of $\underline{r} = .45$ ($p < .05$) and a similar semantic differential evaluative component of $\underline{r} = .38$ ($p < .10$). The relationship is weaker with the index of preference to work with the other person again ($\underline{r} = .20$) and with perceived physical distance ($\underline{r} = .22$). In these cases, the direction of the relationship is as predicted. The correlation with the amount of interpersonal gaze while talking is negligible ($\underline{r} = .05$). One correlation is opposite to what was expected; namely, perceived psychological distance is inversely related to communality of impressions ($\underline{r} = -.22$). While not a particularly strong correlation, this unexpected finding may have arisen due to intimacy management in the too intimate $\frac{3}{4}$ metre face-to-face condition. To summarize, intradyadic agreement on the semantic differential ratings tends to be associated with favourable impressions and perceptions of low social distance in the discussions.

Discussion

The degree of intersubjectivity or communality of impressions was shown to change as a function of media characteristics of the experimental conditions. Group variance profiles derived from semantic differential ratings of the discussions were reliably more consistent in some conditions (i.e., 2 metre face-to-face and mediated 2 metre). Within group agreement in the semantic differential ratings of the discussions was said to reflect the degree of intersubjectivity experienced. In all but one of the comparisons the extent of intersubjectivity was as predicted. Intradyadic rating agreement

which would have been a convincing intersubjectivity index did not yield significant differences. Nevertheless, sizeable correlations were found between this intradyadic agreement and indexes of low social distance, favourable regard for partners, and positive evaluations of the discussion task. In the ANOCOV which considered the degree of intragroup rating consensus, approximately 13% of the variance was accounted for by the experimental conditions, though nearly twice that amount was explained by the semantic differential item effect.

Interaction at the optimal 2 metre face-to-face separation allowed the greatest intersubjectivity. This was as expected since the best circumstance for person-to-person communication should lead to maximally shared experience. At the $\frac{3}{4}$ metre separation where intimacy was reduced, there was a corresponding reduction of intersubjectivity. It appears that by the erection of psychological barriers as part of an intimacy management strategy by subjects, intersubjectivity was inadvertently diminished. This finding may be of consequence for the Intimacy Equilibrium Model which posits the operation of such homeostatic social/psychological forces.

During mediated communication when the video image was the same size as the optimal face-to-face proxemic, intersubjectivity was greater than when the video image was smaller. Information theory might have predicted such an outcome. However, that intersubjectivity should be greater in mediated conditions than in any of the face-to-face conditions was unexpected. Although the optimal face-to-face condition allowed greater intersubjectivity than either of the mediated conditions, the latter two allowed greater intersubjectivity compared with the 3 metre face-to-face condition. This augurs well for teleconference applications.

Social psychologists have for a long time been aware of fundamental differences between task- and person-oriented group behaviour. Bales (1950) offered a distinction between the two in terms of task achievement and socio-emotional maintenance. He measured these orientations using his Interaction Process Analysis which counted the incidence of such member behaviours as "clarifies information, asks for suggestions" (task) and "shows solidarity,

asserts self" (socio-emotional). Moreover, communication medium factors may interact to influence the predominance of these two orientations. Morley and Stephenson (1969) introduced the concept of "formality" to communication studies. It was defined in terms of the number of social cues available to communicators; thus, telephone interactions with relatively few social cues, would be more formal than face-to-face interactions. The authors suggested, "the more formal the communication system, the greater the emphasis that will be placed upon inter-party rather than interpersonal aspects of the interaction. For instance, negotiators are likely to be less concerned with presentation of the self, pay more attention to what is being said, and be more task-oriented, the more formal the communication system" (p. 543).

How could media factors in the present study have influenced the apparent levels of intersubjectivity in the five conditions? Impressions formed of the mediated discussions may have been largely based upon the defined purpose or task for the discussion. Increased salience of objective purpose may contribute to communality of impressions; hence, a larger image on the video monitor led to greater intersubjectivity than did a smaller image. Face-to-face conditions had the same discussion task upon which to focus but communicators also had to contend with the immediacy and the social presence of each other. At the optimal distance of 2 metres, social aspects of the encounter were well-defined and comfortable, requiring a minimum of maintenance but when the separation was either too intimate ($\frac{3}{4}$ metre) or too remote (3 metres), social aspects were more ambiguous. Likely, the too intimate and too remote conditions evoked preoccupation with socio-emotional considerations; certain effort was expended in bringing the level of intimacy into balance. Diffused attention between orientations may be reflected in divergent impressions formed of the discussions.

To be successful, interpersonal communication must often reconcile objective and subjective characteristics. Many of our social encounters are initiated with specific purposes in mind (i.e., the task orientation) but these encounters simultaneously serve interpersonal functions (i.e., socio-emotional maintenance). When the former is under investigation, some absolute criterion

of accuracy or effectiveness may be appropriate. When the latter is under investigation, some relative criterion of communality may be more appropriate. Intersubjectivity analyses, predicated as they are on relative criteria (such as common versus unique) may offer useful means of assessing shared social experience.

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An Assessment of Intersubjectivity in Equivalent Groups

Abstract

This study compared the homogeneity of impressions formed of two encoders by members of equivalent groups. The purpose was to demonstrate that differences do not necessarily emerge when an intersubjectivity analysis is performed. Both groups of subjects viewed a standardized person perception test and then rated the encoders' personalities using semantic differentials. Results showed no significant group differences in homogeneity of impressions formed of either encoder.

Previous studies have assessed intersubjectivity in a variety of communication circumstances and have regularly found significant differences. One might anticipate a concern that Method A for intersubjectivity analysis was not sufficiently conservative to protect against falsely rejecting a null hypothesis (Type I error; see Kirk, 1968, p. 556). The present study compared intersubjectivity in two experimental conditions which were randomly formed from the same subject population and were, therefore, equivalent. While unable to establish that Type I errors would never occur, the study may demonstrate that an intersubjectivity analysis does not necessarily yield group differences. Logically, differences between equivalent groups would not be expected on an intersubjectivity index, however, significant differences which sampling vagary could explain may appear. When performing analysis of variance seemingly "impossible" results are not uncommon. For example, it would seem conceptually meaningless to compute an $\underline{F}$ ratio of less than 1, nevertheless, such $\underline{F}$ ratios occur (see Kirk, 1968, p. 59).

Could an artifactual difference in an intersubjectivity analysis arise from the fact that the independence of observation assumption may, in the strictest sense, be violated? There is no clear cut answer to this question. A logical dependency between variances is certain, a statistical dependency is less so. Past attempts to assess statistical dependency produced correlations ranging from $-.10$ to $+.20$ on 21 items. If sampling error explains the $+.15$ range, a dependency of $+.05$ would seem to be the extent of statistical dependency. Such a small correlation would be negligible. Perhaps independent variable manipulations of interrelated variances are more important considerations.

An analysis of variance performed on rating scale data from equivalent groups should produce a significant block effect (i.e., variance due to semantic differential items). In fact, the absence of such an effect may indicate that sampling error was sufficiently large to obscure all effects. It was expected that the group effect would not be significant and there would not be a strong association between that manipulation and the dependent

variable. A standardized person perception test (PPT) was used as the experimental task so that two encoders could be rated by the subjects.

Method

Hypothesis

It was predicted that a significant block effect would be found in the groups' ratings of the male and female encoders. Another aim was to demonstrate, through nonsignificant group effects, that intersubjectivity differences are not inevitable. Of course, the latter is only a demonstration since predicting a null hypothesis would not permit a statistical decision.

Subjects

Twenty-two volunteer subjects, approximately an equal number of males and females, participated in this experiment. They were first-year undergraduate students at Carleton University, Ottawa. For their participation they received course credit in Introductory Psychology.

Procedure

Subjects were randomly assigned to two experimental conditions. One at a time, they were shown a black-and-white videotape recording of the PPT in which a male and a female encoder displayed short scenes of nonverbal communicative acts. The subjects were asked to classify these acts according to what they felt was being depicted in the scenes (see Appendix B). Following completion of this task, subjects rated the personalities of the two encoders using 21-item semantic differentials. The order of rating the encoders was counter-balanced. Item-by-item group variances became data for an intersubjectivity analysis in which group differences in homogeneity of impressions were assessed.

Results and Discussion

As predicted, block effects (i.e., due to semantic differential items) are found in the groups' ratings of the male encoder ($\underline{F} = 3.47$, $p = .004$) and the female encoder ($\underline{F} = 2.43$, $p = .03$). These block effects account for 54% of the variance in the ratings of the male encoder and 40% of the variance in the ratings of the female encoder. The effects remain after the central tendency dependency is removed. In the ratings of the male encoder, there is greater central tendency in one group than in the other ($\underline{F} = 3.96$, $p = .004$),

a bias introduced in sampling.

Both AVOCOVs demonstrate that group effects are not necessarily present in intersubjectivity analyses. With the ratings of the male encoder, the group effect is not significant ($F = 1.98$, $p = .19$) and only 1% of variance is explained. Likewise with the female encoder's ratings, the group effect is nonsignificant ($F = 2.70$, $p = .13$) and only 2% of the variance is associated with group assignment. In previous studies, the average amount of variance explained by the group variables was substantially larger, approximately 20%.

In conclusion, this study demonstrates that experimental groups do not necessarily differ in intersubjectivity as analysed by the present technique (Method A). The dependent measure under consideration has been the variance score index and this was tested with the homogeneity of variance analysis. Not only were the ANOVAs associated with group effects not significant, the proportion of variance explained by this independent variable was negligible. In contrast, the block effects, variation due to the semantic differential items, produced significant differences and the strengths of association were substantial.

Used in combination with more conservative methods for detecting differences of intersubjectivity, this powerful technique of comparing group variance profiles would seem to be useful, particularly when establishing threshold differences. In subsequent studies, predictions for legitimate group differences should be offered with theoretical support. Used in this way, these analyses can provide sensitive tests of intersubjectivity differences.

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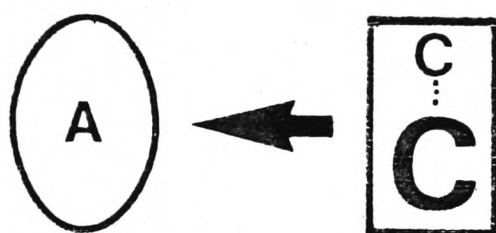
Chapter Four

Attenuation of Social Cues in a Video Medium

A human link and a source of random noise are both incorrigible disturbances in a communication system. In the case of noise, some of our best scientists have devoted themselves to analysing it, measuring it, and avoiding it. The first step in reducing disturbances caused by noise is to find out the properties of the noise and then to take advantage of those properties by some clever method of encoding the message. My plea is that we should treat the man with equal respect. He cannot be abolished. But before we can take advantage of his peculiar fidelity criteria, we will have to find out more about him. Only then will we be able to provide channels of communication that are maximally efficient.

(Miller, 1967, reprinted 1976, p. 60)

Successful communication depends, to some extent, upon C, the medium. Modes of information, channel capacity and transmission distortion are among the basic determinants of communication accuracy. As suggested earlier, unidirectional interactions may be used to simplify processes for experimental investigation, and the findings should generalize to the interactive model of mediated communication.



Reference

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Consequences of Reduced Information Rates for Person Perception in a Video Medium

Abstract

This investigation attempted to determine optimal information rates for person perception in a video medium taking into account practical cost/effectiveness considerations for engineering and human factors, and theoretical issues for social psychology. The independent variable manipulation was created by a video frame rate continuum ranging from 30 frames per second (f.p.s.) to 15, 10, 5, 2 and 1 f.p.s. The first condition at full bandwidth was perceived as continuous motion while the last condition was perceived as frequently updated static images. A standardized person perception task was administered in each condition to separate experimental groups. It was found that (a) there was an optimal information rate at which intersubjective agreement in perception was maximal, (b) at 15 f.p.s. communication effectiveness was at least that of 30 f.p.s., (c) at 10 f.p.s. there was a perceptual flicker that was disruptive to task performance, and (d) at 1 f.p.s. task performance was significantly better than chance or guess rate. Implications of these findings for both orientations were considered.

Imperatives of applied and practical problems can permit, almost as a by-product, the exploration of theoretical issues. The present investigation contained such a dual purpose in its search to determine optimal information rates for person perception in a video medium. The study's main impetus came from the practical questions put by systems engineering and human factors researchers. First, can nonverbal social cues be reliably communicated in a video medium so as to contribute usefully to interpersonal understanding? Secondly, when video bandwidth is compressed (i.e., information systematically reduced), at what reduction point will the communicated message be significantly altered? Some theoretical notions related to social psychology were also examined. Namely, can it be shown that an optimal level (neither too much nor too little) of social information will permit maximal intersubjective communality of perception, and to what extent are static and dynamic displays of nonverbal facial expression decoded in a similar manner?

Engineering and human factors. In past human factors research, defining the part played by visual cues in audio-video communication systems has proved difficult. Several cross-media studies have failed to demonstrate significant differences between conditions which had visual cues and those which did not (see Short, Williams & Christie, 1976; Williams, 1977). In the absence of discernable contributions, there has been a tendency to under-rate the importance of visual communication. "We seem to be able to manage without visual, and hence non-verbal, communication very well" (Young, 1976, p. 24). To summarize that 'visual cues are not important because we can hear quite well without them' would trivialize the issue as would any conclusion here which tried to argue that 'audio cues are no more important because we can see quite well without them'. The real issue must be to show that visual cues contribute effectively to interpersonal communication in a video medium and to assess whether it is worth technological and monetary expenditure to provide visual cues for mediated communication. Certainly, it has not escaped human factors researchers who have declared themselves against the necessity for nonverbal cues that task factors are what determine the relative importance of auditory and visual cues.

For engineers who design telecommunication systems, there is continual trade-off between performance capabilities and cost. Dickson and Bowers (1974) have stated,

The bandwidth of any communication network directly determines its capacity to transmit information. To understand the relative effectiveness of various alternatives for communications one must inevitably ask about bandwidth. Generally speaking, the more bandwidth provided for a communication channel, the greater the cost of the system. (p. 11)

This notion is of central concern in the research of human factors but with a somewhat different focus of attention. "The most basic human factor in the design of a person/person telecommunications device is the question of whether the device is likely to fulfill human communication needs in a cost-effective fashion" (Reid, 1973, p. 449). In the last decade and more, several hundred engineering publications dealing with technical aspects of video bandwidth compression have been published. In this same period, there have been few studies by social scientists investigating the consequences for person perception of signal alteration; the majority have been limited to subjective assessments of picture quality. Human factors relating to video bandwidth compression remain relatively unknown (McManamon, 1975).

Many engineers have recognized that design endeavours are inevitably complicated by the special capabilities of the human user,

Limitations in the response of the human visual system make it possible to create the illusion of motion from a series of scanned images presented in rapid succession. While psychological studies indicate that the illusion of motion occurs when images are presented at rates as low as three per second, they are presented thirty times per second in normal North American television to avoid flicker. The realization that the oft-repeated television image

is highly redundant has led to a field of study referred to as image source coding or bandwidth compression, that seeks to exploit the properties of image sequences so as to reduce the amount of information that must be transmitted to reproduce the image. Such reductions have a significant potential for decreasing transmission costs. (Coll, 1975, p. 157)

Indeed, the savings would be substantial. Redundancy in video pictures is so high that a mere 4% of the information presented on a monitor actually changes between frames (Dickson & Bowers, 1974). With this in mind, the present approach was to investigate the systematic reduction of the number of frames displayed per second, from the normal 30 per second to 15, 10, 5, 2, and 1 frame per second. Determining what consequences these changes might have for person-to-person communication was one central concern.

Social psychological issues. The conceptual or theoretical compatibility of optimal information rates for person perception with previous psychological research should be considered. At a cognitive level of investigation, optimal information rates would seem to have a place. Thorngate (1977) has considered the capacities of human memory and cognition as they might relate to social perception. To paraphrase him, persons receive information in a very efficient manner through sensory receptors (e.g., see Gibson, 1969) and can store large amounts of information in long-term memory (e.g., see Newell & Simon, 1972). Drawing on this store of information, humans are very good at recognizing past events, although somewhat less capable when it comes to recalling them (e.g., see Neisser, 1967). As well as being able to recombine and reorganize stored information (e.g., see Newell & Simon, 1972), humans seem to have a high tolerance for ambiguous, incomplete or imprecise information. Weaker capabilities are to be found in a person's rather limited span of attention (e.g., see Kahneman, 1973) and short-term memory (e.g., see Miller, 1956). Naturally, a person's best cognitive strategy is the one which exploits strengths and avoids weaknesses. Thorngate (1977) argued that most social encounters contain highly redundant

information and interpersonal perceptions are made using only part of the available information; he further suggested that "the brain will favour cognitive processes which rely heavily on perception and long-term memory to those which rely heavily on short-term memory and long intervals of undivided attention" (p. 3).

Burron, Carlson, Getty and Jackson (1971) found that, regardless of the degree of relevance of information provided, impressions formed during person perception were often extreme and made with considerable certainty. When minimally relevant information was offered, it was synthesized with highly relevant information to yield impressions of reduced accuracy. It would seem to suggest that if information could be controlled (quantitatively and qualitatively) accuracy of impression formation may be optimized.

Further to this, at a perceptual level there would seem to be compatibility between the notion of optimal information rates and certain avenues of research. Mackworth and Morandi (1967) studied where persons fix their gaze on pictures and found that the salient areas were gazed at most. Dominant regions in the pictures were those which contained unusual detail and unpredictable contours. Gaze was rarely directed at the regions of the pictures which had predictable or redundant contours. Yarbus (1967) tracked the motions of people's eyes while they looked at pictures of faces and similarly found that most gaze fixation was given to distinctive facial features, most particularly the eyes and mouth. The maximum information regions are said to be the ones that gain our visual attention; information is not distributed equally throughout a picture. A recent study by Walker-Smith, Gale and Findlay (1977) revealed individual fixation strategies employed by persons when gazing at photographs of faces. Individuals tended to show regularity of sequential movement of the eye over the photographs but with some interpersonal variation in search strategy. This study too suggested high information points about the human face.

Since there are individualistic approaches to assimilating information in the face, how might common perceptions be engendered? Perhaps by reducing the amount of information, group consensus of impressions could actually be increased. Minute or ambiguous nonverbal cues might be lost

when the amount of information is reduced, leaving only the most salient cues with which to form an impression. The work of Ekman and Friesen (1969, 1975) on nonverbal leakage and on micro- and macro-affect displays may serve to illustrate.

Because most facial expressions of emotion are brief, you may often miss an important message. Some facial expressions are extremely rapid, lasting only a fraction of a second. We call these micro-expressions. Most people fail to see them or fail to recognize their importance ...even the more usual macro-expressions frequently last only a few seconds. It is rare for a facial expression of emotion to last as long as five or ten seconds. (1975, p. 14)

Group consensus of perception may be raised if micro-expressions are removed and only macro-expressions remain. Auditory and visual channels of interpersonal communication are so rich with information that much of it is unused. When listening to a person, one could focus upon the verbal content, the pitch of the voice, the speed of delivery or paraverbal utterance. When looking at a person, one might attend to visual information arising from the face, head movements, hand gestures or body posture (Argyle, 1975; Ekman & Friesen, 1975; Graham, Ricci Bitti & Argyle, 1975). Thus, a great deal of social information is exchanged simultaneously making selective perception of information inevitable.

The speaker sends out a barrage of signals and may not carefully attend to or employ all of them in optimal fashion, and the listener is barraged and may not attend to all the signals available. With the visual channel, people focus more on the face than on other sources; facial expressions are tuned more than body movements, and people look at faces more than body movements. (Ekman & Friesen, 1975, p. 19)

Among those researchers who have considered related social psychological aspects of communication are Mehrabian and Reed (1968). They have referred to a concept of "optimal information processing rate which is externally imposed", speculating that if the rate of transmission of information is speeded up or slowed down, a point might be found at which the rate is neither too slow for efficient transmission nor too fast thus overloading the communicator's capacity for processing information. To guide future communication studies, Mehrabian and Reed have offered several hypotheses about determining accurate communication and three of these seem particularly relevant here.

1. "The accuracy in the decoding of a communication increases with the degree to which all communication behaviours of the encoder (i.e., behaviours from various channels of communication) are made available to the decoder.

2. The accuracy in the encoding of a communication is correlated with the degree to which all of the communication channels, typically employed by the encoder for that kind of a communication are available to him.

3. The accuracy of a communication is correlated with the degree to which the rate of transmission can be modified by the decoder" (p. 375).

These hypotheses emphasize the three main factors in mediated communication; namely, those arising with the encoder, the decoder and especially the medium or channel of communication.

Just as expectancy set or perceptual readiness has been shown to influence subsequent object perception (Bruner, 1957), so expectancy about an individual has been shown to influence the way in which that individual will be perceived (e.g., Bruner & Taguiri, 1954; Gardner & Taylor, 1968; Warr & Knapper, 1966). Gage and Cronbach (1955) are among those who have suggested that the process of social perception is "dominated far more by what the observer brings to it than by what he takes in during it" (p. 420). They too considered the role of implicit personality theory which they said consists of "built-in" correlations that the decoder consciously or unconsciously imposes on traits, characteristics or behaviours of others. If the observer is disposed to see trait B whenever he sees trait A, he will be accurate

whenever A and B actually occur together and inaccurate when they do not.

Consider a continuum of information rates for a person perception task. At one extreme would be the richest, most complete output and, saturated by it, a group of decoders would selectively perceive and obtain individualistic impressions. At the other extreme would be the impoverished, incomplete output and, owing to its deficiency, a group of decoders would augment the information with their own unique stereotypes and expectancy sets again obtaining individualistic impressions. Between these extremes would be found the optimal output. It would provide necessary information in a manner sufficiently controlled so that most decoders could assimilate it and form common impressions.

Of theoretical interest is the question of whether a full bandwidth or a continuous motion video image would be interpreted in a similar way to a sequence of frequently updated static images. In 1938, Dusenbury and Knower reported that person perception accuracy was higher when facial affect was presented as a motion picture rather than as a still photograph. References in the literature to subsequent studies on this question are rare. After reviewing the few studies which have attempted to compare motion pictures and still pictures of facial affect, Ekman, Friesen and Ellsworth (1972) stated that "still photographs may not be as adequate a method for presenting posed facial behaviour as motion picture film, but this stilted recording procedure does present sufficient information for accurate judgments of static events" (p. 50). They suggested that little was known about the comparability of static and dynamic displays of nonverbal communicative acts.

Argyle and McHenry (1971) found that a brief exposure to a photograph of an individual wearing spectacles led to more superficial and erroneous inferences about assumed high intelligence than when on-going behaviour of the same individual was presented on videotape. People seem capable of drawing inferences based on extremely limited information probably by focusing on the most salient cues. However, when static presentation becomes dynamic presentation, it is as if different information is weighted in the impression.

Just what is the smallest effective quantity of social information is not clear. Depending on the encoding circumstances, it would seem possible for any detectable signal to have significance as a social cue. No doubt, even subliminal displays of social cues could influence the perceiver. Rosenthal, Archer, Koivumaki, Dimatteo & Rogers (1974) attempted to measure the accuracy threshold for nonverbal perception by systematically reducing the duration of a filmed stimulus display. Emotional scenes were reduced from 2 second duration to 1.13, .38, .13 and .04 second. One of their conclusions was as follows:

Apparently, people are able to assess nonverbal cues correctly in very short periods of time. Interestingly, those subjects who were more accurate at very brief exposure times ($3/8^{\text{th}}$ sec. or less) judged their interpersonal relationships as less satisfactory than those who were less accurate. That result suggests that our superfast nonverbal readers may be paying a price for their sensitivity; perhaps in social situations, they "know too much". (p. 3)

If Rosenthal and his colleagues are correct, it might be that the "superfast nonverbal readers" experience information management difficulties which optimized information rates might alleviate.

Bandwidth compression and person perception. Intuitively, the effects of diminished information in a video display should depend on the type of judgments being made and the sort of material presented. In other words, if little information is available, distinctions between happiness and surprise, for example, might be more difficult than between happiness and fear. Thompson and Meltzer (1964) studied the accuracy with which different emotions were judged and found that generally the positive emotions (e.g., happiness) were more easily understood than negative emotions (e.g., anger). Moreover, this is compatible with the summary of earlier results in Figure 1 of Appendix B which shows a rank-order of accuracy (high to low): happiness, surprise, disgust, sadness, anger and fear. In the case of highly compressed video

bandwidth, Lindsey (1974) found that as the degree of activity in the display increased, picture quality was rated more critically. That is, viewers could better tolerate a high compression level when it showed a low-action scene such as persons talking rather than a high-action scene such as persons dancing. This would seem to make sense for if the action changed rapidly, there would be greater necessity to frequently sample the information.

Parameters of pleasantness and activity are reminiscent of an earlier, well-known work on recognition of facial emotion. Schlosberg (1952, 1954) suggested that any emotional display might be classified according to three polar dimensions, namely, attention-rejection, high activity-low activity and pleasantness-unpleasantness. Another feature of his research considered the relative "confusability" of emotions. The Schlosberg circle divided emotional expression into six broad segments or categories in the following order: happiness, surprise, sadness, fear, anger and disgust. It was Schlosberg's notion that distinctions between nonadjacent segments are the easiest to make (e.g., happiness versus fear), between adjacent segments are more difficult (e.g., happiness versus surprise) and within segments are the most difficult (e.g., happiness versus love). The present study used a standardized person perception test (PPT) which was developed to include manipulations of both the Schlosberg circle and his three dimensions as described in detail in Appendix B.

Hypotheses

1. It was expected that when bandwidth compression to the video display of the person perception test (PPT) was increased, the effectiveness of non-verbal communication would decrease until the point on the frame rate continuum at which a significant departure from effective communication would be identified.
2. It was expected that the decline in communication effectiveness would vary with the type of nonverbal act displayed and with the degree of precision required to distinguish the nonverbal acts.
3. It was expected that even at the lowest information level, task performance would exceed chance or guess rate.
4. It was expected that an optimal rate of social information would be

demonstrated with the result that greatest consensus of person perception and impression formation would exist at a point between the richest and the most impoverished information levels.

Subjects

A total of 144 subjects, approximately an equal number of males and females, volunteered to participate in a communication experiment in the Wired City Laboratory, Carleton University, Ottawa. For their participation, these first-year undergraduates received course credit in Introductory Psychology.

Method

The frame rate manipulation. Each of the 38 scenes in the PPT lasted for nine seconds. At full bandwidth video, 30 pictures or frames were displayed every second and appeared as continuous motion similar to a television picture. At 15 frames per second (f.p.s.), every other frame of the videotape was displayed. This was still perceived as continuous motion but with slightly less detail or resolution. At 10 f.p.s., transitions from frame to frame were distinctly perceptible and flicker in the display was quite noticeable. At 5 f.p.s., flicker was slower and discrete frames could be perceived, although these changed every 200 milliseconds. At 2 f.p.s., frames were perceived as static images which were updated or "refreshed" every 500 milliseconds. This sampling frequency exaggerated the extent of activity change between frames. For example, if a hand gesture appeared up high in one frame, it might suddenly appear near the desk top in the next even though during the interval, the hand would have moved downwards as a normal gesture. At 1 f.p.s., exaggerated motion was more striking; for each of the nine seconds of stimulus, nine static images were displayed. The above six frame rates comprised the main independent variable manipulation.

The experimental task. The procedure for employing the PPT has been outlined in Appendix B. Briefly, the task involved watching a videotape of stimulus material and then attempting to classify the nonverbal communicative acts using one of three response questionnaires. All three versions were used since the main aim was an attempt to define as precisely as possible the relationship between frame rates and several parameters of nonverbal

communication as well as showing differences between some frame rates. The three questionnaires used the a priori classification of the three Schlosberg dimensions (i.e., attention-rejection, high activity-low activity, pleasant-unpleasant). Questionnaire I being most unique was analysed on its own; Questionnaires II and III being comparable were analysed together in order to gain power from the increased cell size. Only Questionnaires II and III were suited for the Schlosberg circle analyses, and separate analyses were performed on their data because descriptor choices were not identical.

Following the PPT performance, decoders provided their impressions of the two encoders' personalities using 21-item semantic differentials. The order of rating the encoders was counterbalanced. Intersubjectivity Method A was used to assess communality of impressions between experimental groups.

Procedure

Subjects were randomly assigned to one of six frame rate conditions. Questionnaires I and III were employed by 38 subjects (three males and three females per frame rate); 72 subjects employed Questionnaire II (six males and six females per frame rate). At the data analysis stage of Questionnaire II, it was discovered that two subjects in different frame rate conditions did not appear to have fully comprehended the instructions and so were dropped from the analyses together with one subject (randomly) from each of the other frame rate conditions leaving an equal cell size of 11. Individually, subjects were seated at a node of the interactive audio-video network and given a version of the questionnaire. After the instructions were read, the appropriate videotape was played and the PPT performed. Upon completion of this task, the two encoders were rated. Subjects were debriefed when the session was finished.

Results

Considering first the results for Questionnaire I, Table 1 shows the means and standard deviations for the three polar dimensions at the six frame rates. Of these six dependent measures, only two produce significant differences; those are pleasant ($F = 3.55$, $p < .01$) and attention ($F = 2.48$, $p < .05$). The ANOVAs are shown in Table 2. Within the dimension of

pleasant, multiple comparisons reveal that 10 and 5 f.p.s. are decidedly less effective than are the other frame rates. Within the dimension of attention, there is a similar result but, in this case, only 10 f.p.s. is significantly lower than 30, 15 and 2 f.p.s. conditions. Figure 1 shows group means of accuracy on PPT for Questionnaire I. It was achieved by combining the results of the three dimensions into a single average. The reduced effectiveness at 10 and 5 f.p.s. is quite apparent.

Insert Tables 1 and 2, and Figure 1 about here

In a similar analysis for the data from Questionnaires II and III combined, greater stability in the results is found probably because of the increased cell size ($n = 17$). Table 3 shows the means and standard deviations for the three polar dimensions, and the ANOVAs in Table 4 show a decline in communication effectiveness as the frame rate is reduced. The polar dimensions yielding reliable differences are as follows: unpleasant ($F = 3.92$, $p < .01$), attention ($F = 2.99$, $p < .05$) and high activity ($F = 3.94$, $p < .01$). Multiple comparisons show the stability of difference and, typically, 30 and 15 f.p.s. are distinctly different from the rest of the continuum with a sharp drop in effectiveness again at 10 f.p.s. This is clearly illustrated in Figure 2 in three dimensions of difference; however, the variables of pleasant, rejection and low activity are not depicted here. Figures 3, 4 and 5 graphically demonstrate the complete relationship between the frame rates and the three polar dimensions.

Insert Tables 3 and 4, and Figures 2, 3, 4, and 5 about here

Evidence seems to support the decision to treat the dimensions in separate analyses (see Table 5). Test item overlap exists in the Schlosberg dimensions by virtue of their a priori classification. There is a sizeable overlap between attention and high activity (72%) but rather less between attention and unpleasant (32%). Based on correlations in the present data,

Table 1
Means and Standard Deviations for Three Schlosberg Polar Dimensions
(Questionnaire I, N = 36)

Dimension	Frame Rate					
		<u>30</u>	<u>15</u>	<u>10</u>	<u>5</u>	<u>1</u>
Pleasant	$\bar{X}$	.81	1.13	.56	.68	1.19
	s	.38	.20	.33	.46	.30
Unpleasant	$\bar{X}$	1.29	1.22	.85	.96	1.18
	s	.32	.25	.38	.43	.44
Rejection	$\bar{X}$	1.23	1.29	1.03	.98	1.33
	s	.21	.17	.34	.51	.30
Attention	$\bar{X}$	1.04	1.08	.50	.75	.99
	s	.44	.33	.33	.29	.44
Low Activity	$\bar{X}$	1.34	1.24	.89	.99	1.35
	s	.50	.32	.14	.42	.29
High Activity	$\bar{X}$	1.05	1.15	.63	.77	1.01
	s	.48	.22	.40	.31	.49

Maximum score = 1.75
 Minimum score = 0.25
 $\bar{X}$ = Mean.
 s = Standard deviation.

Table 2
ANOVAs for Three Schlosberg Polar Dimensions
(Questionnaire I, N = 36)

Dimension	Source							
	<u>TSS</u>	<u>TrSS</u>	<u>ESS</u>	<u>TrMs</u>	<u>EMS</u>	<u>F</u>	<u>p</u>	<u>ω^2</u>
Pleasant	5.00	1.86	3.14	.37	.10	3.55	.01	.27
Unpleasant	4.60	.90	3.70	.18	.12	1.46	NS	
Rejection	3.87	.60	3.27	.12	.11	1.11	NS	
Attention	5.37	1.57	3.80	.31	.13	2.48	.05	.17
Low Activity	4.72	1.07	3.64	.21	.12	1.77	NS	
High Activity	5.28	1.13	4.15	.23	.14	1.64	NS	

Multiple comparisons (t statistic) reveal for Pleasant 15 + 10, 5; 10 + 2; 5 + 2 and for Attention 30 + 10; 15 + 10; 10 + 2.

ω^2 = Strength of association between the independent variable and dependent variable.
df = 5/30/35.

Figure 1. Accuracy on PPT
Questionnaire I.

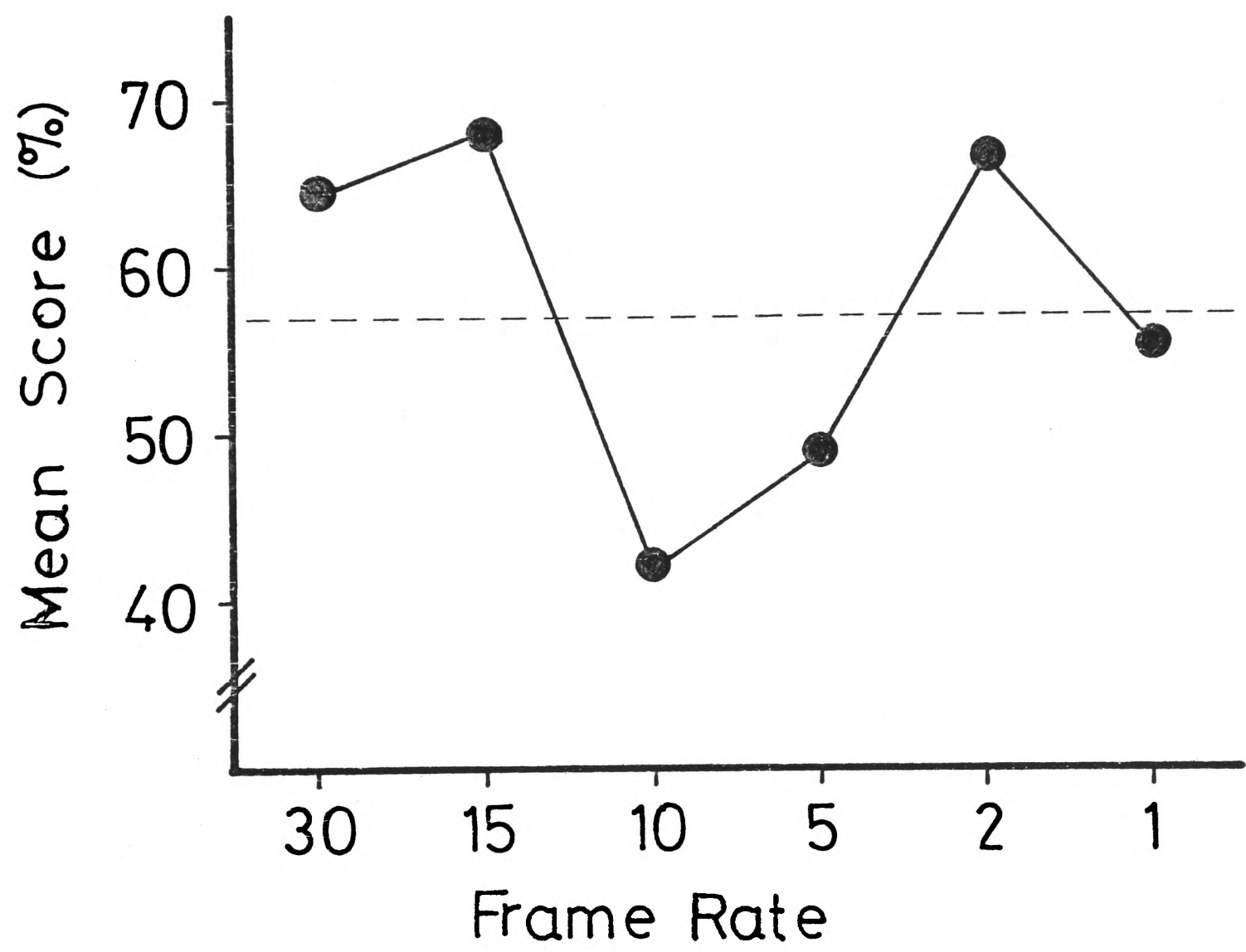


Table 3
Means and Standard Deviations for Three Schlosberg Polar Dimensions
(Questionnaire II and III, N = 102)

Dimension		Frame Rate					
		<u>30</u>	<u>15</u>	<u>10</u>	<u>5</u>	<u>2</u>	<u>1</u>
Pleasant	$\bar{X}$	1.10	1.13	.93	.99	1.00	.95
	s	.38	.39	.44	.44	.38	.39
Unpleasant	$\bar{X}$	1.24	1.28	1.02	1.05	1.04	.91
	s	.28	.19	.32	.38	.33	.29
Rejection	$\bar{X}$	1.15	1.17	.98	1.08	1.07	.90
	s	.24	.30	.30	.36	.37	.38
Attention	$\bar{X}$	1.31	1.31	.99	1.06	1.07	.94
	s	.50	.37	.44	.33	.37	.31
Low Activity	$\bar{X}$	1.16	1.20	1.00	1.11	1.07	.91
	s	.32	.35	.32	.33	.43	.35
High Activity	$\bar{X}$	1.22	1.26	.97	1.03	.98	.93
	s	.33	.20	.43	.27	.31	.23

Maximum score = 1.75.
 Minimum score = 0.25.
 Chance or guess rate = 0.57.
 $\bar{X}$ = Mean.
 s = Standard deviation.

Table 4

ANOVAs for Three Schlosberg Polar Dimensions
(Questionnaire II and III, N = 102)

Dimension	<u>TSS</u>	<u>TrSS</u>	<u>ESS</u>	<u>TrMS</u>	<u>EMS</u>	<u>F</u>	<u>ω^2</u>
Pleasant	17.28	.59	16.69	.12	.16	.72	.00
Unpleasant	11.15	1.80	9.35	.36	.09	3.92**	.12
Rejection	11.97	.94	11.03	.19	.11	1.74	.03
Attention	17.94	2.29	15.65	.46	.15	2.99*	.09
Low Activity	13.76	1.06	12.70	.21	.12	1.71	.03
High Activity	11.25	1.82	9.43	.36	.09	3.94**	.12

Multiple comparisons (Tukey's LSD statistic) reveal for Unpleasant 30 ≠ 10, 2, 1; 15 ≠ 10, 5, 2, 1 and for Attention 30 ≠ 10, 1; 15 ≠ 10, 1, and High Activity 30 ≠ 10, 2, 1; 15 ≠ 10, 5, 2, 1.

$\hat{\omega}^2$ = Strength of association between the independent variable and dependent variable.

df = 5/96/101.

*p < .05.

**p < .01.

Figure 2. Three Dimensions and Five Frame Rates.

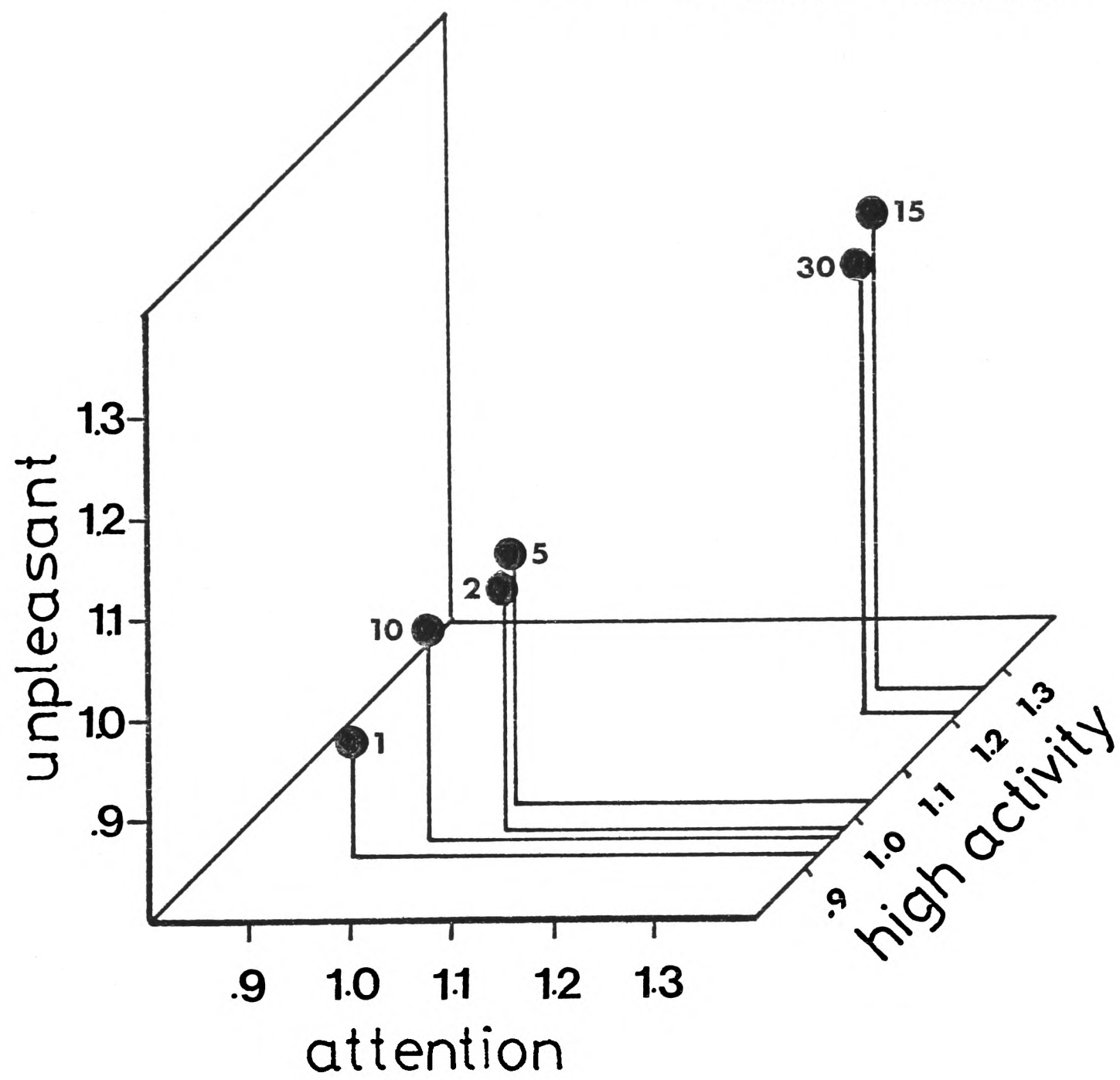
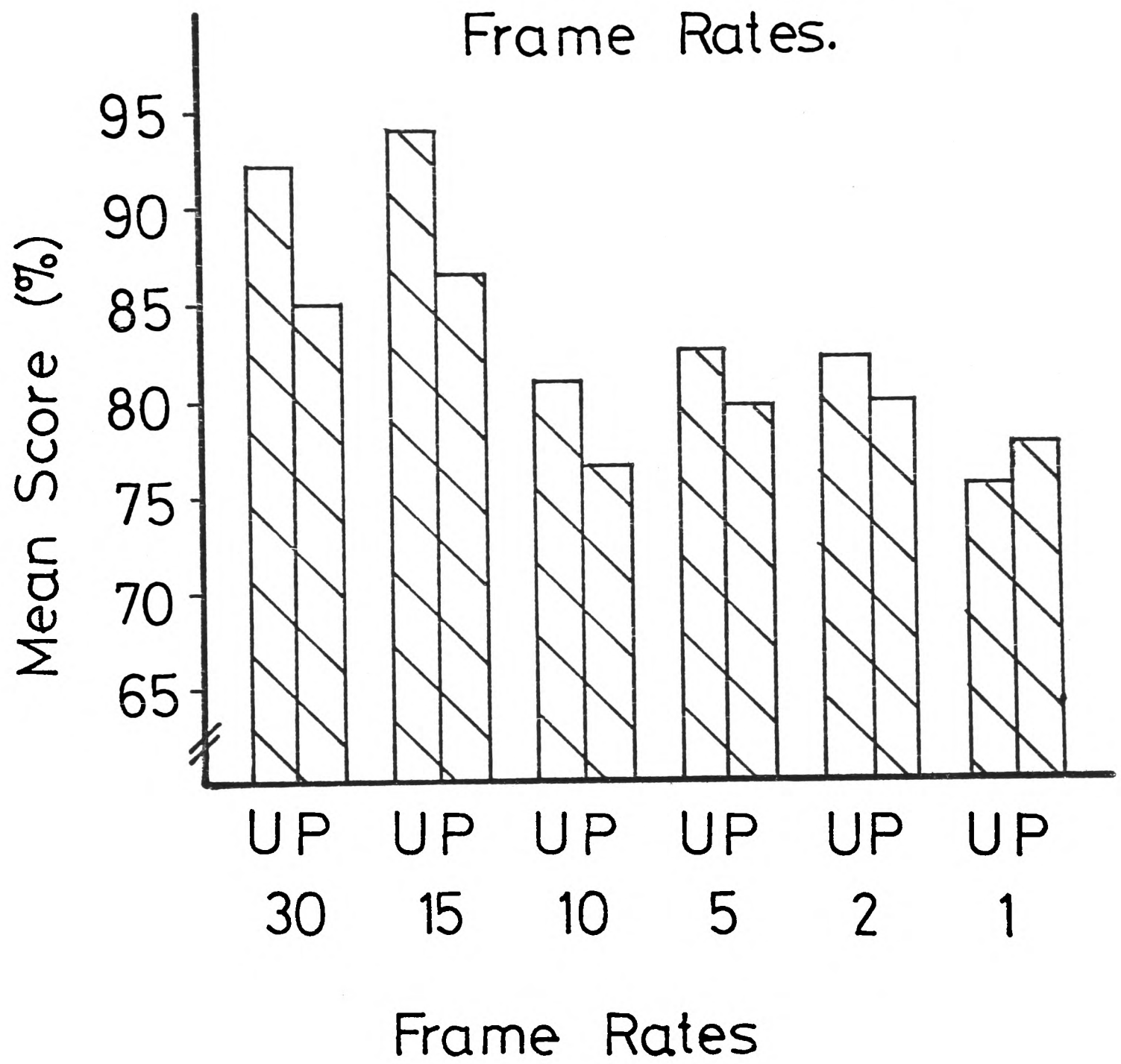
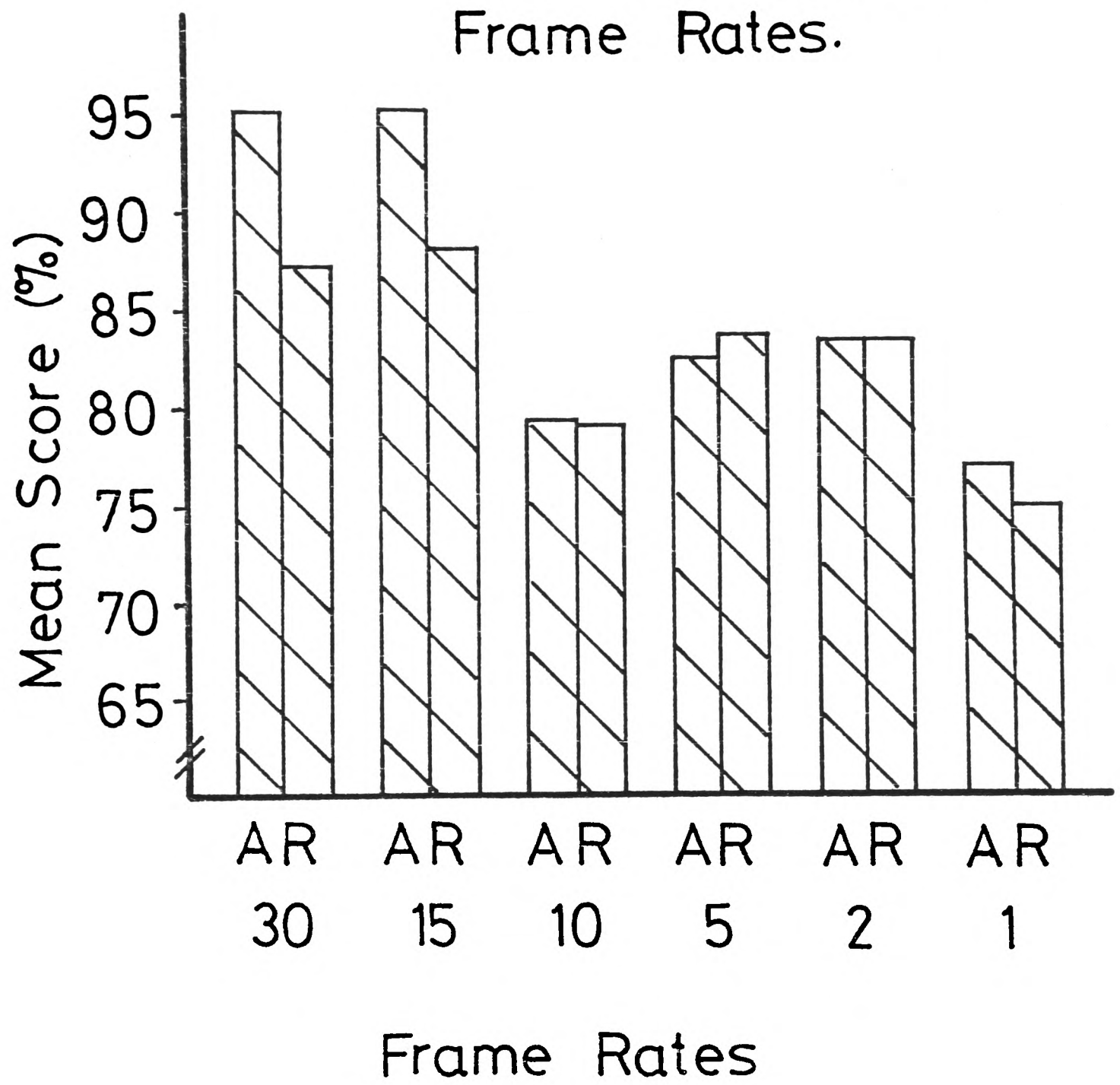


Figure 3. Pleasant-unpleasant
Dimension at Five
Frame Rates.



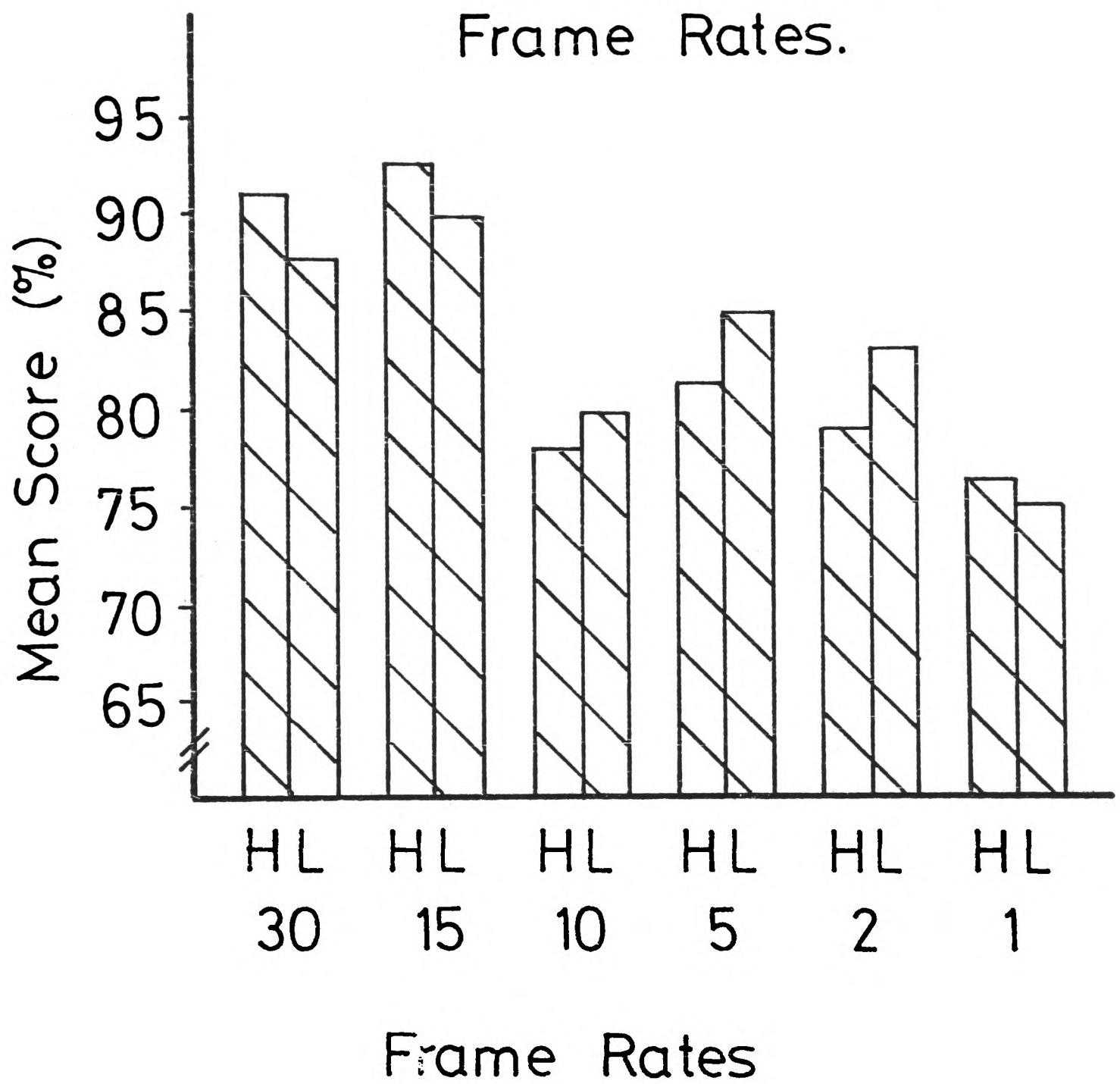
U = unpleasant
P = pleasant

Figure 4. Attention-rejection
Dimension at Five
Frame Rates.



A = attention
R = rejection

Figure 5. High & Low Activity
Dimension at Five
Frame Rates.



H = high activity
L = low activity

within dimension mutual dependency, displayed on the diagonal, is seen to be negligible (2%, < 1% and 6%). However, below the diagonal is shown the statistical dependency based on coefficient of determination and it is considerable between significant dimensions. A communality ratio is computed to show the statistical dependency while taking into account the shared items of the dimensions. Between high activity and unpleasant, this ratio is very large (.96); however, between high activity and attention it is comparatively smaller (.62). Clearly, a multivariate analysis of variance would be inappropriate in this analysis.

Insert Table 5 about here

Considering now the distinctions made in the Schlosberg circle analyses, recall first that in Questionnaires II and III the test item descriptor choices were grouped according to whether they required distinctions from within one segment of the circle, from adjacent segments or from nonadjacent segments. Segmental classifications were mutually exclusive rendering the factors independent of each other and eligible for a two-way analysis of variance. With the data from Questionnaire II (see Table 6), there is a significant effect due to frame rate ($F = 4.28, p < .01$), another due to segmentation ($F = 48.42, p < .01$) and a significant interaction ($F = 2.28, p < .05$). Analysis of simple-main effects reveals that frame rates are systematically differentiated only where adjacent segment distinctions are made ($F = 6.50, p < .01$). A similar analysis of the segmentation variable reveals significant differences between the three segmentation categories at the following frame rates: 30, 15, 10, 5 and 1 f.p.s. Table 7 shows the group means, standard deviations and multiple comparisons for the ANOVA just reported. Where distinctions were made between descriptors in adjacent segments of the Schlosberg circle, numerous significant differences between group means reveal a steady decline in communication effectiveness. The decline approximates a linear relationship with 30 f.p.s. clearly superior followed closely by 15 f.p.s.; while 1 f.p.s. is distinctly inferior in communication effectiveness. Note that in the complete summary of differences between group means (see Table 7) all

Table 5

Communality of Test Item Dimensions
and Proportions of Variance Shared
(Expressed as a Percentage)

	Attention	Unpleasant High Act.	
Attention	Rejection		
	2	32	74
Unpleasant		Pleasant	
	24	<1	52
High Activity			Low Act.
	46	50	6

Above diagonal: Test item communality between dimensions.
On the diagonal: Variance shared within polar dimensions.
Below diagonal: Variance shared between dimensions.

	Unpleasant- Attention	High Act. - Unpleasant	Attention- High Act.
R	$\frac{24}{32} = .75$	$\frac{50}{52} = .96$	$\frac{46}{74} = .62$

Communality Ratio:

$$R = \frac{\% \text{ shared variance (estimated)}}{\% \text{ common items (actual)}}$$

all of the 23 statistically reliable differences are in the direction expected. Nine follow predictions for the frame rate continuum and 14 support the notion that the most difficult descriptor distinctions are those which are relatively close together on the Schlosberg circle. Figure 6 graphically summarizes the results of this analysis.

Insert Tables 6 and 7, and Figure 6 about here

The data from Questionnaire III shows that once more there is a significant effect due to frame rate ($\underline{F} = 4.23$, $p < .01$), another due to segmentation ($\underline{F} = 21.65$, $p < .01$) and a significant interaction effect ($\underline{F} = 2.09$, $p < .05$). Analysis of simple-main effects reveals frame rate differentiation when making distinctions between adjacent segments ($\underline{F} = 2.38$, $p < .04$) and between nonadjacent segments ($\underline{F} = 4.26$, $p < .01$). In the case of adjacent segments, it could be argued that an $\underline{F}$ ratio of this size is not large enough to warrant rejection of the null hypothesis. Typically, simple-main effects analyses use more stringent protection against Type I errors; an alpha-level of .01 would normally be used to compensate for the fact that numerous comparisons are made (see Kirk, 1968, p. 181). Since the previous analysis detected a similar difference, however, the decision is taken to proceed with multiple comparisons in this case. Table 9 shows the expected general decline of communication effectiveness as the frame rate is reduced. Of 18 differences between means, 16 are as predicted. The only exceptions are an inexplicable rise in efficiency at 1 f.p.s. when distinguishing between adjacent segments and a high efficiency at 5 f.p.s. when distinguishing between nonadjacent segments. Perhaps these are best explained as sampling vagary. As Figure 7 shows, there is the familiar decline at 10 f.p.s. and the superiority at 30 and 15 f.p.s. The segmentation variable shows expected differences. Distinctions between nonadjacent segments are more easily made than between adjacent segments and these, in turn, are made more easily than distinctions within segments. This is true for 12 of 13 differences; the exception is again created by the seemingly aberrant 1 f.p.s. mean for adjacent segment distinctions.

Table 6

Classification in Schlosberg Circle Segments Differentiated by Six Frame Rates:
ANOVA Summary for Questionnaire II

	Source	SS	df	MS	F	$\hat{\omega}^2$
1	Between Subjects					
	(A-Frame Rate)	(2.77)	(5)	(.56)	(4.28)**	.07
2	Between A at b ₁	.26	5	.05	.43	
3	Between A at b ₂	3.90	5	.78	6.50**	
4	Between A at b ₃	1.35	5	.27	2.25	
5	Within Cell	19.90	90	.12		
6	Within Subjects					
	(B-Segments)	(9.95)	(2)	(4.98)	(48.42)**	.31
7	Between B at a ₁	3.16	2	1.58	13.17**	
8	Between B at a ₂	2.81	2	1.41	11.71**	
9	Between B at a ₃	1.66	2	.83	6.92**	
10	Between B at a ₄	1.84	2	.92	7.67**	
11	Between B at a ₅	.38	2	.19	1.58	
12	Between B at a ₆	4.51	2	2.26	18.79**	
13	(AB)	(2.74)	(10)	(.17)	(2.28)*	.04
14	B x Ss Within Groups	12.80	60	.12		
15	Total	37.04	107			

$\hat{\omega}^2$ = Strength of association between the independent variable and dependent variable.
*p < .05.
**p < .01.

Table 7

Classification in Schlosberg Circle Segments Differentiated by Six Frame Rates:
Means and Standard Deviations for Questionnaire II

		Frame Rate (A)					
		a ₁	a ₂	a ₃	a ₄	a ₅	a ₆
Segment (B)		30	15	10	5	2	1
b ₁ Within One	$\bar{X}$	1.24	1.33	1.32	1.24	1.32	1.14
	s	.24	.21	.18	.35	.12	.30
b ₂ Adjacent	$\bar{X}$	1.79	1.78	1.65	1.61	1.47	1.04
	s	.34	.43	.40	.44	.23	.45
b ₃ Nonadjacent	$\bar{X}$	2.01	2.07	1.89	1.84	1.60	1.91
	s	.47	.39	.39	.27	.52	.30

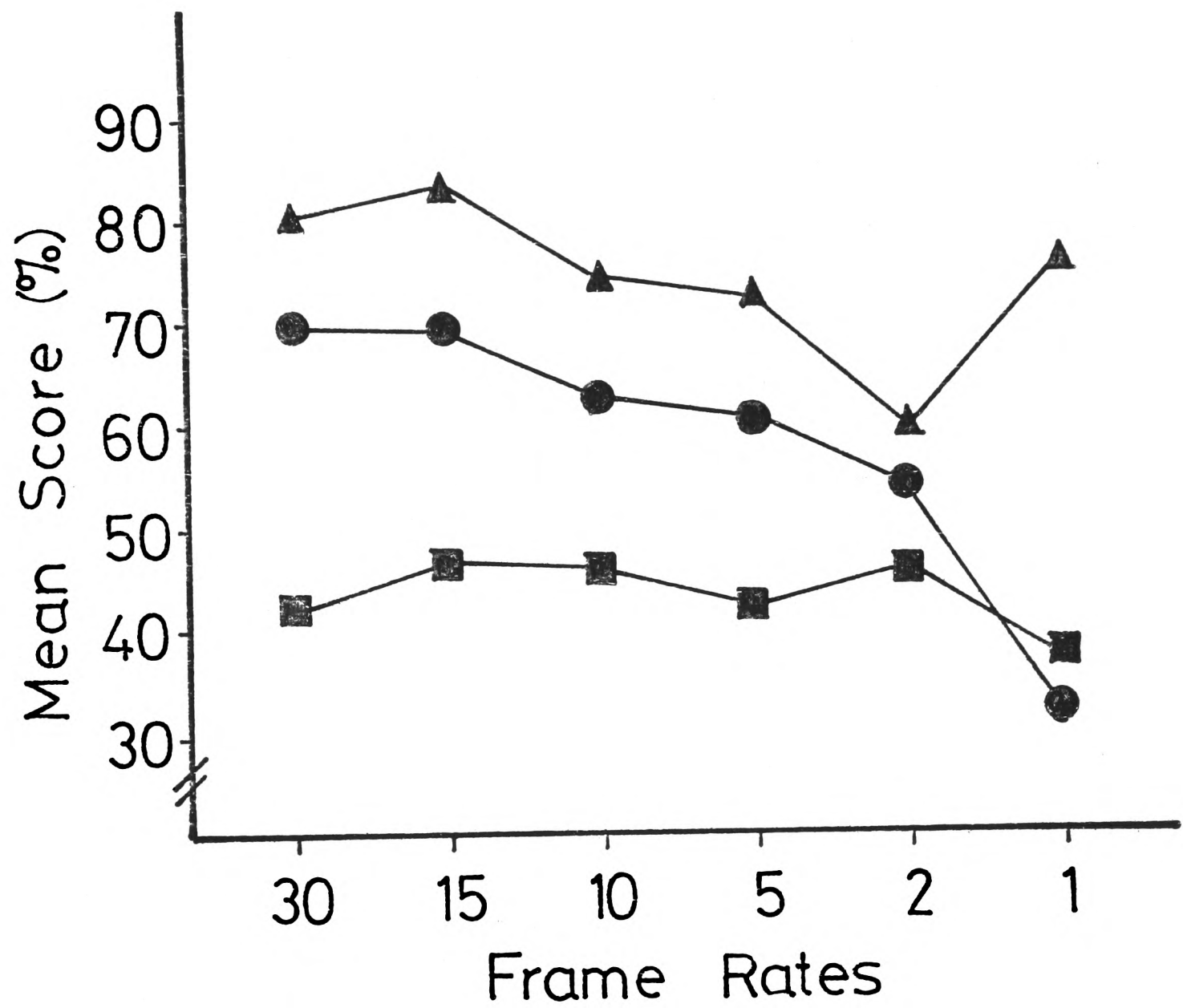
Critical difference between means using t statistic (.05/2) for comparisons among six levels of A is .180 and for comparisons among three levels of B is .125.

Maximum score = 3.00.
 Chance or guess rate = 1.00.
 $\bar{X}$ = Mean.
 s = Standard deviation.

Summary of multiple comparisons:

Between A at b₂: a₁ ≠ a₄, a₅, a₆; a₂ ≠ a₅, a₆; a₃ ≠ a₅, a₆; a₄ ≠ a₆; a₅ ≠ a₆.
 Between B at a₁, a₂, a₃ and a₄: b₁ ≠ b₂; b₂ ≠ b₃; b₃ ≠ b₁.
 Between B at a₆: b₂ ≠ b₃; b₁ ≠ b₃.

Figure 6. Schlosberg Circle Classification at Five Frame Rates.



- Classification Choices:
- Within One Segment
 - Adjacent Segments
 - ▲ Nonadjacent Segments

Questionnaire II

Insert Tables 8 and 9, and Figure 7 about here

Finally, recalling the prediction that an optimal information rate between the richest (30 f.p.s.) and the most impoverished (1 f.p.s.) frame rates would yield greatest consensus of person perception and impression formation, visual inspection of group means on the frame rate continuum suggests that 15 f.p.s. may have operated in this way. Among the analyses reported above, six comparisons between the 15 and 1 f.p.s. conditions show expected differences in effectiveness of communication on the PPT; only once is there an instance of greater effectiveness at 15 f.p.s. than at 30 f.p.s. but the latter never significantly exceeds the former. A ceiling effect in PPT performance cannot be ruled out. Although small in magnitude, the direction of difference between 30 and 15 f.p.s. is remarkably stable. Among the 13 ANOVAs reported above, the average rank-ordering of means for 30, 15 and 1 f.p.s. conditions is 1.88, 1.19 and 2.92. When tested with Kendall's coefficient of concordance, these rank-orderings show significant stability ($\underline{W} = 0.76$, $\underline{p} < .001$). Yet, this in itself does not constitute strong evidence from which to infer optimal information rates. Another analysis is possible, however, which is intended specifically to compare communality of impressions formed of the encoders. It is based on the homogeneity of variance in the semantic differential ratings of the encoders' personalities (Intersubjectivity Method A). When analysed with ANOCOVs, group variance profiles for the 21-item semantic differential ratings yield the results as shown in Table 10. With the ratings of the male encoder, the variance score index produces significant differences across conditions ($\underline{F} = 3.20$, $\underline{p} = .05$). While the groups do not differ in central tendency responding on the rating scales ($\underline{F} < 1$), there is a mutual dependency between central tendency and variance scores evidenced by the fact that the adjusted variance score is no longer significant ($\underline{F} = 2.91$, $\underline{p} = .20$). To interpret differences between the groups in homogeneity of impressions formed of the male encoder, a one-tailed $\underline{t}$ statistic is employed with the result that the 15 f.p.s. condition is found to be marginally more consistent than the 30 f.p.s. condition ($\underline{p} = .06$) and reliably more

Table 8

Classification in Schlosberg Circle Segments Differentiated by Six Frame Rates:
ANOVA Summary for Questionnaire III

Source		<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>$\hat{\omega}^2$</u>
1	Between Subjects					
	(A-Frame Rate)	(2.77)	(5)	(.55)	(4.23)**	.06
2	Between A at b ₁	.98	5	.20	1.00	
3	Between A at b ₂	2.38	5	.48	2.38*	
4	Between A at b ₃	4.26	5	.85	4.26**	
5	Within Cell	17.72	90	.20		
6	Within Subjects					
	(B-Segments)	(9.95)	(2)	(4.98)	(21.65)**	.27
7	Between B at a ₁	4.07	2	2.04	8.85**	
8	Between B at a ₂	2.93	2	1.47	6.37**	
9	Between B at a ₃	1.14	2	.57	2.48	
10	Between B at a ₄	2.62	2	1.31	5.70**	
11	Between B at a ₅	1.86	2	.93	4.04*	
12	Between B at a ₆	2.12	2	1.06	4.61**	
13	(AB)	(4.79)	(10)	(.48)	(2.09)*	.07
14	B x <u>Ss</u> Within Groups	13.69	60	.23		
15	Total	35.23	107			

$\hat{\omega}^2$ = Strength of association between the independent variable and dependent variable.
*p < .05.
**p < .01.

Table 9

Classification in Schlosberg Circle Segments Differentiated by Six Frame Rates:
Means and Standard Deviations for Questionnaire III

		Frame Rate (A)					
		a ₁	a ₂	a ₃	a ₄	a ₅	a ₆
Segment (B)		30	15	10	5	2	1
b ₁ Within One	$\bar{X}$	1.15	1.33	1.35	1.30	1.02	.92
	s	.25	.22	.41	.27	.30	.27
b ₂ Adjacent	$\bar{X}$	1.74	2.12	1.94	2.16	1.41	1.76
	s	.32	.29	.37	.30	.28	.72
b ₃ Nonadjacent	$\bar{X}$	2.32	2.25	1.81	2.04	1.80	1.30
	s	.15	.34	.40	.25	.31	.28

Critical difference between means using t statistic (.05/2) for comparisons among six levels of A is .305 and for comparisons among three levels of B is .220.

Maximum score = 3.00.

Chance or guess rate = 1.00.

$\bar{X}$ = Mean.

s = Standard deviation.

Summary of multiple comparisons:

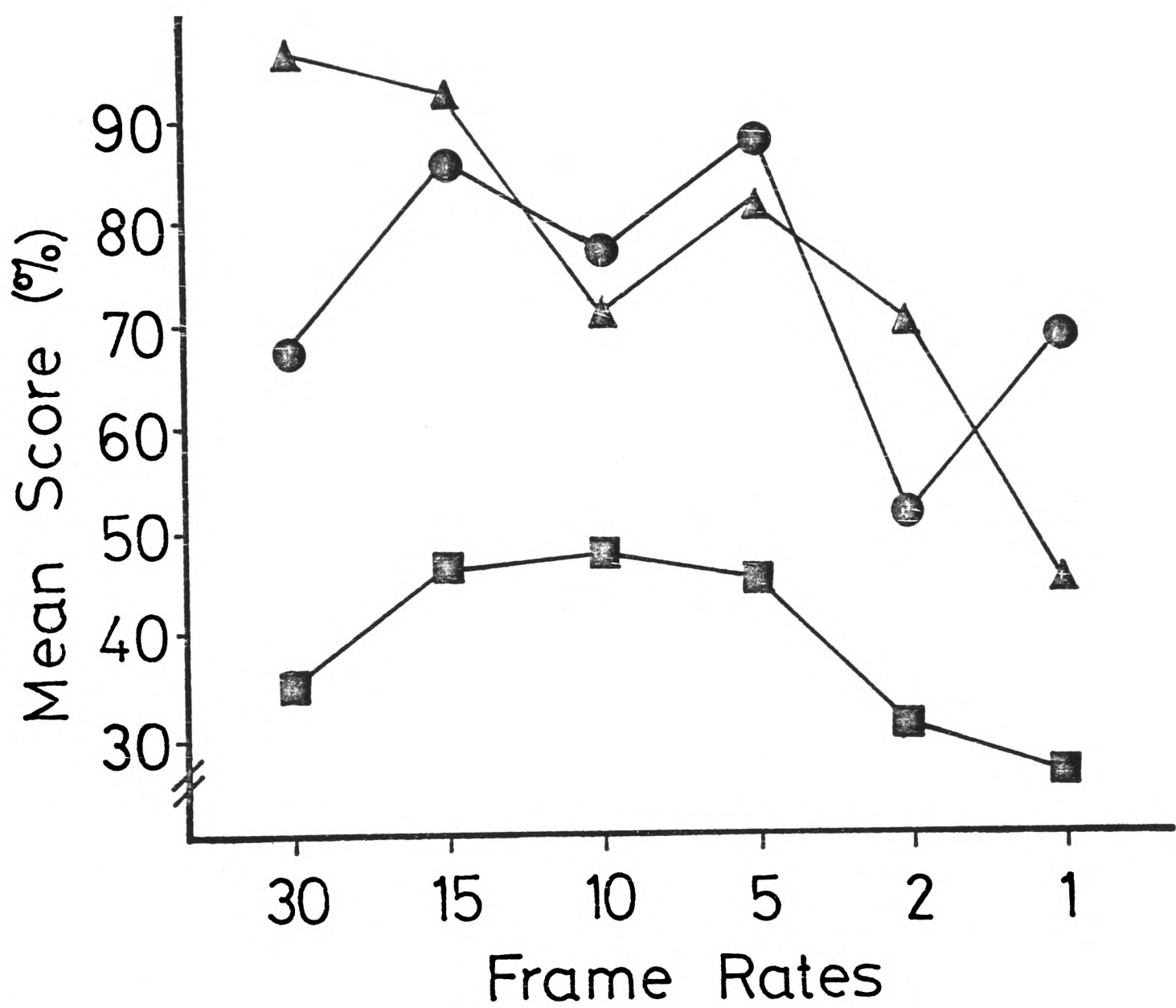
Between A at b₂: a₁ ≠ a₂, a₄, a₅; a₂ ≠ a₅, a₆; a₃ ≠ a₅; a₄ ≠ a₅, a₆; a₅ ≠ a₆.

Between A at b₃: a₁ ≠ a₃, a₅, a₆; a₂ ≠ a₃, a₅, a₆; a₃ ≠ a₆; a₄ ≠ a₆; a₅ ≠ a₆.

Between B at a₁, a₅ and a₆: b₁ ≠ b₂; b₂ ≠ b₃; b₁ ≠ b₃.

Between B at a₂ and a₄: b₁ ≠ b₂; b₁ ≠ b₃.

Figure 7. Schlosberg Circle Classification at Five Frame Rates.



- Classification Choices:
- Within One Segment
 - Adjacent Segments
 - ▲ Nonadjacent Segments

Questionnaire III

consistent than the 1 f.p.s. condition ($p = .05$). With the ratings of the female encoder, there is a significant difference in central tendency responding ($F = 8.62, p = .001$) and a difference on the variance score index ($F = 2.72, p = .07$). The latter difference strengthens when its mutual dependency with central tendency is partitioned ($F = 3.44, p = .04$). Again, one-tailed t statistic reveals that the most homogeneous impression of the female encoder is formed in the 15 f.p.s. condition; it is statistically different from both the 30 and 1 f.p.s. conditions ($p < .05$). A summary of differences in homogeneity of impressions formed of the encoders is shown graphically in Figure 8.

Insert Table 10 and Figure 8 about here

Discussion

In summary, a significant departure from effective communication was found at the information rate of 10 f.p.s. Consistently, this frame rate produced reliably lower group means for the performance of PPT than did the 30 and 15 f.p.s. conditions. The optimal information rate was found to occur at the 15 f.p.s. condition where there seemed to be the necessary yet sufficient information to permit maximal consensus of person perception and impression formation.

The impact of reduced information on communication effectiveness was dependent, in part, upon the type of act expressed by the encoders (e.g., composition according to the Schlosberg dimensions) and, in part, upon the ambiguity inherent in the distinctions made by the decoders (e.g., relative proximity on the Schlosberg circle. Considering the analyses of the Schlosberg dimensions, the results from Questionnaire I (in which pleasant and attention discriminated among frame rates) partially corroborated the results from Questionnaires II and III combined (in which unpleasant attention and high activity discriminated among frame rates). The latter result would seem to be more persuasive because it was based on more than twice the sample size of the former. Schlosberg circle analyses consistently showed that (a) distinctions within one segment were most difficult to make regardless

Table 10

ANOCOV Summaries: Test of Differences in Homogeneity of Impressions
Formed of Encoders at 30, 15 and 1 Frame per Second

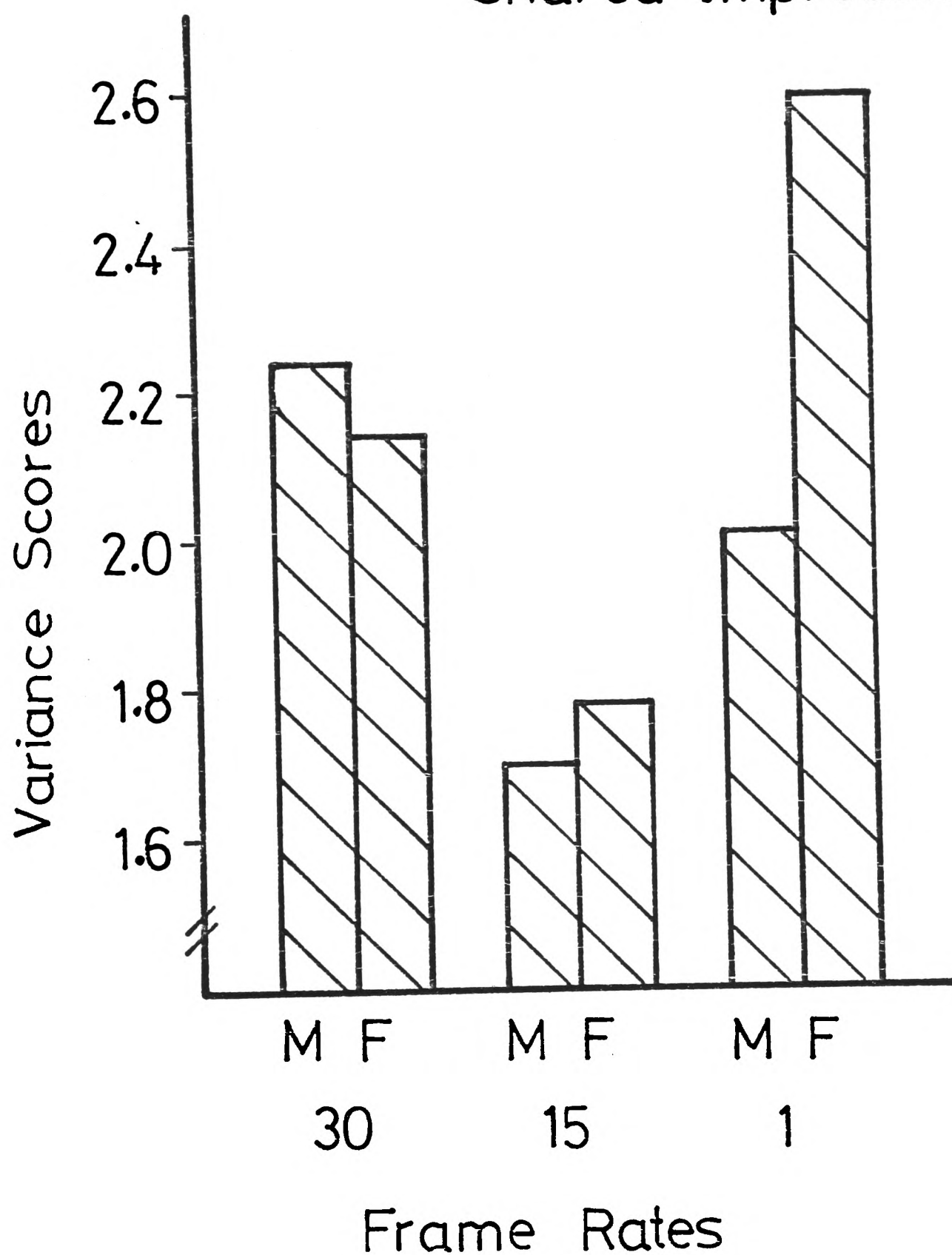
Encoder	Source	Central Tendency				Variance Score				Adjusted Variance Score			
		df	SS ^a	F	p	SS	F	p	SP ^b	SS	F	p	p
Male	Treatment	2	0.05	0.22	NS	3.03	3.20	.05	0.41	2.53	2.91		0.20
	Error	60	7.35			28.41			4.54	25.60			
	Total	62	7.40			31.44			4.95	28.13			
Female	Treatment	2	0.66	8.62	.001	2.75	2.72	.07	0.67	2.51	3.44		.04
	Error	60	2.30			30.26			4.47	21.56			
	Total	62	2.95			33.01			5.14	24.08			

Multiple comparisons (t statistic) reveal for male encoder 30 + 15 (p = .06/1, 60); 15 + 1 (p < .05/1, 60) and for female encoder 30 + 15; 15 + 1 (p < .05/1, 60).

^aSum of squares.

^bSum of products.

Figure 8. Optimal Information for Shared Impressions.



Encoders: M=Male, F=Female.

of frame rate, (b) distinctions between adjacent segments were made more easily, especially for the conditions with most information, and (c) distinctions between nonadjacent segments were most easily made especially when information was increased.

At the relatively impoverished information rates of 2 and 1 f.p.s., communication performance was more effective than would be expected by chance or guessing. There was ample evidence to suggest that nonverbal social cues can be communicated reliably in a video medium. Most audio-video teleconferences offer little in the way of contextual information to assist interpretation of communicative acts. Beyond verbal and paraverbal outputs, the majority of social information would take the form of nonverbal cues originating in the face. Most of these nonverbal cues would be under the deliberate control of the communicator rather than being displays of genuine affect such as deep sorrow or fear.

Strong support was found for the notion that dynamic displays of nonverbal communicative acts (30 f.p.s.) are decoded more effectively than static displays (1 f.p.s.). This finding may be of interest to those who study facial expression and have questioned whether the findings generated using still photographs of facial expression generalize to real life. The present findings would seem to support the earlier finding of Dusenbury and Knower (1938) which concluded that greater accuracy was possible with moving pictures of facial affect than with still photographs.

The most plausible answer to the question of why 10 f.p.s. was such an ineffective information rate would seem to be that it coincides with maximal flicker. Kelly (1972) found with human subjects that greatest sensitivity to a sine-wave, uniform field flicker display was at 10 Hz, a frequency similar to the 10 f.p.s. bandwidth compression level. He found a marked reduction of flicker sensitivity on either side of the 10 Hz maximum point (i.e., 5 and 15 Hz). It would seem reasonable to assume that the deviation from a monotonic relationship between frame rate and communication effectiveness reported in the present study was largely due to coincidence of 10 f.p.s. with maximal flicker sensitivity.

Further studies of bandwidth compression might investigate techniques

which would allow continuously variable frame selection intervals rather than maintaining a fixed interval. Such a scheme is feasible and has been considered by systems engineers (e.g., see Coll, 1975). A pseudorandom selection criterion might be produced with the mean interval set to 1/10 of a second but continuously varying between 1/15 and 1/5 of a second. This technique, while maintaining the same average information level, might avoid perceptual annoyance associated with 10 f.p.s. flicker. Moreover, it may be possible to "soften" the transition from frame to frame by dissolving images into each other very quickly; thus, abrupt transitions would no longer detract from the continuity of a sequence. Perhaps, an ultimate bandwidth compression technique would contain all of these characteristics and, in addition, make the selection of frames contingent upon the amount of activity change occurring between frames. With such an "intelligent" selection criterion, only novel or nonredundant information would need to be transmitted.

For some time, a concern of social psychologists has been the way in which social impressions are formed (e.g., Asch, 1946). Numerous attempts have been made to understand how information is combined during social perception. Mathematical models have been used to explain impression formation processes; a review of information integration theory can be found in Anderson (1974). Although theories of impression formation would seem to apply most appropriately to people's management of information more than their control of it, it may eventually prove possible to generate similar mathematical models for use when determining optimal information rates.

Earlier in the study, an attempt was made to show that a theoretical foundation for the notion of optimal information rates was already set in social psychology. In order to derive the hypothesis concerning the manipulation of social information on the video frame rate continuum, certain assumptions were advanced. One assumption was that at one extreme of the continuum would be the "communication barrage" (Ekman & Friesen, 1975) and so excessive would be the information presented that the decoder's capacity for processing it would be overloaded (Mehrabian & Reed, 1968). Under such circumstances there would necessarily be selective perception and partial processing of information. At the other extreme of the continuum

would be "communication deficiency" and because little information would be presented, uncertainty and ambiguity would result. Faced with this circumstance, the decoder might complete the missing information by drawing on past experience, stereotypes, perceptual sets, implicit personality theories, etc. Both extremes were thought to encourage highly subjective impression formation and to diminish homogeneous understanding. Results of this study appear to support these notions. Moreover, at the optimal information rate, there was neither evidence of overloading nor of a lack of information. Significant agreement of perceptions and impression formation was manifest.

Shifting emphasis from maximal to optimal information levels would seem to imply a distinction with respect to communication purpose. This distinction can be illustrated by another form of communication, namely, style of writing. If an artistic writer wishes to create multiple meanings and subjective, divergent understanding, then an abstract, metaphoric and impressionistic style would seem appropriate. If a scientific writer strives for singular meaning and objective, convergent understanding, then certainly a concrete, logical and impersonal style of writing would be most suitable. Audio-video mediated communication provides a parallel to this. Certain communication objectives may require the richest possible exchange of information. For example, if one was attempting to assess the truthfulness and sincerity of another person, access to all subtle and minute nonverbal cues which could reveal deception would be advantageous (Ekman & Friesen, 1969). Alternatively, it has been demonstrated that a limited quantity of nonverbal social cues can give added emphasis to objective or impersonal problem-solving tasks (Morley & Stephenson, 1969).

A final point might be made regarding the use of compressed bandwidth for interpersonal video-mediated communication. Although the present study has shown that one-half the normal frame rate at 15 f.p.s. can be at least as effective as full bandwidth at 30 f.p.s., the user may not be satisfied with this compromise. He/she, knowing that better quality video images are attainable, may not tolerate the less detailed display. In a similar vein, the credibility of reduced bandwidth communication may be challenged when it is made obvious that something has been lost in the exchange. Certainly, the

fabric for future telecommunications must be woven from the threads of both engineering research and social psychological research.

Acknowledgements

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An Effect of the Absence of Colour Cues on Person Perception in the Video Medium

Abstract

In an attempt to demonstrate an effect of the absence of colour as a social cue, a standardized person perception test was performed using black-and-white and colour video displays. The experimental task was to decode non-verbal communicative acts which were depicted by a male and a female encoder (19 acts each) and then to rate the encoders' personalities using a semantic differential. It was predicted that colour as a social cue might function at two levels; the first contributing to decoders' interpretations of specific communicative acts and the second contributing to overall impressions formed of the two encoders by decoders. Evidence was found for the second effect but not for the first. Consequences of this finding for video mediated communication were considered.

Little evidence can be found in social psychological literature to suggest the importance of colour as a nonverbal social cue. Studies in which race of stimulus person has been an independent variable (e.g., see Malpass & Kravitz, 1969) are one exception. Investigations into the physiological and sensory aspects of colour vision have been plentiful and, similarly, there has been a strong focus of attention upon colour perception. Yet, the role of colour in person perception seems to have been largely overlooked. The present study represents an attempt to demonstrate an effect of the absence of colour as a social cue on person perception in the video medium. It was thought that by comparing the effective use of black-and-white and colour video displays during performance of a person perception task this might be accomplished.

Undoubtedly, colour cues are used during interpersonal communication. A red face may suggest anger or embarrassment whereas a white face may be perceived to reflect fear; colour can be used to describe body postures (see Rosenberg & Langer, 1965). More enduring aspects of personal colouration such as hair colour, use of cosmetics, etc., might also be considered as social cues (see McKeachie, 1952). Colour of clothing may provide information about a person (see Gibbons, 1969), although this may be complicated by such factors as fashion and seasonal variations.

Since social interactions normally occur in a coloured physical setting, complete consideration of colour as a social cue would have to include more factors than just personal sources. Architects and environmental psychologists share a common concern for the influence of room colour on human behaviour. It has been suggested that room colour can create impressions which generalize to interpersonal events occurring in the room (e.g., see Birren, 1971, 1972; Porter & Mikellides, 1976). For example, a social encounter in a room with red walls may seem to be more congenial than if the walls were blue.

Some studies have considered the way in which colours connote socio-emotional meaning. Osgood, Suci and Tannenbaum (1957) reported that red packaging can make advertised products seem "warm", whereas blue and

green can make them seem "cool". In addition, they found that colour variation can imply differences along such dimensions as "serious-humorous" and "masculine-feminine". Perhaps similar influences operate with clothing. Osgood's congruency principle, a theoretical notion of attribution generalization, might be used to explain how impressions of persons can be influenced by the colours of their dress.

Using a factor analytic technique and stimuli which were coloured cards, Wright and Rainwater (1962) found that when hue, saturation and luminance were manipulated, there emerged six factors of colour perception termed (a) happiness, (b) showiness, (c) forcefulness, (d) warmth, (e) elegance, and (f) calmness. Happiness, for example, was suggested by light and soft colours, showiness by intense, bright colours and forcefulness by dark colours. To some extent, people share understanding of colour connotations.

Considering the seeming relevance of colour as a social cue demonstrated above, there has been a paucity of such investigations in the area of person perception. Most studies of recognition of facial emotion have used exclusively black-and-white photographs for stimulus material (e.g., Ekman & Friesen, 1969, 1971; Frois-Wittman, 1930; Schlosberg, 1954). More recently, in composing the PONS test, Rosenthal, Archer, Koivumaki, Dimatteo and Rogers (1974) used black-and-white 16 mm film. Ekman and Friesen (1976) devised their Pictures of Affect Test using black-and-white 35 mm slides as stimulus material. The choice of black-and-white over colour may have been decided by factors of cost and convenience. However, it is possible that the role of colour as a social cue has been deliberately ignored because its exact contribution remains unknown. Colour stimulus material of this type may require strict control or standardization to some colour fidelity criterion so as not to be misleading. On the other hand, there exists evidence that if colour fidelity were low, e.g., with too much red or green in the image, perceptual constancy could operate to correct colour imbalance (Bruner, Postman & Rodrigues, 1951; Harper, 1953).

The majority of teleconference systems are currently limited to black-and-white video displays primarily because of prohibitive cost and technical

complexity of colour. However, it was possible to simulate a teleconference with or without colour information and thus attempt to demonstrate an effect of the absence of colour as a social cue. This author produced a person perception test (PPT) in Super-8 colour format (see Appendix B). In it, colour information included a blue-grey background curtain, a female encoder whose hair was blonde and who wore a pastel green sweater over a pink blouse, and a male encoder whose hair was brown and who wore a reddish-brown sweater. The PPT was dubbed to black-and-white and colour videotapes in order to provide the independent variable manipulation in this study.

The effect of the absence of colour cues in PPT might be assessed at two levels, one specific and one general. At the first level, decoders of the black-and-white video display were expected to be less effective in their perceptions of specific nonverbal communicative acts and this may be reflected in lowered PPT scores. Since the a priori scoring method for PPT was established using a colour display, black-and-white decoders may be disadvantaged by the absence of colour cues. These decoders would be less likely to detect subtle changes in skin colouration if any had occurred when the encoders depicted the various communicative acts. Access to colour information which might complement specific emotional reactions (e.g., red anywhere on the video display might influence colour decoders to perceive a reaction as "irate" rather than "displeased") would be denied. At the second level, black-and-white decoders could not employ colour cues when formulating overall impressions of the encoders' personalities. Even the blue-grey background curtain might contribute to general impressions formed by colour decoders which would be lacking for black-and-white decoders. With absence of colour cues one might expect less homogeneity of variance on the semantic differential ratings of the encoders' personalities.

Hypotheses

1. The absence of colour cues in the video display of the person perception test (PPT) was expected to reduce the effectiveness to decode specific nonverbal communicative acts.
2. The absence of colour cues in the video display of the person per-

ception test (PPT) was expected, in general, to decrease the homogeneity of impressions formed of the encoders' personalities by the decoders.

Method

Subjects

A class of third-year psychiatric nursing students at St. George's Hospital Medical School, University of London, participated in this experiment as part of a course requirement. Two groups were matched in demographic composition (according to sex, age and ethnic origin) with 13 subjects in each group.

Procedure

In two separate but essentially identical sessions, the PPT was administered to the groups of psychiatric nursing students in their academic setting according to the instructions provided. The rationale, procedure and scoring method employed with PPT is described in Appendix B. In the first session, the video display was black-and-white and in the second, it was colour. Following the PPT in which both groups classified 38 communicative acts, subjects offered overall impressions of the two encoders by rating their personalities using two 21-item semantic differential scales. The order in which the male and female encoders were rated was counterbalanced. The experimental task took approximately one half hour to complete.

Results

Decoding specific nonverbal communicative acts. An analysis using the a priori scoring method developed for the PPT shows that the average score for the black-and-white video group is 63.54% (standard deviation of 11.24) and 67.15% (standard deviation of 6.64) for the colour video group. This represents a decrease of 3.61% when colour cues are absent but it is not a statistically significant difference ($t = 1.08$, $df = 12$, $p = .21$). Another method for analysing specific decoding effectiveness is to employ a modal scoring criteria separately for each group. Using this criteria, the result is suggestive but, again, not significantly different. An average of 64.29% of the black-and-white judgments are modal and for the colour judgments, an average of 71.42% are modal. No support is found for Hypothesis 1.

Overall impressions of the encoders. The group means in Table 1 show that, as predicted, there are less homogeneous impressions formed of the two encoders by the black-and-white video group than by the colour group. There is 16.13% greater variability in the ratings of the male encoder and 80.20% greater variability in the female encoder's ratings among subjects who viewed the PPT without colour cues. This relationship is depicted graphically in Figure 1. The rationale for this analysis has been described earlier.

Insert Table 1 and Figure 1 about here

In Table 2, ANOCOVs show that the differences on the variance score index are statistically reliable for the ratings of the male encoder ($F = 3.22$, $df = 1,40$, $p = .08$) and more decisive for the ratings of the female encoder ($F = 29.77$, $df = 1,40$, $p < .01$). For the male encoder, the difference does not remain after mutual dependency with the central tendency is removed ($F < 1$). However, with the female encoder, the difference remains after the covariate is statistically isolated ($F = 14.73$, $df = 1,40$, $p < .01$). Both findings support Hypothesis 2.

Insert Table 2 about here

Discussion

The absence of colour as a social cue in a video display has been shown to influence person perception. There was increased variability of impressions formed of encoders when these colour cues were not available. No reliable evidence was found, however, for colour's contribution to the effective perception of specific communicative acts. Osgood's congruency principle may offer an explanation as to how the general influence may have occurred. Impression of persons may be influenced by their proximity to colour as in a

Table 1

Variance Score and Central Tendency Indexes
for Black-and-White and Colour Video Displays

Video Display	Male Encoder		Female Encoder	
	<u>A</u>	<u>B</u>	<u>A</u>	<u>B</u>
Black-and-White	3.24	2.96	3.64	3.20
Colour	2.79	2.46	2.02	2.58

A = Variance score index.

B = Central tendency index.

Figure 1. Intersubjectivity
Without Colour Cues.

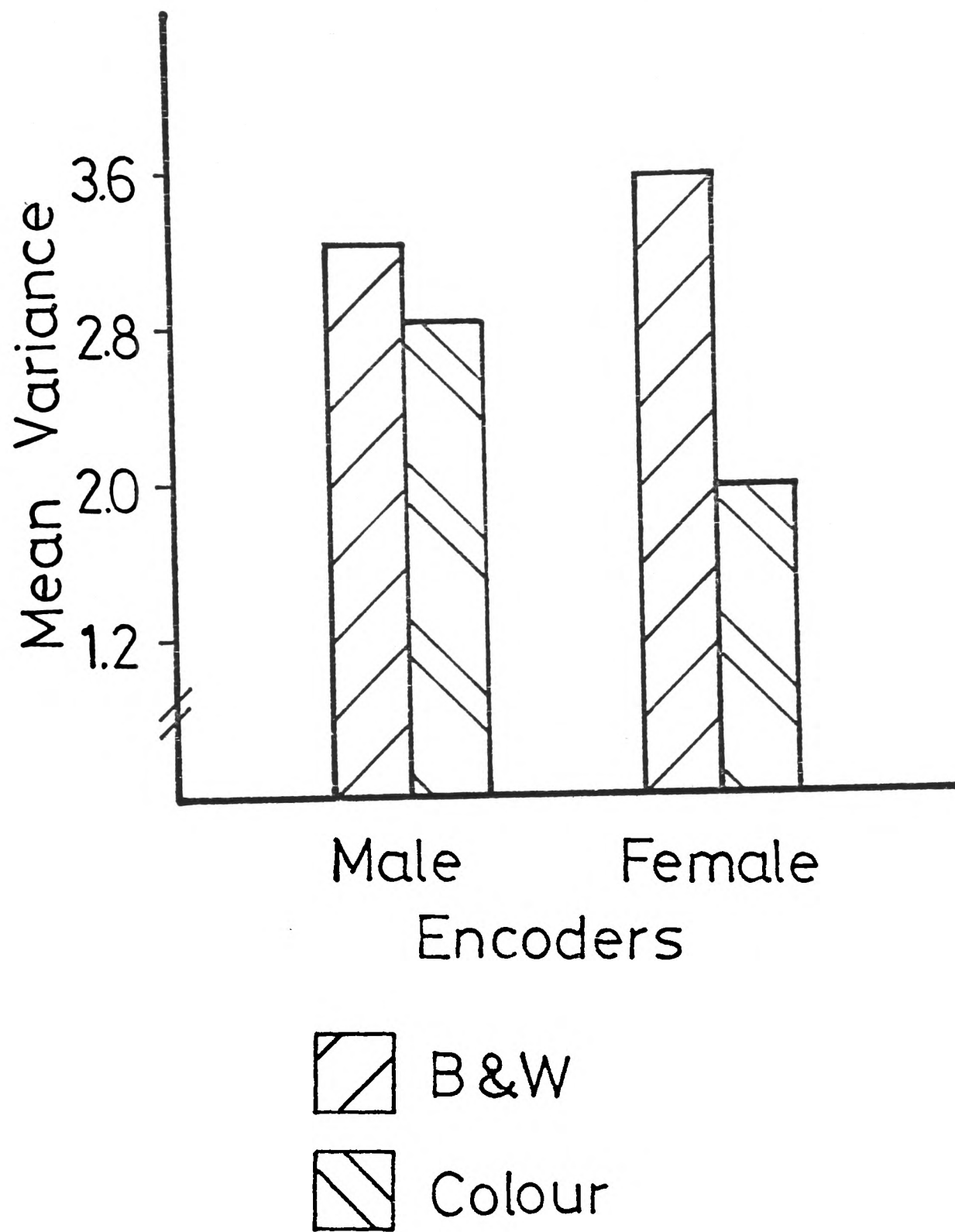


Table 2

ANOCOV Summary Tables: Test of Differences in Homogeneity
of Impressions Formed of Encoders when Viewed on
Black-and-White and Colour Video Displays

Index									
Encoder		Central Tendency			Variance Score			Adjusted Variance Score	
		df	SS ^a	F	SS	F	SP ^b	SS	F
Male	Treatment	1	0.85	9.42*	2.13	3.22**	1.34	0.11	0.20
	Error	40	3.59		26.41		4.26	21.35	
	Total	41	4.44		28.54		5.61	21.46	
Female									
Female	Treatment	1	1.35	12.62*	27.67	29.77*	6.10	12.11	14.73*
	Error	40	4.27		37.18		4.67	32.07	
	Total	41	5.61		64.85		10.77	44.18	

*p < .01; **p = .08.
a Sum of Squares.
b Sum of Products.

background or in clothing. Such an influence could operate in a systematic way only if the connotations of colour are shared by decoders, a possibility which previous evidence would suggest (e.g., Osgood, Suci & Tannenbaum, 1957; Wright & Rainwater, 1962).

The colours which appeared in the PPT were not manipulated nor were they purposefully selected to have particular information value. Did colour cues then mislead the decoders who drew similar but irrelevant inferences from them? This would seem to be a legitimate question but not one which would challenge the possibility of employing colour to convey meaning or mould impressions. Even an unintentional message could become a human factor in the use of video-based communication systems. Employing black-and-white video displays for teleconferences circumvents this question. In time, when video colour displays have become a more viable prospect, perhaps enough research into colour as a social cue will have been conducted to bring this source of interpersonal influence under the control of the communicator; eventually, the manipulation of colour as a social cue may be more readily accomplished in mediated communication than it ever has been in face-to-face interactions.

For consideration in the near future, certain intermediate questions related to colour in video displays seem intriguing. For example, the finding that hue, saturation and luminance are critical determinants of colour preference and meaning would seem to be of particular consequence (e.g., see Payne, 1964). These factors are always present in video displays and can be varied by tuning the controls for colour balance, contrast and brightness on the monitor.

In the present study, there may be a further significance in the findings for other experiments which have used the particular person perception test employed here. Recall that the original standardization of the accuracy criterion was established under optimal conditions which included colour cues. Subsequent studies employed black-and-white video and the same scoring criterion. This study would suggest that the absence of colour has only a minimal effect on the perception of specific communicative acts. The discerned

contribution of colour has been that it helps to create overall impressions which may in part generalize to persons shown in the video medium.

Acknowledgement

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Chapter Five

Content Analysis of Mediated Communication

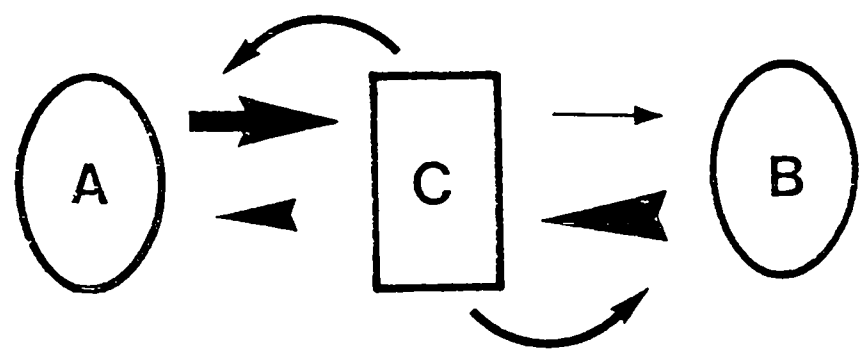
(The telephone rings.)

Hello, is that you, dear?....is it you?....Yes....it's very difficult to hear....you sound ever such a long way off....Hello!....Oh! it's awful.... there are several people on the line....Ask them to put you through again.... Hello! Ask them to put you through again....I said: ask them to put you through to me again....But please get off the line, I tell you I'm not Doctor Weinsberg....Hello....(She hangs up the receiver....The telephone bell rings.)

Ah! at last....it's you, dear....yes....very well....hello!....It was a real torture to hear you with all those voices in between....yes....yes.... no....you're lucky....I only came in ten minutes ago....You hadn't phoned me before, had you?....Ah!....Oh! no I dined out....at Margaret's....It must be quarter past eleven....Are you at home? Then, what's the time by your electric clock?....What I thought....Yes, my darling....Last night? I went to bed straight away and as I couldn't sleep I took a sleeping tablet.... no....just one....nine o'clock this morning....I had a slight headache, but I pulled myself together. Margaret came and lunched with me. I did some shopping and then came home again. I've put all the letters in the yellow bag. I....

(Cocteau, 1951, reprinted 1971, pp. 21-22).

Communication between A and B is influenced by C, the medium. The communicators may be aware of medium effects and may adjust their manner of expression to match their perceptions of media attributes. Medium and user effects, together, operate as a system producing fundamental changes to mediated communication processes. Content analyses may reveal specific differences between face-to-face and audio-video mediated communication.



Reference

Cocteau, J. The human voice. London: Vision Press, 1971. (First edition published 1951)

Content Analyses of Cross-Media Studies

Abstract

This investigation attempted to content analyse two studies which were reported earlier. One study compared leadership emergence in four-person groups which met either face-to-face or using an audio-video teleconference system. The other study compared negotiation outcome in face-to-face, simulated-distance teleconferencing and real-distance teleconferencing dyads. Social psychological literature suggested a number of interpersonal communication variables which were considered: (a) verbal including frequency and duration of talking, interruptions, back-channel responses and invited comment, (b) paraverbal including filled pauses, ritualized speech and sentence disfluences, and (c) nonverbal including frequency and duration of gaze, smiles, head movements, gestures and postural changes. There were more verbal utterances and gestures exchanged in face-to-face interactions; mediated communicators gazed more but interrupted each other less. Considering the number of dependent measures under investigation, significant media differences proved somewhat elusive. Nevertheless, interrelationships between dependent variables were sufficiently systematic to encourage further investigations using a multidimensional approach, and suggestions were offered for future content analyses in cross-media studies.

Content analysis has been a valuable research method in the social sciences for many years (see Holsti, 1969). An in-depth examination of the communication content of face-to-face and mediated groups may establish fundamental differences in those group dynamics. For example, it might establish whether media effects arise because communicators make adjustments to their own output under particular communication circumstances or if differences in their communication are entirely due to media factors, a dilution of the communications exchanged.

Face-to-face and audio-video mediated interactions would seem to have the requisite communication channels for transmission of verbal, paraverbal and nonverbal cues between communicators because they both can provide vision and audition. Social psychologists interested in mediated communication have proposed several important distinctions between these forms of interaction, namely, differences in their "immediacy" (Mehrabian, 1971), "social presence" (Short, Williams & Christie, 1976), "formality" (Morley & Stephenson, 1969, 1970) and extent of useable synchronization cues (e.g., Cook & Lalljee, 1972).

In the general case of face-to-face interaction, the function of vision has been considered by many, among them Argyle, Lalljee & Cook (1968). Visual contact was said to offer a source of feedback to communicators thereby enabling them to modify their style of social behaviour. Visual cues were said to synchronize speech and give coordination to verbal behaviour. Vision served an affiliative balance function by indicating the intensity of involvement or concern between communicators. Studies by Duncan (1972, 1973) and Rosenfeld (1978) have also investigated the function of vision in conversation, both dealing with conversation control functions of verbal and nonverbal cues and their role in synchronizing turn-taking in conversations. In the present analyses, theoretical considerations for three spheres of concern were examined as potentially relevant to audio-video mediated discussions, namely, synchronization, formality and anxiety differences between face-to-face and video-mediated interactions.

Synchronization. Cook and Lalljee (1972) are among those who have considered the synchronization function of visual cues in conversation. They

compared face-to-face and audio interactions on various dependent measures and found that there were more very short utterances in an audio-only condition and, unexpectedly, the incidence of simultaneous speech was greater in face-to-face. More simultaneous speech had been expected in the audio condition where less successful meshing of the verbal interactions and, hence, increased interruptions seemed more likely. Earlier, Kasl and Mahl (1965) reported to have found more "ah" type utterances during audio interactions than during face-to-face. Intuitive explanations of the function of filled pauses (ah, er, uhm) stated that they were believed to ward off interruptions or to signal that the speaker desired to continue holding the floor in the conversation. Several attempts to empirically demonstrate a relationship between filled pauses and frequency of interruptions met with no success (Cook & Lalljee, 1970; Lalljee & Cook, 1969, 1974). Cook, Smith and Lalljee (1975) found that filled pauses in conversation often precede longer than average clauses and went on to suggest that filled pauses might reflect the operation of organizational processes in spontaneous speech.

A recent study by Williams (1978) in considering the role of visual cues in mediated speech patterns, found synchronization differences relating to three media of communication: (a) audio, (b) audio-video, and (c) face-to-face. The incidence of simultaneous speech and pauses were found to be significantly higher in face-to-face than in the other two conditions. He suggested that, since the audio and audio-video conditions did not differ in these respects, explanations for synchronization differences could not be provided solely in terms of the presence of visual, nonverbal cues. Instead, he suggested that social presence, a varying property of communication media, might account for the differences.

Formality. In their experimental studies of negotiation, Morley and Stephenson (1969, 1970) manipulated communication medium in order to control the number of social cues exchanged by communicators. They compared audio and face-to-face interactions. Under what they termed as "formal" conditions (i.e., where few social cues were available) the negotiator with the stronger case was less assailable; there was greater opportunity for effective social influence under "informal" circumstances (i.e., where more nonverbal cues were available). They reported that the formal interactions tended to be more

task- and less person-oriented. Stephenson, Ayling and Rutter (1976), again in comparing face-to-face and audio-only conversations, concluded that the latter was more depersonalized and task-oriented and that visual interactions were characteristically more spontaneous, diversified and conventional in terms of role relationships between communicators. Rutter and Stephenson (1977) reported that face-to-face interactions had more interruptions than audio-only, a finding contrary to their predictions. Their interpretation was that face-to-face interactions allow interruptions because visual cues compensate for potentially disruptive effects of simultaneous speech. Without the visual channel, conversations were less synchronized and communicators could not afford to interrupt each other and still carry on a meaningful conversation. They concluded with the prediction that there would be a similarity between face-to-face and videophone interactions because both should give access to the visual cues so vital for synchronized conversation. This interpretation assumes that the visual cues are as readily useable in audio-video mediated interaction as they are in face-to-face. Otherwise, the former may be more like the audio-only interaction as Williams (1978) would suggest.

Anxiety in verbal behaviour. Several studies have demonstrated relationships between speech disfluencies and anxiety (e.g., Dibner, 1956; Krause & Pilisuk, 1961). An oft-cited study by Kasl and Mahl (1965) categorized seven types of speech disfluencies which they said reflected anxiety. These were (a) sentence change, (b) repetition, (c) stutter, (d) omission, (e) sentence incomplete, (f) tongue slips, and (g) intruding incoherent sounds. They found that anxiety increased all of these speech disturbance indexes. Another category marked by hesitations such as er, ah or uhm was said to function like filled pauses. The ah utterance was 40% greater in audio-only conversations as compared to those face-to-face. Uncertainty with mediated circumstances might be expected to produce heightened anxiety which might be detectable in the form of speech disfluencies. Lalljee and Cook (1975) found that the frequency of ritualized speech (use of irrelevant words such as "in fact", "really", or "I mean") increased along with anxiety level. These indexes

may be useful in pointing out media-related differences in speech anxiety.

Dependent variables. The content analyses will consider the following variables:

1. Frequency and duration of talking (e.g., Argyle & Cook, 1976; Rosenfeld, 1978).
2. Interruptions, with a distinction between those successful and those not (e.g., Ferguson, 1977).
3. Back-channel responses which offer a signal of attention or encouragement to the speaker from the listener but are not intended to take over the conversation (e.g., Yngve, 1970).
4. Invited comment in which one speaker invites the other to elaborate, clarify or make a contribution to the discussion.
5. Filled pauses which are thought to be a means of preventing interruptions (e.g., Cook, Smith & Lalljee, 1974; Lalljee & Cook, 1973).
6. Ritualized speech, those injected words which have little or no communicative value and which may be a sign of anxiety (e.g., Lalljee & Cook, 1975).
7. Various sentence disfluencies which have already been described (e.g., Kasl & Mahl, 1965; Krause & Pilisuk, 1961).
8. Gaze frequency and duration (e.g., Argyle & Cook, 1976).
9. Frequency of smiles and, considered separately, the incidence of reciprocated smiles (e.g., Rosenfeld, 1972).
10. Head movements, most frequently nods affirmative or negative (e.g., Dittmann & Llewellyn, 1968).
11. Gestures, mainly comprised of hand and arm movements which typically accompany speech (e.g., Dittmann & Llewellyn, 1969).
12. Postural shifts (e.g., Stewart & Patterson, 1973).
13. The total use of nonverbal cues combined because certain cues might be mutually interchangeable and subject to individual differences of preference (e.g., Argyle, 1975).
14. The proportion of all nonverbal cues which could have been transmitted between communicators (e.g., implied by Rutter, Stephenson, Ayling & White, 1978).

Differences between face-to-face and audio-video mediated interactions.

It was possible, in a general way, to predict the direction of differences expected in comparisons of face-to-face and audio-video mediated interactions. The first list contains dependent measures for which it was expected that face-to-face interactions would exceed mediated interactions.

1. Amount of talking, especially short utterances which are typical of rapid speaker changes.
2. Interruptions and the frequency of back-channel responses.
3. Emission of general nonverbal social cues and specific postural shifts, gestures and head movements.
4. Extent to which all nonverbal cues can be perceived by the receiver.
5. Proportion of smiles reciprocated by the receiver.

The second list contains dependent measures for which it was expected that mediated interactions would exceed face-to-face interactions.

1. Duration of gaze, a behaviour not subject to intimacy management in mediated circumstances.
2. All indexes of anxiety in speech including the various sentence disfluencies and ritualized speech.
3. Smiles which may also signal anxiety but may be present due to reactions to the novelty of the medium.
4. Incidence of filled pauses, possibly both a sign of anxiety and a signal that the speaker wishes to hold the floor.
5. Long utterances, more formal and thought-out verbal exchanges.

STUDY I

An earlier study which compared face-to-face and audio-video mediated interactions reported significant alterations to the group process of leadership emergence. The present content analysis had four central aims. First was to explore the question of synchrony in the verbal interactions of the two conditions. Secondly, because the groups in the two conditions met repeatedly, an objective was to demonstrate variation in the style of communication and adaptation to the mediated circumstances over time by those groups in the audio-video mediated condition. Third was an attempt to explore indexes of

verbal and paraverbal activity with a view to attributing media differences to communicator uncertainty. The fourth aim was that the most useful dependent variables for use in this type of analysis may be identified.

To summarize briefly the earlier findings, it was reported that in the face-to-face condition, development of leadership took almost a classic form with sociometric measures systematically related to behavioural indexes. Yet with the audio-video condition, role differentiation tendencies were sharply curtailed and the relationship of sociometric indexes with indexes of verbal output were greatly diminished. The present investigation began with the knowledge that these two types of interactions differed in important ways; at this point evidence was sought to suggest how they differed.

Method

This section is the same as that reported in the earlier study entitled "Teleconferencing and Leadership Emergence".

Procedure for coding content. Face-to-face groups were recorded using a wide-angle camera lens and with slight adjustment of seating positions, all four persons were recorded simultaneously. Mediated groups were recorded using a split-screen method. The output between nodes was used in this analysis. The videotapes were replayed on a Sony VTR and displayed in black-and-white on a 19 inch video monitor. The VTR could be stopped, started and replayed as necessary for coding. Nonverbal indexes were measured from videotape recordings, and verbal and paraverbal indexes from audio cassette recordings dubbed from the videotapes. The audiotapes were replayed on a Sony cassette recorder and monitored on headphones, again with stop, start and replay facilities for coding. All tapes were analysed in a random order.

Certain of the measures (i.e., indexes of speaking frequency and duration) were made in the Wired City Laboratory from the 30 minute videotape recording of the discussions and other measures were performed at the Department of Experimental Psychology, University of Oxford and assessed from audiotapes. Five minute samples were excerpted from the 30 minute discussions in about the middle of sessions 1, 3 and 5 of both conditions. The conceptual analysis for all dependent variables was the group output rather

than that of individuals. An eight-channel event recorder (Rustrak) was used to measure the frequency and duration of two dependent measures simultaneously (e.g., filled pause and sentence disfluency). Criteria for identifying the various dependent measures followed as closely as possible those criteria cited in the introduction of this investigation. Prior to statistical analysis, all indexes were adjusted to a standard session duration and those dependent on speech (e.g., interruptions) were adjusted for the amount of talking.

Results and Discussion

Medium effects. The first level of analysis took the form of nine two-way ANOVAs as shown in Table 1. Mediated groups spoke for an average 76% of the session duration while face-to-face groups spoke 96% of the time. This represents a 20% difference which is statistically reliable ($F = 6.60, p < .03$). However, the two measures of utterance frequency, those of less than three seconds and those of more than 20 seconds, do not show differences (both $F_s < 1$). Had the mediated groups produced reliably fewer short utterances but more long ones, support might have been inferred for the notion that mediated interactions contained more carefully expressed formal utterances.

There are significantly more interruptions face-to-face ($F = 5.13, p = .04$) even when it is taken into account that the mediated groups spoke less and, hence, would have had less opportunity to interrupt each other (see Figure 1). There are an average of 23.96 per 30 minutes of face-to-face discussions as opposed to an average of 15.33 in mediated. Without compensating for equal speaking times, this difference is even more striking ($F = 10.92, p = .01$). This might suggest the formal and rule-bound nature of mediated interactions. The frequency of back-channel responses is not reliably different in the two conditions ($F = 1.05, NS$): neither is there any apparent difference in the frequency with which group members invited comments from each other ($F < 1$).

Insert Table 1 and Figure 1 about here

Table 1

Indexes of Verbal and Paraverbal Behaviour: Study I

Dependent Variable	<u>F</u> Ratios of Partitioned Effects		
	Medium (<u>A</u>)	Session (<u>B</u>)	Interaction (<u>AB</u>)
I Duration of Talking (%)	6.60*	1.67	<1
II Frequency of Short Utterances	<1	1.79	<1
III Frequency of Long Utterances	<1	3.43*	<1
IV Interruptions	5.13*	<1	<1
V Back-Channel	1.05	<1	2.00
VI Invited Comment	<1	1.35	<1
VII Filled Pauses	2.88**	1.67	1.58
VIII Ritualized Speech	3.86**	<1	<1
IX Sentence Disfluencies	1.31	<1	<1

Dependent variables II to IX are adjusted for duration of talking.

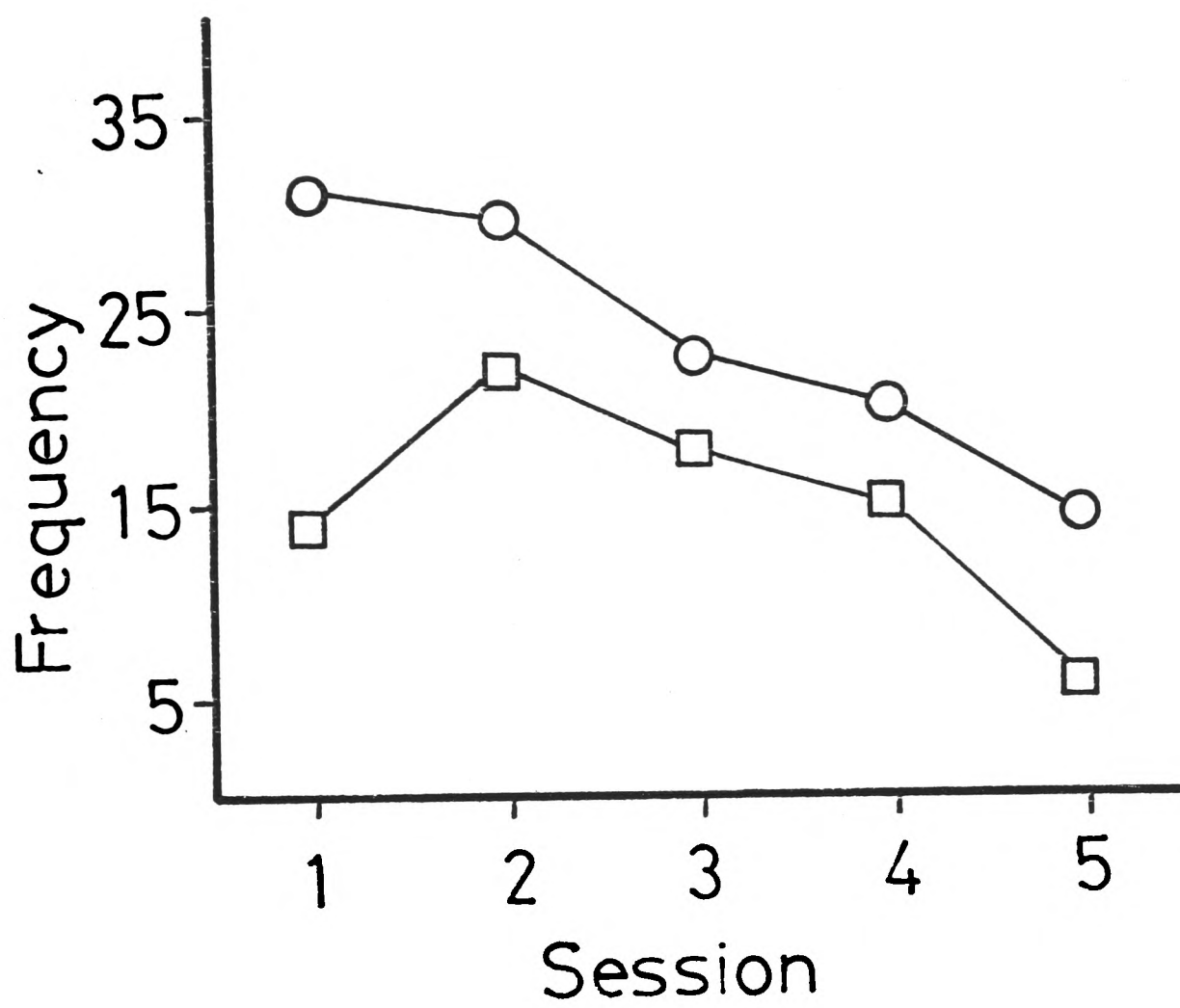
In ANOVAs I to IV, $df = \underline{A} (1, 8), \underline{B} (4, 32)$ and $\underline{AB} (4, 32)$.

In ANOVAs V to IX, $df = \underline{A} (1, 8), \underline{B} (2, 16)$ and $\underline{AB} (2, 16)$.

* $p < .05$.

** $p < .15$ (marginal).

Figure 1. Interruptions as a Function of Medium.

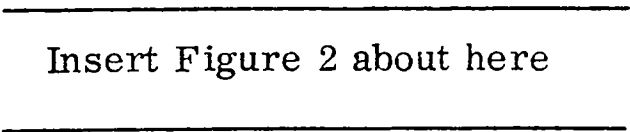


○ = Face-to-Face
□ = Video Mediated

Communicators in mediated interactions show some tendency to produce more filled pauses in their utterances with a mean of 20.07 as compared with 14.27 though this seems to be only a trend and does not meet the usual level of significance ($F = 2.88, p = .13$). Since previous research has raised the question of functional relationship between interruptions and filled pauses, this trend may be worthy of comment. When an ANOCOV is performed with interruption frequency as the main variable and frequency of filled pauses as the covariate, the interruption effect disappears completely ($F < 1$), providing evidence of a mutual dependency between these two indexes. Communicators may have employed the filled pauses to signal their desire to hold the floor. This being the case, these signals appeared to function because the speakers were not interrupted.

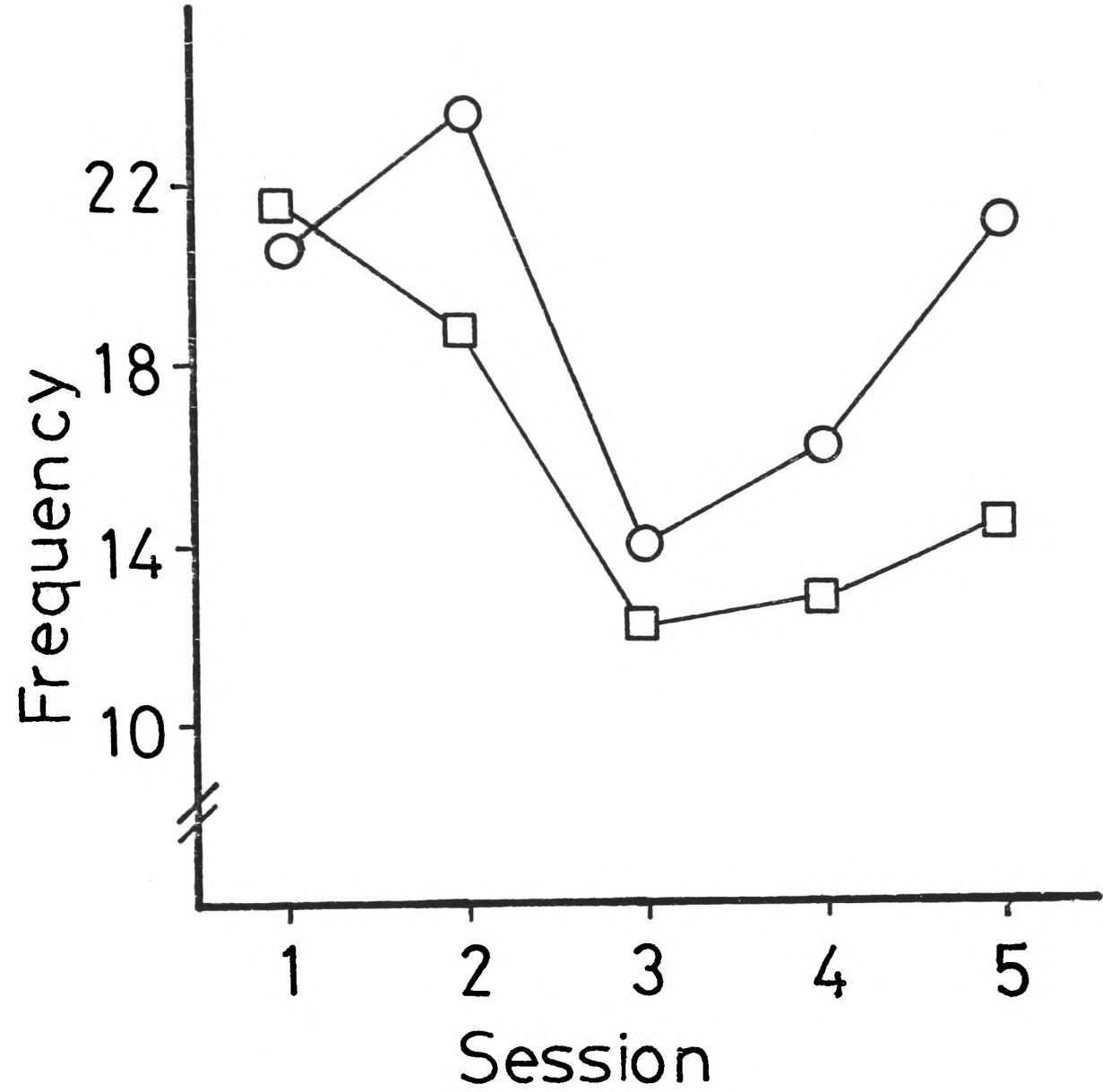
Two measures of speech anxiety do not yield the expected significant differences. There is no evidence of increased frequency of sentence disfluencies among mediated communicators ($F = 1.31, NS$). Moreover, the ritualized speech index approaches significance but in the opposite direction to what was expected ($F = 3.86, p = .09$).

Session effect and interaction effect. As Table 1 reveals, there is little to report with respect to either session or interaction effect. The only dependent variable to show systematic session effect is the frequency of long utterances ($F = 3.43, p = .02$). As Figure 2 shows, both mediated and face-to-face groups produced fewer of the long utterances in the third session.



Relationships between dependent variables. An intercorrelation matrix of nine dependent variables can be found in Table 2. It may be appropriate to reassert the exploratory nature of this study while acknowledging the danger of overinterpreting this type of analysis. The central aim was to identify which dependent variables appeared to be most useful for content analysis. Considering the proportion of variance shared by the variables with other ones and the strength of association between independent and dependent variables

Figure 2. Sessions Effect for Long Utterances.



○ = Face-to-Face
□ = Video Mediated

would be one approach to this. Below the diagonal in Table 2 are the correlation coefficients and above the diagonal are the percentages of variance shared by the dependent variables. At the outset it should be stated that marginally significant correlations of .26 ($p = .10$) share about 7% of the variance and correlations of less than .16 are not shown in the matrix because variance shared is negligible (less than 3%). Correlations of greater than .16 but of less than .26 are displayed while most correlations greater than or equal to .26 are discussed.

Insert Table 2 about here

Among the seemingly "common sense" correlations are those between duration of talking and the two frequency variables of short and long utterances. They produce correlations of .36 and .70 respectively. Common sense relationships lend confidence that systematic dependency among these indexes has occurred. For example, it would seem to make sense that there is a negative relationship between the number of interruptions and the frequency of long utterances; here a significant correlation of $-.62$ is found. Also, not too surprising, the two indexes of speech anxiety are themselves positively correlated (.29). Sentence disfluencies are correlated with both frequency of short utterances (.33) and with interruptions (.26). The expected dependency between interruptions and filled pauses is found with a correlation of $-.45$; no doubt this relationship underlies the ANOCOV result reported earlier. Notice, however, that interruption frequency is, at the same time, positively correlated with back-channel responses (.46) and with invited comment (.58). All of these correlation coefficients are significant at $p < .01$ and considered together may be seen as consistent with the notion that interruptions may be a sign of efficient communication, of heightened synchrony during information exchange. Especially in mediated discussions, long utterances may have had formal characteristics such as monologues, being negatively related to interruptions ($-.62$), invited comment ($-.35$) and back-channel responses ($-.23$). It would be expected that filled pauses should function in just the opposite way to the invited comment index, and this is supported with the correlation $-.26$.

Table 2

Relationships between Dependent Variables¹¹: Study I

	I	II	III	IV	V	VI	VII	VIII	IX	$\bar{r}^2$	$\hat{\omega}^2$
I		13	50	31	X	17	X	4	4	15	18
II	.36		6	X	3	X	X	5	10	5	0
III	.70	-.25		49	5	12	4	X	X	14	10
IV	-.56	X	-.62		21	34	20	X	7	19	13
V	X	.16	-.23	.46		3	X	X	X	4	4
VI	-.41	X	-.35	.58	.16		7	X	X	10	3
VII	X	X	.20	-.45	X	-.26		X	X	4	13
VIII	.21	.22	X	X	X	X	X		9	3	11
IX	.19	.33	X	.26	X	X	X	.29		4	2

Above the diagonal = Percentage of variance shared by dependent variables.
Below the diagonal = Intercorrelations between dependent variables.
For $\bar{r} = +.35$, $\underline{p} = .05$; $\bar{r} = +.26$, $\underline{p} = .10$; for $\bar{r} < +.16$ (3%) are deleted as negligible.
 $\bar{r}^2$ = Average coefficient of determination between dependent variables (as %).
 $\hat{\omega}^2$ = Strength of association between the independent variable and dependent variable (as %).
^aDependent variables I to IX are the same as in Table 1.

Generally, the intercorrelations in this exploratory analysis suggest the operation of systematic conversation-control variables.

Also in Table 2, the column showing the strength of association gives some indication of the relatively useful variables in this study. Measures such as the duration of talking, frequency of long utterances, interruptions and filled pauses are fairly stable indexes while measures such as frequency of short utterances, back-channel responses and sentence disfluencies seem less useful. Undoubtedly, it is not a chance coincidence that the more useful variables here are also those reported in many other studies of conversation analysis. Future investigations of cross-media studies which focus on verbal interaction may uncover other subtler indexes which would be useful when developing more precise definitions of speech interaction changes.

STUDY II

The aim was, as with Study I, to examine the content of a study reported earlier, in this case "Comparing Social Influence and Intersubjectivity in Three Communication Conditions". The three conditions of dyadic interaction were (a) face-to-face (F-F), (b) closed-circuit, audio-video mediated (CCTV), and (c) satellite, audio-video mediated (Satellite). The objective was to explore further the synchronization of face-to-face versus mediated discussion interactions with particular attention given to the relationship between verbal and nonverbal cues. Because a .25 second delay occurred between transmission and reception times in the Satellite condition, it was thought that the greatest synchronization problems would be evident in this condition. F-F interactions were expected to be more synchronized than those of CCTV. It was believed that this content analysis might help to diagnose the operation of intervening factors which contributed to the null result of social influence reported earlier. Most particularly, differences arising from the two subject populations were sought. Finally, as a more general objective, it was hoped that the utility of various dependent variables for this type of content analysis might be demonstrated and that systematic relationships between variables might be explored.

Method

This section is the same as that reported in the earlier study entitled

"Comparing Social Influence and Intersubjectivity in Three Communication Conditions". Coding procedures similar to those reported in Study I of this investigation were employed.

Results and Discussion

Indexes of verbal and paraverbal behaviour. Table 3 shows that for speech indexes, there are no significant differences between the three groups. The analyses of variance produced clearly nonsignificant results on the indexes of duration of talking, interruptions, back-channel responses, filled pauses and sentence disfluencies. Of course, this is not interpreted as suggesting that there are no differences along these dimensions but rather that no differences have been demonstrated. Likewise for the nonverbal indexes, there is little to suggest the operation of systematic differences between experimental conditions (see Table 4). There is, however, reliably greater frequency of gaze in the mediated conditions than in face-to-face and this was as expected ($F = 6.94, p = .01$). In F-F dyads, the average gaze frequency is 150.9 times per session; in CCTV dyads, the average is 246.2 and in the Satellite dyads, it is 250.6. Gaze frequency may emphasize an informational function of visual contact while gaze duration may emphasize a social function (i.e., affiliative balance). Note that the latter variable does not produce a systematic difference ($F < 1$). A significant difference in frequency of hand and arm gestures is found to exist in the direction predicted ($F = 5.88, p = .01$); more frequent gestures were made in face-to-face interactions (mean of 95.9) than in mediated interactions (mean of 56.1 in CCTV and 54.4 in Satellite).

Insert Table 3 and 4 about here

Intercorrelations between dependent variables. With so few significant results, it seems unnecessary to report in detail a correlation matrix of dependent measures. However, certain correlations seem worthy of comment. In this study, a correlation of .47 is significant ($p = .05$). The dependent variable of gaze frequency produces moderately high correlations with gaze duration (.41), interruptions (.42), sentence disfluencies (.46) and a negative correlation with smiles reciprocated (-.43). Gaze duration produces a high

Table 3

Indexes of Verbal and Paraverbal Behaviour: Study II

Dependent Variable	Face-to-Face		CCTV		Satellite		F Ratio
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s	
Duration of Talking (%)	76.0	17.0	88.0	7.0	74.0	20.0	1.72 (NS)
Interruptions	14.0	10.6	17.4	10.5	9.3	6.4	1.55 (NS)
Back-Channel	14.0	12.4	13.6	12.6	7.3	5.5	<1 (NS)
Filled Pauses	54.7	27.9	75.3	22.4	85.5	33.2	2.07 (NS)
Sentence Disfluencies	49.8	31.1	37.6	18.8	41.9	23.4	<1 (NS)

$\bar{X}$ = Mean.
s = Standard deviation.

Table 4
Indexes of Nonverbal Behaviour: Study II

Dependent Variable		Face-to-Face		CCTV		Satellite		F Ratio	p
		$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s		
Gaze	Freq.	150.9	21.8	246.2	65.2	250.6	59.6	6.94	.01
	Dur.	139.6	39.4	114.5	36.7	128.1	40.3	<1	NS
Smiles	Freq.	22.2	16.9	26.6	13.4	34.4	14.4	1.27	NS
	% M	11.9	10.4	31.4	31.0	31.9	13.9	1.59	NS
	% NR	49.9	51.5	23.3	18.9	20.5	12.6	1.94	NS
Head Moves	Freq.	19.1	13.9	24.0	16.1	27.5	9.2	<1	NS
	% H	69.5	36.1	70.0	24.2	69.9	17.6	<1	NS
Gestures	Freq.	95.9	27.6	56.1	24.9	54.4	22.6	5.88	.01
	% H	68.1	14.2	64.5	33.7	61.1	27.7	<1	NS
Posture	Freq.	68.1	30.1	75.9	23.7	51.7	31.9	1.40	NS
	% H	65.5	10.9	53.6	28.4	56.2	21.3	<1	NS
Total NVC	Freq.	202.8	80.8	182.6	29.7	168.1	54.7	<1	NS
	% H	67.6	8.3	59.3	25.5	58.4	21.9	<1	NS

Freq. = Frequency; Dur. = Duration.
% NR = Percentage of smiles not reciprocated
% H = Percentage of nonverbal cues that may have been noticed by other.
% M = Percentage of nonverbal cues that may not have been noticed by other.
NVC = Nonverbal cues.
 $\bar{X}$ = Mean.
s = Standard deviation.

correlation with the overall number of nonverbal cues received (.78); this correlation would seem to make intuitive sense. Sentence disfluencies correlate with the frequency of filled pauses (.58), interruptions (.40) and the percentage of time spent talking (.51). Also evident is the fact that the more communicators speak during the interaction, the more they tend to use filled pauses (.53) and the more they interrupt each other (.48). The number of nonverbal cues transmitted is positively related to the number of interruptions (.42) and the number of interjections (.47). Finally, there is a positive correlation between the number of smiles reciprocated and the number of interjections (.47).

Differences in subject population. To perform a diagnostic function, secondary analyses are performed on the dependent variables reported in Tables 3 and 4. This is done in a way which compared the behaviours of the Canadian and American students when they interacted with each other and further analyses are performed on each subject population separately, interacting with members of their own culture. On the duration of talking index, Canadian students in the Satellite condition speak approximately 25% more than do American students ($F = 3.95$, $p = .07$). The Canadians seem to monopolize the conversations and further evidence of this is seen in the significant difference when contrasting the amount of talking time by Americans when face-to-face with each other and when they used the satellite. There is approximately a 15% increase in F-F over Satellite ($F = 7.27$, $p = .02$). Canadian students smile twice as often in the Satellite condition as they do in the CCTV condition ($F = 8.16$, $p = .01$). The behaviour seems to have been contagious because the American students also smiled approximately twice as often in the Satellite condition than in F-F ($F = 3.78$, $p = .08$). There is a clearly nonsignificant difference in the amount of smiling by Canadians and Americans over the satellite ($F = 1.23$, NS). One further marginally significant difference is found in the frequency of gestures evident in the Satellite condition. It seems that the American students gestured almost twice as often as the Canadian students ($F = 3.02$, $p = .10$).

Generally, far fewer significant differences were found in this study than were expected. Perhaps this was due to the fact that it was a quasi-experiment

and it was impossible to randomly assign subjects to experimental conditions. A visual inspection of the videotapes of the Satellite condition revealed that there seemed to be about a two year age difference between the American and Canadian students; the former being slightly younger. This may be why the American students appeared less at ease and were less active during their interactions over the satellite. Clearly, there was excessive error variance which obliterated any significant differences in dependent measures.

Conclusion

In summary, the two content analyses revealed several media-related differences when face-to-face and audio-video mediated interactions were compared. There were more utterances of long duration, a greater proportion of time spent talking and more gestures exchanged among face-to-face communicators. Mediated interactions were characterized by increased levels of gaze and relative infrequency of interruptions. A negative relationship between filled pauses and interruptions was found. Dependent variables which proved most useful in the present analyses were those which have recurred in past cross-media studies; these included indexes of talking, interpersonal gaze, interruptions, filled pauses, ritualized speech and the non-verbal cue of gestures. Suggestive systematic correlations between many of the dependent variables examined here would seem to encourage further, more powerful content analyses.

Nevertheless, the present content analyses represent a substantial investment of research effort with relatively little return in the form of substantive evidence. These investigations began from what seemed to be sound theoretical frameworks and were not "guided by a sheer fascination with counting" (Cartwright, 1953). But like many studies before it, this investigation has found media differences to be quite elusive. It is acknowledged that quasi-experiments may not offer sufficient control to perform such in-depth probing of a system of factors. There was strong evidence that a population sampling artifact may have contributed to the overwhelming error variance.

Many of the dependent variables might be assessed more precisely in

future with assistance from some of the same high-powered video technology presently under investigation. Computers may eventually be able to recognize speech and it would then seem a simple matter to produce transcribed text of verbal behaviour with parallel records (coded in both time and location) of various other events of communicative significance. At this time, it is possible to electronically mark tones on an unused audio track of a videotape thus providing a coordinated and adaptable event recorder which can more closely link the verbal, paraverbal and nonverbal outputs. Psychological stress analysers may be used to complement the other techniques used to detect anxiety in speech. Computer techniques for measuring activity change in a video image may help to quantify objectively movement and gestures, perhaps even to the point of detecting changes in facial expression.

If steps are taken to control precisely measurement of dependent variables, it would seem logical to use the same rigorous control when setting out procedures for independent variables. This should include selection of experimental tasks which have a high degree of realism for the communicators. If possible, a genuine communication problem task should be employed; one which would permit participants to interact (face-to-face and mediated) for an indeterminate number of sessions making the start and finish of the experiment not apparent. As a final suggestion, it seems that the use of theoretical frameworks to guide methodology and selection of dependent variables offers greatest hope for productive content analyses. A multidimensional approach which takes into account a complex system of verbal, paraverbal and nonverbal behaviours would seem to be a viable route to a more complete understanding of mediated communication.

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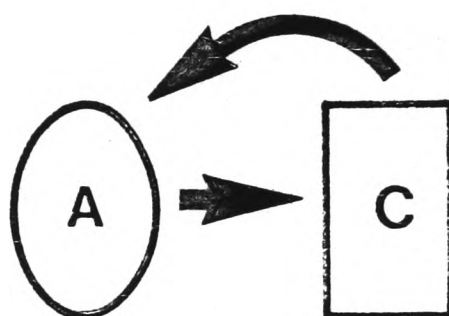
Chapter Six

Focus Upon Self During Mediated Communication

It is unfortunate that the nature of self consciousness, especially its determinants, has been given light treatment, for a theoretical understanding of the phenomenon could lead to a more complete understanding of behavior in general. We place such emphasis on self consciousness because of our belief that awareness of the self as an object acts as a feedback system which forces the individual to alter aspects of himself in the direction of his conception of what a correct person should be. When self consciousness is viewed from this perspective, the person's awareness of himself must figure into any ongoing behavior. The self conscious person responds not only to external stimuli, but also to himself as a stimulus.

(Duval & Wicklund, 1972, p. ix)

Video-mediated interaction can provide a unique opportunity for A to perceive self as B would normally perceive A. In typical face-to-face, two-way interaction, the majority of A's time is spent in outward-directed attention towards B. The presence of a video camera and/or a self-reference monitor can place greater emphasis upon self than is usual in social interactions. This type of self-feedback may have the consequence of evoking negative self-evaluation, disrupting outward communication or avoiding the eliciting circumstance.



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A Demonstration of Age-Related Differences in the Preference to Teleconference

Abstract

This field study attempted to demonstrate an age-related difference in the preference to use a teleconference system. Visitors to a faculty of engineering's open house were classified into four age categories: (I) elementary school, (II) secondary school, (III) university and junior career, and (IV) middle and senior career. The frequency and duration of teleconference system use were found to decrease across the four categories. The compatibility of these results with Duval and Wicklund's theory of objective self-awareness was considered.

Users of audio-video teleconference systems enjoy the experience in varying degrees. Previous studies have shown that for some participants self-focused attention generates decidedly negative reactions. Individual differences in preference to teleconference have been observed by other researchers. Barefoot (1975) has stated that "among users of our teleconference facilities, few topics are as provocative as the question of self-monitoring....Some users make no comment on the presence of the self-monitoring capability; others have commented extensively with some declaring it to be personally devastating" (pp. 70-71).

During the demonstration of an audio-video teleconference system, the present author observed informally that young people typically showed more enthusiasm for teleconferencing than did middle-aged people. In fact, the latter often showed reserve and even aversion towards the experience. In the present study, the aim was to demonstrate an age-related preference to teleconference. Although it was beyond the scope of this demonstration to test theoretical explanations for age-related preference, an attempt was made to show its conceptual compatibility with Duval and Wicklund's theory of objective self-awareness (OSA).

If an ideal self-image is challenged by the kind of self-awareness that is elicited through video feedback, individuals may want to avoid such circumstances. Wicklund (1975) has suggested that "discrepancies between aspiration and attainment were assumed to be negative in general--across virtually all people and all traits--with the consequence that self-focused attention was postulated to be an aversive condition" (p. 235). In the same paper, he reported that increased salience of discrepancies can make the experience of OSA more aversive. It may be that with age, people become more aware of the discrepancies between an ideal self and observed self, and the discrepancies may become greater.

Developmental aspects of OSA remain relatively unexplored. However, Duval and Wicklund (1972) have contended that awareness of self as object is a learned consciousness: "...the possibility of objective self awareness is contingent upon a special type of encounter with the environment in which

the child learns that his casual agent self is a bounded unit, that is, an object. Until such a recognition, the child's immersion in the self precludes the possibility of self-focused attention" (pp. 37-38). This suggests that children should not be affected by OSA eliciting circumstances such as an audio-video teleconference system. It is thought that in late childhood or young adulthood the object status of self becomes appreciated. With age, this appreciation can become a source of undesirable information; an ideal self-image can be disillusioned by encounters with objective self. While the former may become well-defined and aggrandized, the latter often reveals its compromises (e.g., commonly remarked upon is evidence of aging or perceived underachievement in task performance).

User impact studies have provided evidence that senior and high-status persons (e.g., business executives, senior civil servants and military leaders) are often reluctant to use audio-video teleconference systems in their professional capacities. They have often expressed a preference for face-to-face meetings even when teleconferencing would relieve them of considerable travel (see Christie, 1974; Christie & Holloway, 1975; Sinaiko, 1974; Wish, 1975). Undoubtedly, the evaluations offered by these users reflect careful assessments of the match between teleconference capabilities and professional needs. Nevertheless, it is possible that reactions have been amplified or complicated by a more fundamental aversion to OSA evoking circumstances.

In the above-mentioned studies, it has typically been senior persons whose opinions have been consulted. As pointed out by Williams (1977), such studies "...endeavoured to use tasks, media and subjects that corresponded as closely as possible to the present or likely future real world use of telecommunications" (p. 973). Yet, if hypersensitivity to the OSA experience could account for some of the resistance shown by these users, it may be of consequence for designers and evaluators of teleconference systems.

The opportunity to demonstrate an age-related preference to teleconference emerged during a research project display in the Faculty of Engineering at Carleton University, Ottawa. Among the open house displays was the audio-video teleconference system of the Wired City Laboratory. Visitors to the open house were observed and classified according to

approximate age. This classification was repeated for those persons who elected to use the teleconference system. The amount of time each visitor spent using the teleconference system might be indicative of preference for the experience.

Hypothesis

It was predicted that an age-related difference would be demonstrated in the proportion of visitors in various age groups to use the teleconference system, and a similar differential in the amount of time that each group remained at the teleconference nodes. Both indexes were expected to bear negative linear relationships with age.

Method

Subjects

The participants in this field study were members of the Ottawa public who visited an open house and research project display at the Faculty of Engineering at Carleton University. In total, 570 males and 280 females visited the communication display in approximately five hours during which time the study was conducted. The majority of these 850 visitors were not familiar with such a teleconference system.

Procedure

In order to assess the approximate ages of visitors to the communication display, a predetermined four-category classification (as shown in Table 1) was employed. An assistant, who was blind to the hypothesis under investigation, stood near the entrance to the display and classified the visitors. Since the flow of pedestrian traffic was in one direction, it simplified the procedure. Visitors were unaware of any systematic observation. Signs invited the public to make use of three teleconference nodes. It was explained that this person-to-person communication system permitted three-way interaction using audio and video channels. In the five-hour period during which visitors were observed, users of the teleconference system were videotaped.

Insert Table 1 about here

Table 1

Predefined Visitor Categories
with Approximate Age Ranges

Group Number	Age Category	Approximate Range of Age
I	Elementary School	5 to 11
II	Secondary School	12 to 17
III	University and Junior Career	18 to 35
IV	Middle and Senior Career	36 to 65

Later, the videotapes were replayed and the assistant classified the users in a manner similar to the one he had used earlier with the live population.

Many visitors came in groups of two to four persons; some appeared to be members of the same family. There was no evidence of large groups such as classes of students visiting the communication display during the study. It would be difficult to argue successfully that each subject provided an independent observation of the phenomenon under investigation. However, when attempts were made to identify biasing influences which might have systematically determined visitors' use of the teleconference system, such forces were not apparent.

Results

As predicted, the ratio of users to visitors decreased with age. A test of difference among proportions (Freund, 1962) reveals that this ratio is not the same in each category (see Table 2). The highest ratio of users to visitors is found in the elementary school category with 38%, followed by the secondary school category with 22.5%. In the two senior groups, the university and junior career category has a user to visitor ratio of 11%, nearly twice that of the middle and senior category which has only 6%; these proportions are not the same ($\chi^2 = 3.14, p = .06$). Although a linear relationship was expected, a goodness-of-fit test reveals that an exponential relationship best describes this curve ($\chi^2 = 2.50, df = 3, p = .18$). Data points used to test this relationship, depicted graphically in Figure 1, were determined by estimating the ages of users from the videotapes to provide an approximate mean age for each category.

Insert Table 2 and Figure 1 about here

Among the teleconference users, the duration of time spent at a node is also found to decrease with age (see Table 3). Analysis of variance reveals that the categories differed significantly on the duration index ($F = 5.46, p < .002$). Multiple comparisons establish that the users in the secondary school category spent more time teleconferencing (with an average of 4.03

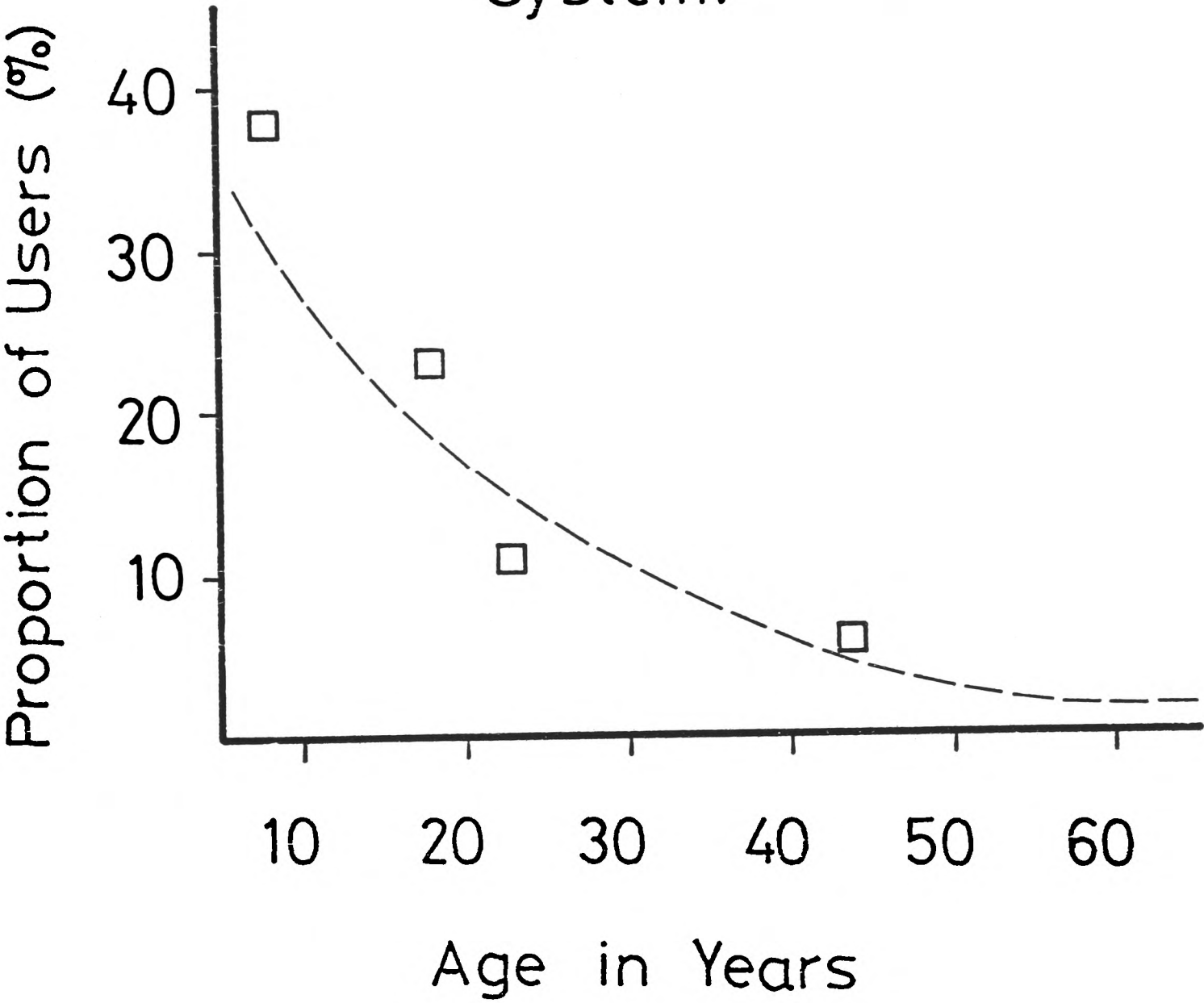
Table 2

Differences Among Proportions of
Teleconference Users by Age Category

Age Category	Number of Users	Number of Visitors	Proportion of Users Visitors (%) ^a
Elementary School	52	165	38
Secondary School	23	95	22.5
University and Junior Career	39	360	11
Middle and Senior Career	15	230	6

^a A test of differences among proportions shows that the categories are not the same ($\chi^2 = 58.90$, $df = 3$, exceeds critical value $\chi^2 = 7.82$, $p = .05$).

Figure 1. Visitors Who Used Teleconference System.



minutes) than did users in the elementary school category (with an average time of 3.11 minutes), a difference which is statistically reliable ($p < .05$). Users in the two school categories spent reliably more time at the nodes than did those in either the university and junior career category (with an average time of 1.88 minutes) or the middle and senior career category (with an average time of 1.33 minutes). On this index, the latter two categories did not differ significantly. The departure from linearity across all four categories, as shown in Figure 2, is due to the fact that secondary school users spent longer at the nodes than did elementary school users.

Insert Table 3 and Figure 2 about here

In order to make salient an overall difference between visitors in the two senior categories, a further index of preference might be considered which would deal with the frequency and duration variables together. In each category, the average time per visitor spent teleconferencing was (I) 58.8 seconds, (II) 58.8 seconds, (III) 13.8 seconds, and (IV) 5.4 seconds. According to this derived preference index, the university and junior career category teleconferenced 2.56 times more than did the middle and senior career category. The briefer durations may have been influenced by a "floor effect"; that is, a decision to sit down at a teleconference node may tacitly necessitate remaining there for a minimum amount of time.

The time spent at the three nodes totalled to just under five hours. This indicates that about one-third of teleconference time available was actually utilized. Visitors appeared to have ample time to use the system if they so desired.

Discussion

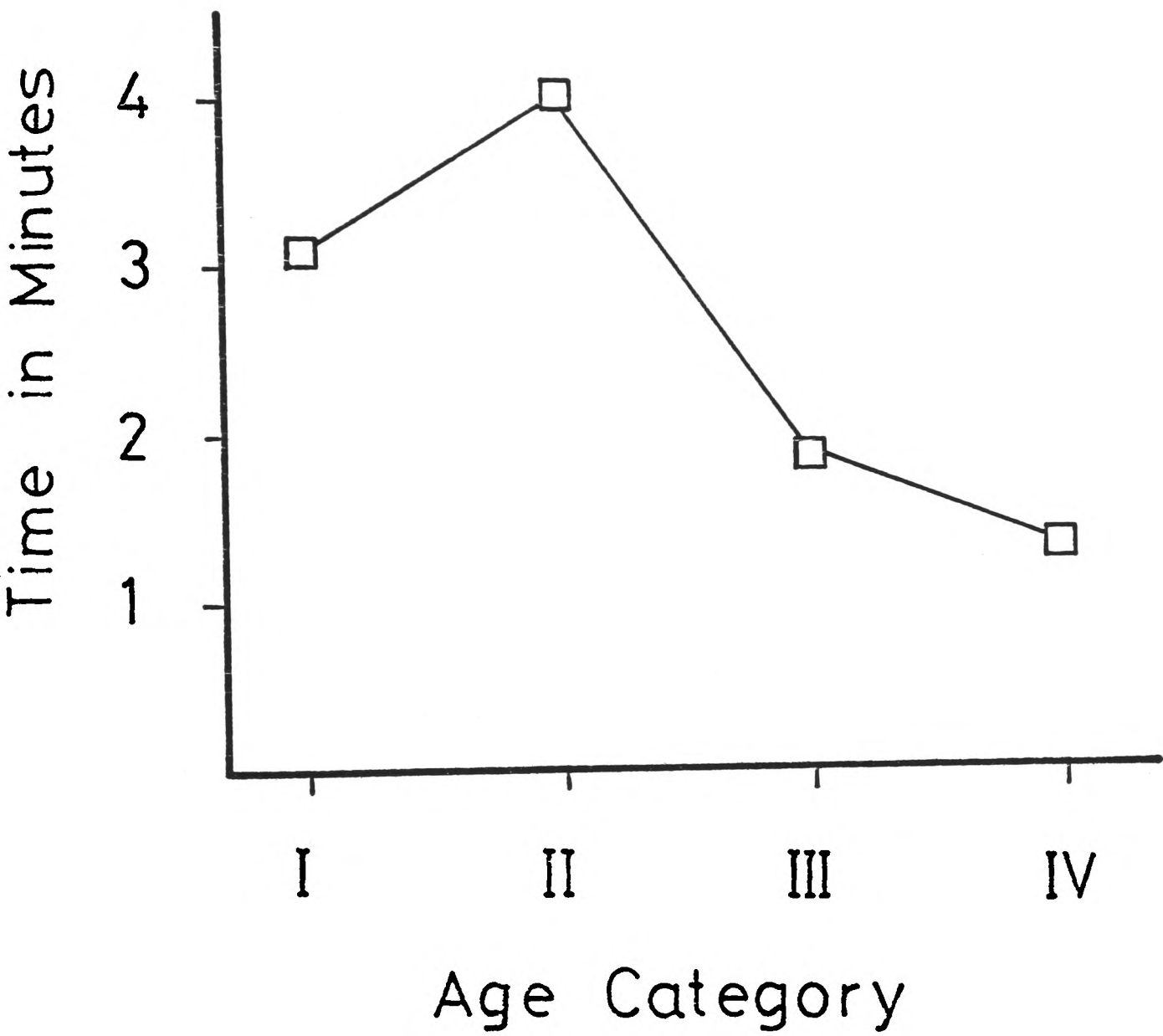
As predicted, an age-related difference in the preference to use a teleconference system has been demonstrated. It was observed that the proportion of visitors who used the audio-video teleconference system decreased significantly across the four age categories which spanned elementary age to retirement age. Moreover, users showed an age-related difference in the amount of time spent teleconferencing. The users in the secondary school

Table 3
Differences Among Categories in Time
Spent Using Teleconference System

Group Number	Age Category	Mean Time (Minutes)	Standard Deviation
I	Elementary School	3.11	2.69
II	Secondary School	4.03	3.41
III	University and Junior Career	1.88	2.04
IV	Middle and Senior Career	1.33	0.82

ANOVA: $F = 5.46$, $df = 3.125$, $p < .002$.
Multiple comparisons using t tests at $p < .05/2$:
 $I \neq II, III, IV$; $II \neq III, IV$.

Figure 2. Time Spent in Teleconference.



I = 5 to 11 years
II = 12 to 17 years
III = 18 to 35 years
IV = 36 to 65 years

category teleconferenced longer than did those in the elementary school category and, although this deviated from the predicted negative linear relationship between preference and age, users in the two school categories teleconferenced reliably longer than did users in the two senior categories. The teleconferencing time per visitor in the university and junior career category was more than twice that per visitor in the middle and senior career category lending further support to the hypothesis. Consecutive age categories in this study produced at least one dimension of difference.

The theory of objective self-awareness would seem to predict results similar to the findings of this study. Television cameras and self-reference monitors can evoke states of OSA (Davis & Brock, 1974; Duval, 1976; Vallacher, 1978; Wicklund, 1975). People learn to experience OSA and, because it points out personal failings, the experience is typically aversive. The greater the discrepancy between an ideal self and observed self, the greater the aversion; hence, the more pronounced should be the reactions of avoidance or escape. The exception to this seems to be that children do not appreciate an objective self and thus should not find self-focused attention uncomfortable (Duval & Wicklund, 1972).

Two possible explanations for why secondary school visitors spent more time using the facility than did elementary school visitors are considered. First, some younger children may have teleconferenced with their parents who, being sensitive to OSA, did not wish to prolong the experience. No doubt, this was a mutual influence whereby some adults would have been encouraged by their children to use the facility. Such biasing factors were neither estimated nor controlled for in this demonstration.

Secondly, it may be during secondary school years that awareness of self as object develops and perhaps any opportunity to extend self-knowledge is welcomed. To teenagers, video feedback may be complimentary, exceeding personal expectations. In a revised theoretical statement of OSA, Wicklund found it necessary to recognize the concept of positive discrepancy by which self-focused attention might lead to self-appreciation. "When a person's behavior, or real self, exceeds his aspirations, the resulting positive discrepancy plus focused attention will produce a positive affect"

(Wicklund, 1975, p. 245).

In later life, when negative OSA reactions predominate, individuals detect discrepancies between their ideal selves and observed selves if they monitor personal communication styles, mannerisms, receding hairlines, facial wrinkles, etc. Reduced teleconferencing activity among visitors in the two senior categories may reflect attempts to avoid or escape from self-focused attention. Although this study was unable to demonstrate reliable differences between the senior categories, the direction of difference was predicted. Controlled investigations might detect more subtle differences in OSA sensitivity. To this end, precise age classification and additional means of measuring reactions to self-monitoring might prove useful.

The main significance of this study for teleconferencing would seem to lie in the suggestion that potential users, particularly senior individuals, may have fundamental aversions to the experience of self-focused attention. It is unlikely that the reduction in frequency and duration of teleconference use demonstrated here was intended to imply evaluative criticism of the facility. Yet, OSA reactions may influence both evaluations and use of video-based teleconference systems. To minimize the effect of this phenomenon, it may be necessary to pursue social psychological (e.g., exploring possibilities for management of or adaptation to OSA), and technological solutions (e.g., developing systems which minimize OSA). The effect of self-focused attention on communication processes should not be underestimated.

Acknowledgement

I wish to acknowledge the assistance of Mr. Brian Bourque who classified the visitors according to age categories.

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Video Feedback and Self-Assessment of Communication Effectiveness

Abstract

Two studies attempted to demonstrate a negative shift in self-assessment of communication task performance following video feedback. Both studies found that subjects typically perceived their task performances to be below their expectations of effectiveness. There was the suggestion that this reduced effectiveness was more personal than media-related (Study I), and that it was more of an enduring disability than a temporary one (Study II). Also, in the second study, personal performance was rated lower than peer performance of the same task. It seems likely that most video-based teleconference systems can evoke states of objective self-awareness among users and, in addition, many systems provide video feedback with the use of self-reference monitors. Experiences of self-focused attention, video feedback and subsequent negative self-attributions may bring about a reluctance to use teleconference systems.

Evidence concerning the nature and consequences of self-focused attention, also referred to as objective self-awareness (OSA) continues to grow (Duval, 1976; Duval & Wicklund, 1972; Wicklund, 1975). According to the predictions of OSA theory, persons attempt to avoid or to escape from circumstances of self-focused attention. The OSA state is thought to elicit self-evaluation, and the usual result is negative self-assessment. This would appear to arise from discrepancy between an ideal self and observed self. Consequently, a person may attempt to (a) reduce the discrepancy, (b) escape from the self-focusing circumstance, or (c) distract attention away from self in some way.

It has been demonstrated that when a video camera is trained on a person an OSA state can result (e.g., Davis & Brock, 1974; Duval, 1976; Vallacher, 1978). For video-based telecommunications, the implications of such findings seem clear. If a video camera elicits OSA during a two-way mediated interaction, a communicator may experience more than the usual amount of concern for self. This may be accentuated by the availability of feedback from a self-reference monitor. Assuming that under such circumstances the self is negatively evaluated (see Wicklund, 1975, p. 238), it is conceivable that (a) communication would be disrupted, (b) communicators may attempt to escape from mediated communication circumstances, or (c) they may avoid such circumstances in future (see Sinaiko, 1974).

The purpose of the following two studies was to demonstrate that following video feedback, typical self-assessments are negative or less positive when compared with expectations about personal effectiveness. Such an attributional mechanism would seem central to an OSA interpretation of aversive reactions to video-mediated communications. If communicators were pleased or satisfied with personal effectiveness, their use of video-based communication systems might be reinforced. However, displeasing self-assessments might well render these experiences punishing.

Research founded upon attribution theory may contribute another perspective to the present studies. Jones and Nisbett (1972) reported that actors showed a tendency to attribute their actions to situational or external

factors while observers tended to make attributions that emphasized enduring personal or internal characteristics. Of particular significance here is Storms's (1973) report that, following video feedback of self, actors made increased dispositional or internal attributions when accounting for their own behaviour. Reviewing literature that reported the use of video as a feedback tool in therapy and t-group situations, Storms concluded that there were some constructive but also some destructive consequences of this attributional shift. Self-observation through video feedback can bring about underestimation of genuine situational determinants of life circumstances and perhaps undermine self-esteem. Some further empirical and theoretical complexities of actor-observer attribution differences have been considered in recent papers by Arkin and Duval (1975), and Monson and Snyder (1977).

In the present studies, it was believed that attribution theory would complement the predictions of the OSA paradigm. The central aim was to demonstrate salience of personal responsibility for ineffectiveness at the exclusion of extrapersonal factors. To this end, OSA was preferred as the primary paradigm for three reasons. First, it seemed to predict a necessary discrepancy between an ideal self and perceived self. Secondly, the consequences of such a discrepancy, which might take the form of disrupted communication, escape or avoidance, might be examined in subsequent studies. Thirdly, it seemed to be sufficient when accounting for certain complex socio-technological influences, including theoretical assertions of self-attribution (see Arkin & Duval, 1975).

STUDY I

This study attempted to demonstrate a negative shift in self-assessment of communication task performance following video feedback. But, what might constitute evidence of negative self-assessment under such circumstances? Comparisons of self-ratings before and after video feedback could be one source. A negative shift in these ratings may indicate some degree of dissatisfaction with personal performance. More precisely, prefeedback expectations about personal effectiveness in a mediated communication task may be reflected in the initial ratings. Then, following an experience of

negative discrepancy between expectation and perception, a negative assessment of self may be apparent in second ratings. However, sometimes rating differences in pre- and posttest comparisons can be confounded by statistical regression artifact. Therefore, an additional form of evidence would be desirable.

Literature on interpersonal evaluations may contribute another approach. If after seeing their own performances subjects were to rate a peer's effectiveness at the same task, one might infer the nature of self-perceptions from these peer ratings. It has been shown that persons induced to anticipate low self-appraisals of ability tend to give more positive evaluations to peers from whom negative assessments seem imminent (see Jones & Pines, 1968; Jones & Ratner, 1967). Thus, video-mediated communicators having first offered self-effacing reactions to their own video performances might be expected to give more positive ratings to peers. It bears repeating that this outcome would be expected if communicators believed that negative evaluations from peers were inevitable.

To employ these sources of information a consistent order of three ratings for all subjects could be maintained, thus creating the following experimental manipulations. First, following the communication task but before video feedback communicators could offer ratings reflecting how effective they thought their own performances had been. Secondly, after video feedback they could again offer self-assessments which one would expect to be more negative than the first. Thirdly, influenced by their negative self-assessments communicators could view and then rate the effectiveness of a peer's performance with the understanding that their own performances would be similarly scrutinized.

Hypotheses

Following video feedback of their own performances of a communication task, subjects were expected to offer more negative ratings of their performances than the ratings which they offered prior to video feedback. Subjects were expected to rate the performance of an evaluating peer more positively than they had rated themselves. A further aim was to explore the notion that subjects would accept personal responsibility for their perceived

ineffectiveness in the performance of the communication task and not shift the blame to some aspect of the medium or video recording itself.

Method

Subjects

Thirty undergraduates (15 males and 15 females) of Carleton University, Ottawa volunteered to take part in this study. For their participation they received \$1.00 and course credit in Introductory Psychology.

Procedure

Subjects participated individually in a communication study held in the Wired City Laboratory at Carleton University, a facility which provided audio-video communication between up to four persons. At the laboratory, the subject was seated at one communication node and the experimenter at another. Before the session commenced, the two-way interactive capabilities of the system were demonstrated. Each subject was asked to role play the part of a television newscaster and attempt to deliver a news report as if to a viewing audience. In order that the experimenter's reaction to the delivery could not influence the subject's ratings, the video monitor showing the experimenter was switched off. At the same time, a monitor displaying the news report was switched on. It functioned like a "teleprompter" from which the subject read aloud the following:

A Sweepstakes win proved too much for a Burlington, Ontario woman who collapsed Saturday and had to be treated by a doctor after she was told that she had won \$115,000 with an Irish Sweepstakes ticket. Shirley Labuda's home was sheer pandemonium after the family received news of the windfall. Said a family friend, "She doesn't have any idea about what she is going to do with the money. At the moment we're trying to calm her down."

And in Dudley, England, a court was told how a jealous husband constructed a springboard

who took care to explain that it was typical for self-evaluation to be lowered following video feedback.

Data Analysis

Rating scale responses ranging from 1 to 9 were analysed using a matched t -test method to test a priori predictions. It may not seem sufficiently conservative to treat the data in this way as there would be little protection against pyramiding probabilities when performing multiple t tests. This may not be as risky as it appears, however, since with replications six analyses were used to test two basic hypotheses. Necessary assumptions were not met for appropriate use of analysis of variance.

Results and Discussion

As expected, there is an apparent shift towards more negative self-evaluation following video feedback. When all subjects are considered at once, there is a significant decline in the positiveness of the ratings for Question I ($t = 3.29$, $p = .003$). Similarly, for Question II, there is a decline in the self-ratings which is marginally significant ($t = 1.92$, $p = .07$). However, neither of these variables showed the expected positive increase in ratings when the peers' performances were judged.

Internal analyses reveal that the significant difference between the self-ratings on Question I is largely due to the female subjects ($t = 2.67$, $p = .02$) as opposed to the males ($t = 1.91$, $p = .07$). However, the difference found in the self-ratings on Question II is largely due to the male subjects ($t = 2.09$, $p = .05$), and not the females ($t = .05$, NS). Perhaps this reflects a sex difference in dispositional versus situational attribution processes under such circumstances.

It may be worth noting that, possibly related to the distinction between dispositional and situational attribution, there appears to be a systematic tendency towards more positive ratings being given to the question of "tape segment effectiveness" than to the question of "personal effectiveness" (see Figure 1). Considering both sexes together, in the initial ratings prior to video feedback, the tape segment ratings are more positive than the personal ratings ($t = 2.55$, $p = .02$), a difference largely due to the female subjects ($t = 2.61$, $p = .02$) rather than the male subjects ($t = 1.17$, NS). The post-

feedback ratings show a similar effect with the males only ($t = 3.17, p = .01$).

Insert Figure 1 about here

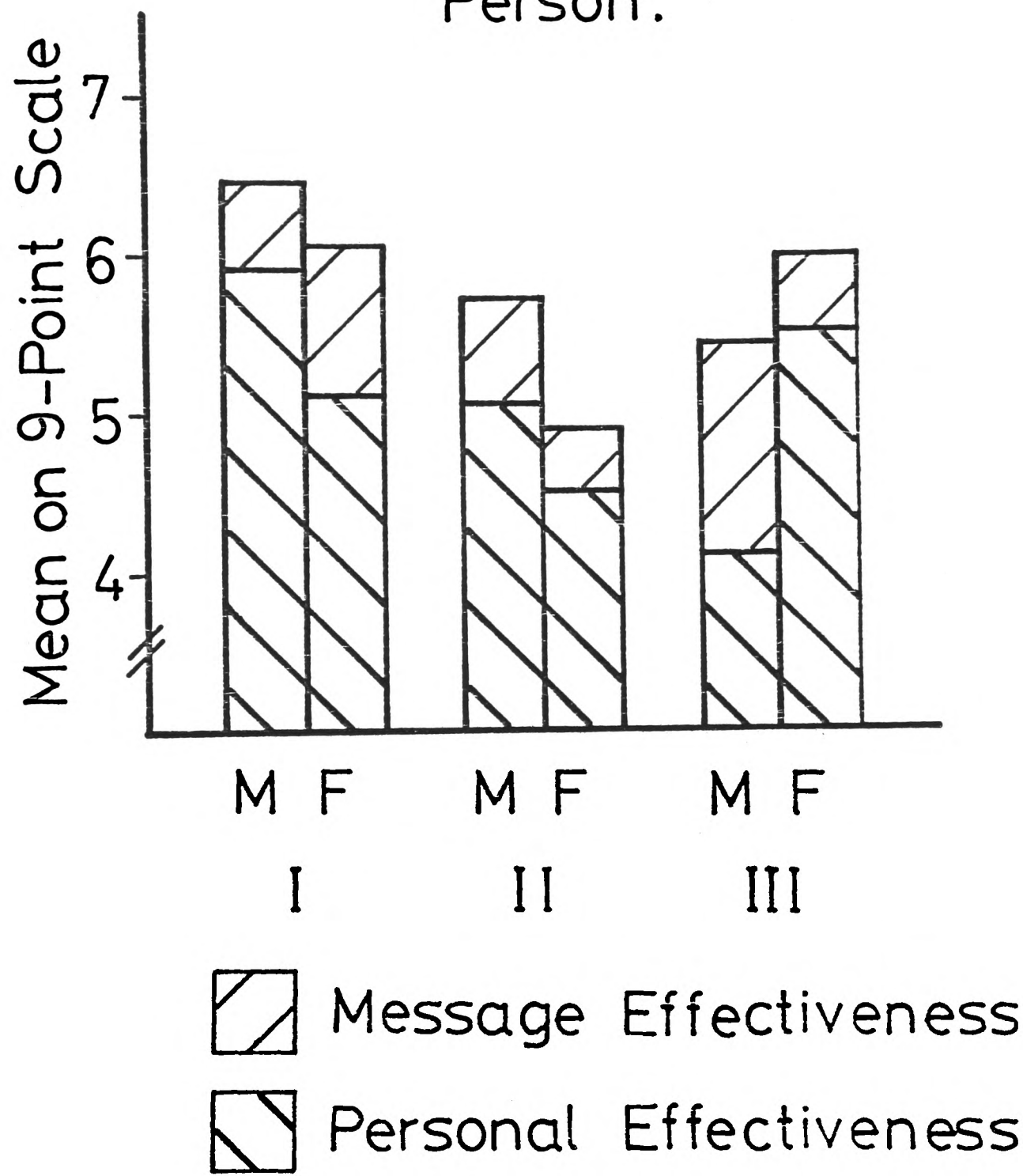
In the peer ratings, again the combined sex ratings for tape segment effectiveness exceed those of personal effectiveness ($t = 4.51, p < .01$). This is true for the males ($t = 4.39, p < .01$), and for the females ($t = 2.17, p = .04$). In a conservative interpretation of these results, it appears that subjects showed a tendency to accept responsibility for their perceived ineffectiveness rather than blaming media factors. It is acknowledged that cautious interpretation of these results is necessary; while the question responses were offered using similar rating scales, these variables might be considered to be separate and not comparable dependent measures. Further verification of this possible attribution difference is needed.

In summary, support was found for the hypothesis that negative self-evaluations follow video feedback. Initial self-assessments were reliably more positive than those offered following replay of the subjects' own performances. However, subjects did not rate a peer's videotape performance as being superior to their own. Perhaps it was not made sufficiently clear that subject's own performance would subsequently be evaluated by a peer and, therefore, the evaluative mechanism may have failed to operate in the manner described by Jones and Pines (1968), and Jones and Ratner (1967). If the mutual evaluation process had been made explicit enough, subjects might have produced evaluations consistent with those expected from peers, namely, self lower than the peer.

STUDY II

The previous study reported some support for the notion that assessment of one's own performance of a communication task can be lowered by video feedback. Communicators did not perceive their own performances to be as effective as their prefeedback expectations. When provided with an opportunity to attribute their weak performances to situational factors,

Figure 1. Assessments of Message and Person.



I = Self Live M = Males
II = Self Tape F = Females
III = Peer Tape

communicators preferred to ascribe at least as much responsibility to themselves.

Recall that in the above study, it was expected that subjects would evaluate a videotape performance of a same-sex peer more positively than they would their own performances; however, this result did not emerge. It was thought to be essential that subjects should anticipate that their own performances would be evaluated by a peer, otherwise positive evaluations may not be given to the peer's performance (Jones & Pines, 1968; Jones & Ratner, 1967). The present study attempted to make the mutual evaluation process more explicit and, again, video feedback was expected to reduce the positiveness of self-assessment.

As yet, there appears to be little evidence to suggest whether one's performance is perceived as being indicative of permanent communication inadequacies or of a temporary failing at a specific communicative act. In Storms's (1973) study which reported that video feedback often exaggerated personal causality over situational causality, it seemed implicit that this tendency was towards enduring or intransient dispositional attribution. Anecdotal evidence too would suggest that video feedback is typically perceived to be unflattering and to reflect a characteristic of enduring ineffectiveness. This speculation was explored in the present study. Communicators were asked to judge videotapes of their own performances of a communication task and that of an opposite-sex peer. These mutual evaluations were made in confidence but in the immediate presence of each other. Under these circumstances, subjects responded to questions of "personal effectiveness" which was thought to be the more enduring attribute, and "apparent ease" which was thought to be the more transient attribute.

Hypotheses

Following video feedback, subjects were expected to show dissatisfaction with the effectiveness of their own performances relative to the perceived effectiveness of an opposite-sex peer's performance. As well, judgments were expected to reflect the perceptions of enduring rather than temporary personal effectiveness.

Method

Subjects

Forty members of the University of Oxford Psychology Department Subject Panel (20 males and 20 females), about an equal number of non-students and undergraduate students, were paid 50 pence per hour for participation in this experiment. Twenty mixed sex dyads made up of persons who were previously unacquainted were formed.

Procedure

During a 16 minute period in which the dyads discussed four human relations problems, each subject was individually videotaped so as to record the head-and-shoulders image and the speech. After the discussion task, each subject was asked to rate confidentially, but in the presence of the partner, his/her own videotape and that of the partner. This was done in the experimental control room where it was possible to show the recordings of the two persons simultaneously. The order in which the subjects judged the videotapes was counterbalanced (i.e., half the time self first, half the time other first).

After viewing a three minute segment from either videotape, the subject was asked to respond confidentially to the following questions:

Question I. How effective was this subject in the performance of the experimental task?

not at all effective _____ : _____ : _____ : _____ : _____ extremely effective

Question II. Did this subject appear to be at ease with the television communication system?

not at all : : : a great deal

This evaluation procedure was repeated for the remaining videotape segment. After the questionnaires were removed, the subjects were debriefed. It was explained that persons often evaluate their own performances very critically following video feedback.

Results and Discussion

As expected, subjects tend to rate the effectiveness of their own performances more negatively than the performance of an opposite-sex peer. This is true for males ($\underline{t} = 4.25, \underline{p} < .001$) and for females ($\underline{t} = 3.87, \underline{p} < .001$). Moreover, ratings of performance received by subjects from their partners are reliably more positive than the ratings given to themselves; again true for males ($\underline{t} = 2.59, \underline{p} = .02$) and females ($\underline{t} = 3.81, \underline{p} < .001$). This is not thought to have been a gesture of modesty. Having made the mutual evaluation process explicit, this study produces results interpretable in the light of previous research findings of Jones and Pines (1968), and Jones and Ratner (1967).

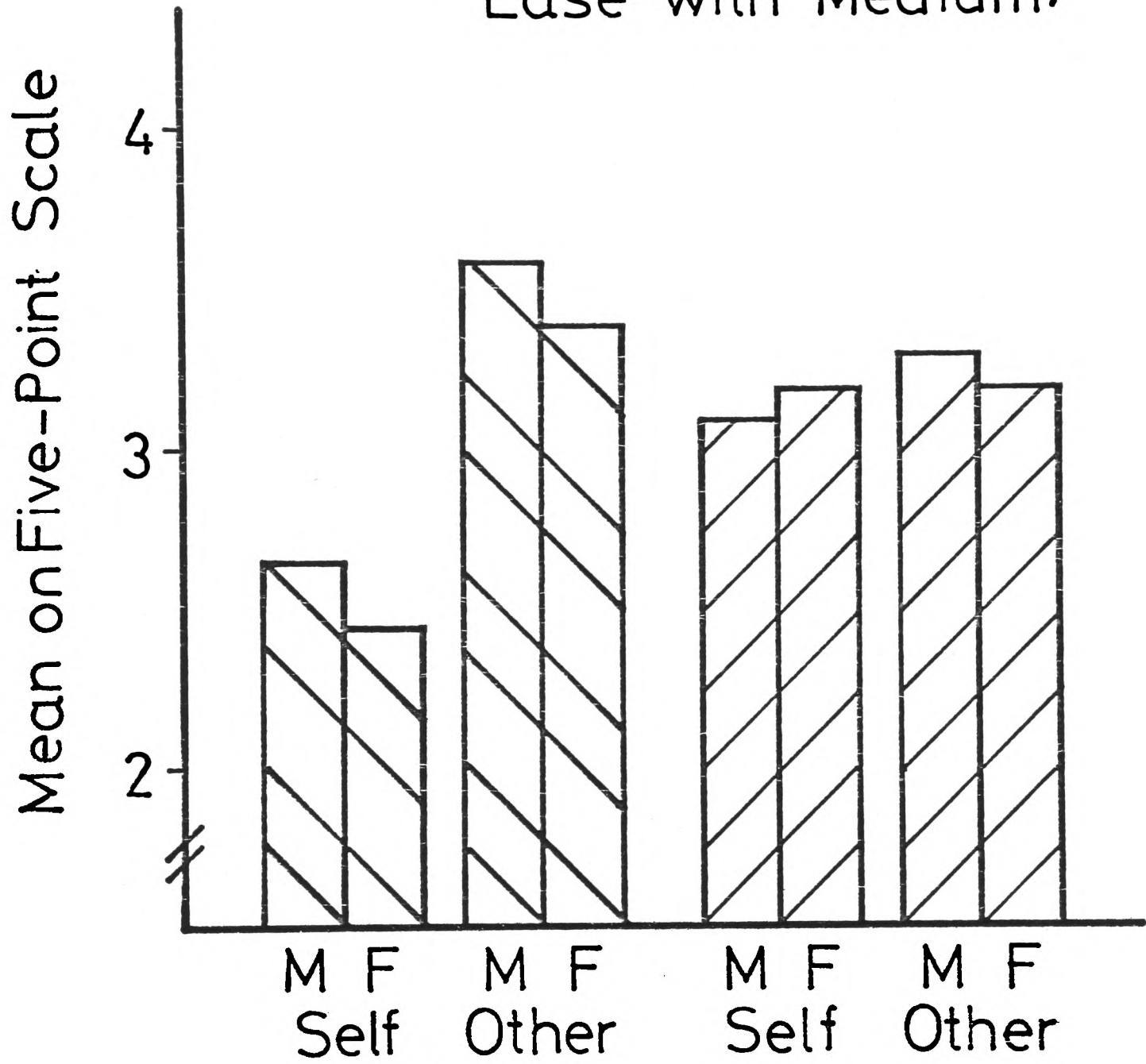
When paired comparisons were conducted on the ratings of apparent ease, not one comparison yielded a significant difference. Figure 1 shows an effect on personal effectiveness which is assumed to be an enduring attribute but no such effect is evident on apparent ease which is assumed to be a transient attribute.

Insert Figure 2 about here

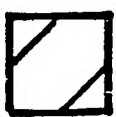
In summary, results of the two studies suggest that persons, who are shown videotapes of their own performances of a communication task, are generally displeased with the performances. They appear to accept personal responsibility for their ineffectiveness and do not attempt to save face by ascribing blame to the communication medium. Negative self-assessment appears to stem more from perceived enduring ineffectiveness than from a more transient attribution of being ill at ease. Typically, peers are perceived by subjects to perform the same task more effectively than the subjects themselves. What little evidence there was regarding possible sex differences in these attributional processes requires further examination.

By the fact that particular questions were asked under experimental circumstances, certain reactions of subjects may have been legitimized. For example, the question which asked if communicators appeared ill at ease

Figure 2. Assessments of Effectiveness and Ease with Medium.



 Question I (effectiveness)

 Question II (ease)

M= Males

F= Females

during the performance of the task might have suggested that such a reaction was to be expected. It is acknowledged that the choice of dependent variable questions posed to subjects in the two studies were not empirically validated. It cannot be claimed that these questions were necessarily the ones which all subjects would deem critical for an assessment of communication task performance. Yet, these questions were anything but arbitrary; they were chosen in an attempt to reflect those attributional dimensions discussed earlier. Responses to these questions have been shown to be close to expectation and interpretable within a priori frameworks offered.

The theory of objective self-awareness posits a discrepancy between an ideal self and observed self to explain why self-focused attention is aversive. In the present two studies it has been shown that a similar ideal self versus self discrepancy can be made apparent by the kind of feedback often provided by video-based teleconference systems. Avoidance or reduction of such a discrepancy may be manifest among teleconference users as reluctance to communicate via such media. Further, one might speculate that the greater the discrepancy between an ideal self and observed self, the more aversive will be the mediated communication experience. A high status user such as a senior executive whose self-esteem is challenged by apparently diminished personal effectiveness might be most unwilling to communicate in this way.

Several implications for teleconferences may be drawn from these studies. First, video feedback might best be limited or used with caution. Limitation could be exercised by the removal of the self-reference monitor which is typically provided for communicators in order to compose their self-presentation (e.g., centred on the screen and sitting neither too close nor too far from the camera). Caution might be exercised by forewarning communicators that it is usual for persons to underestimate their own effectiveness in such circumstances. Secondly, it may be advantageous to develop technological means of diminishing the impact of self-focused attention and video feedback. Cameras might be made unobtrusive, perhaps to the extent of combining monitor and camera lens through the use of fibre optics. Also, cameras might be made to automatically focus and self-compose

in order to maintain an optimal image of the person, at the same time, relieving the communicator of these concerns. Thirdly, it seems essential to investigate social psychological aspects of self-focused attention and video feedback with a view to examining whether it is possible for persons to learn management of the OSA state or to learn to shift from it into states of subjective awareness. Perhaps, with increased OSA experience in teleconference circumstances, communicators may learn to reduce the disparity between an ideal self and observed self, either by making the former more realistic or by gaining a more positive appreciation of the latter. Finally, it would seem important to know the extent of disruption created by self-focused attention upon interpersonal mediated communication. This question is considered in a later study.

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Determining the Effect of Self-Focused Attention on Communication Task Performance

Abstract

In this experiment, an attempt was made to determine the disruptive influences of self-focused attention, a phenomenon which might be evoked in teleconference situations. Subjects performed a standardized person perception task and word perception task in one of three conditions: (I) high OSA created by the presence of a self-reference monitor and video camera, (II) medium OSA created by the presence of a video camera only, and (III) low OSA without a self-reference monitor or video camera. Three dependent measures, shown to discriminate conditions in communication studies, were employed. However, no evidence was found of reduced performance of the communication tasks.

Duval and Wicklund's (1972) theory of objective self-awareness (OSA) has stated that a person's attention can be divided between a focus outwards from the individual and a focus inwards upon self. It has been shown that certain situational factors, such as the presence of mirrors and cameras, can evoke self-focused attention, at times with detrimental effects on outward-directed activities. The present experiment attempted to establish the extent to which OSA might disrupt a communication task having characteristics similar to a teleconference.

Recent studies have provided examples of how self-focused attention can interfere with a subject's performance of an experimental task. Laughlin and Wong-McCarthy (1975) showed that audio and video recording can decrease the performance of a concept attainment task. It was thought that an evaluative emphasis was created by the recording process. Although not among their possible interpretations, the theory of objective self-awareness might suggest that recording may have diverted attention from the task to self. Enzle and Hansen (1976) might also be interpreted as having demonstrated an intrusive effect of self-focused attention during a Prisoner's Dilemma game. If video-mediated participants were more self-aware than nonmediated game players, they may have overattributed events in their interactions to themselves. Vallacher (1978) found that self-aware subjects who were shown a videotape of several persons being interviewed for a job, were less able to discriminate the best candidates than were non-OA subjects.

Both self-reference monitors and video cameras have been used to create self-focused attention (see Davis & Brock, 1974; Duval, 1976; Vallacher, 1978; Wicklund, 1975). In addition to the main objective of this study, it was thought possible to demonstrate that the presence of a self-reference monitor plus a video camera would evoke more OSA interference than would either alone. A self-reference monitor placed beside the monitor displaying the experimental stimulus material would be in peripheral vision much of the time as in many teleconference facilities.

This author has devised a two-part standardized task in order to explore factors which influence use of the video information in teleconferences; it

seemed appropriate to use this task in the present study. The task, entitled person perception test (PPT) and word perception test (WPT), is described in Appendix B. Typically, the three dependent variables measured using this test were (1) the average score on PPT, (2) the average score on WPT, and (3) the homogeneity of impressions formed of the encoders, as measured by the degree of group variability in semantic differential ratings.

Among the findings of previous studies which have used this task were (a) under optimal viewing conditions, the average scores on both PPT and WPT were approximately 78%, (b) when video frame rate was reduced from the normal 30 frames per second to one frame per second, accuracy on PPT was reduced by about 14%, (c) when colour cues were removed from a video display, the reduction in PPT scores was nonsignificant (about 3.6%) but the homogeneity of impressions formed of the encoders decreased by 43%, and (d) with a multicultural subject population, it was found that persons of the like cultural origin as the encoders scored an average of about 9% higher on PPT than did persons of unlike cultural origins; this latter group had approximately 40% less homogeneity of impressions formed of the encoders. It was thought that by using this same experimental task, the impact of self-focused attention may be measured against previous findings.

Hypothesis

It was predicted that self-focused attention would bring about reduced outward-directed concentration and, hence, reduced efficiency of performance on a standardized person perception and word perception test. The maximum effect was predicted for the self-reference monitor plus video camera condition (high OSA) followed by the video camera only condition (medium OSA), with neither self-reference monitor nor video camera condition (low OSA) the least affected.

Method

Subjects

Participants were 30 University of Oxford undergraduates who volunteered to take part and were paid 70 pence per hour. Male and female subjects (15 of each) were randomly assigned to three conditions.

Procedure

Each subject was asked to sit at one end of a five-foot long table at the other end of which was located a 23 inch black-and-white video monitor. It displayed in turn two experimental tasks which were played through a video-tape recorder located in an adjoining room. In the first condition (high OSA), a small video camera aimed at the subject was mounted on the top of the video monitor. To the immediate right of this monitor was a 10 inch black-and-white video monitor which displayed a head-and-shoulders image of the subject throughout the experiment. In the second condition (medium OSA), the 10 inch self-reference monitor was demonstrated to the subject (to establish that the video camera was operable) but was turned off during the experimental tasks. The video camera was in place on the top of the larger monitor and was operating. In the third condition (low OSA), the subject saw only the 23 inch video monitor; both the self-reference monitor and the video camera had been removed prior to his/her arrival.

The concept of a teleconference was explained to the subject and the person perception task, which was to simulate a teleconference, was described (see Appendix B). Sufficient time was given to read the instructions in the questionnaire booklet and when he/she acknowledged that the procedure was understood, the task was begun. The PPT and WPT were administered individually to subjects in all three conditions. Following the PPT, impressions of the two encoders were offered by each subject using the 21-item semantic differential. Next, the subject performed the WPT, and when this was completed he/she was fully debriefed.

Results

For the three dependent variables that were measured, the results are:

1. On PPT, the average score in Condition I is 64.37%, in Condition II the average is 69.21% and in Condition III the average is 69.92%. ANOVA reveals no significant difference between conditions ($F < 1$). This result is the same when PPT is scored using the a priori criterion of accuracy and the intragroup consensus criterion of accuracy.
2. On WPT, again, there is no significant difference between conditions

($\underline{F}$ = 1.35). In Condition I the average score is 84.50%, it is 82.00% in Condition II and 91.50% in Condition III. Although this represents at least an 8% improvement in Condition III, the lowest in OSA, there is considerable within group variability on this dependent variable.

3. The comparison of homogeneity of variance within the semantic differential profiles reveals no evidence of systematic differences ($\underline{F}$ < 1).

These results are summarized in Table 1.

Insert Table 1 about here

Discussion

This study provides no evidence to suggest that subjects' performances of the experimental tasks administered under simulated teleconference conditions were disrupted by self-focused attention. It was expected that a state of OSA would be evoked by the presence of a video camera plus a self-reference monitor (high OSA) and by the video camera only (medium OSA). Yet, in these two conditions, average scores on a person perception task and a word perception task were not significantly lower than in the condition without a self-reference monitor or video camera (low OSA). Similarly, the index which in previous studies has shown differences in homogeneity of impressions formed of the two encoders did not produce the expected differences.

Unlike the experiment which generates results as predicted, the one which produces null results is uninterpretable. At best, it may be possible to list various factors which may have contributed to the outcome. The following, while not contributing directly to an understanding of effects in the present study, might suggest hypotheses to be tested. First, it may be that the OSA effect was either not evoked or, at least, not evoked differentially across experimental conditions. Secondly, there remains the possibility that, while self-focused attention influences subjects, it exerts a relatively small influence which was not detectable using this methodology. Thirdly, perhaps subjects employed some form of OSA management strategy so that outward-directed attention was synchronized with the stimulus presentation

Table 1
Group Means, Standard Deviations and
F Ratios for Three Dependent Variables

Dependent Variable	Experimental Condition						<u>F</u> Ratio
	I		II		III		
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s	
Average Score on PPT ^a (%)	64.37	11.88	69.21	12.76	69.92	8.32	0.73
Average Score on WPT ^b (%)	84.50	14.40	82.00	13.35	91.50	12.25	1.35
Homogeneity of Impression	3.41	1.49	2.90	1.08	3.08	1.35	0.79

$\bar{X}$ = Group mean; s = Standard deviation.

^a Person perception test.

^b Word perception test.

I = High OSA created by a self-reference monitor and video camera.

II = Medium OSA created by a video camera only.

III = Low OSA without a self-reference monitor or video camera.

interval in the experimental tasks. Fourthly, there may be considerable individual differences in the extent or consequence of OSA reactions. Finally, it would seem possible that some heightened vigilance effect may have intervened to counter OSA effects.

The last hypothesis could find a basis of support in previous research findings and theoretical arguments. For example, Zajonc (1965) found that the presence of others could facilitate performance of well-learned tasks but hinder performance of new ones. Assuming that person perception and word perception are familiar tasks, it may be that live observation and mediated observation exert similar influences. A study by Putz (1975) examined the effects of different modes of supervision on vigilance when performing a signal detection task. It was found that the presence of a supervising experimenter, either live or mediated, enhanced vigilance on the task. To use a parallel argument, it is possible that subjects in the high OSA and medium OSA conditions were more vigilant during the experimental tasks and, perhaps, this precluded tendencies toward self-focused attention.

The implications of self-focused attention for teleconferencing should not be dismissed without further investigation. Some of the hypotheses discussed previously may prove useful in subsequent examination of the phenomena related to objective self-awareness.

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Chapter Seven

Conclusion

It is the thesis of this book that society can only be understood through a study of the messages and the communication facilities which belong to it; and that in the future development of these messages and communication facilities, messages between man and machines, between machine and man, and between machine and machine are destined to play an ever-increasing part.

(Wiener, 1950, p. 9)

In the early to mid-1970s, social psychology matured despite a phase of self-criticism, even self-denegration, the likes of which many disciplines could not have survived. Earlier in the thesis, it was suggested that social psychologists had generally ignored the important research area of mediated person-to-person communication. By the end of the 1970s, there are signs that social psychology has begun to re-examine some of its priorities (e.g., see Strickland, Aboud & Gergen, 1976), and that evident among these priorities is an increased concern for its role in deciding the future of telecommunications (e.g., see Short, Williams & Christie, 1976; Weeks & Chapanis, 1976; Williams, 1977; Wish & Kaplan, 1977). Perhaps certain findings reported in this thesis have also contributed to knowledge about mediated social processes.

An overview of the research which comprises this thesis now follows and is subdivided into (a) methodology, (2) application, and (3) theory. In order to cite conveniently findings reported earlier, Table 1 lists all the studies which are denoted by a lower case letter; throughout this concluding chapter, the letters are cited to represent the studies.

Insert Table 1 about here

Methodology. The first indication that variance/invariance of social process would play an important part in the reported studies occurred in the first study where leadership emergence was examined using indexes of group members' agreement on perceived leadership qualities. In the face-to-face groups, there was greater agreement as to who members felt had assumed the group leader role (a). In the same study, relative communality of variance between dependent measures was reported.

Subsequently, communality of impressions played a central role in the intersubjectivity analyses which were performed in several studies (c, d, e, f, g, h). Four methods for assessing communality of impressions were developed based on some familiar techniques in person perception literature (e.g., Gage & Cronbach, 1955) and some new methods for assessing homogeneity of variance (O'Brien, 1976). These methods proved useful when probing the extent of

Table 1
A list of the Studies Denoted by Lower Case Letters

- (a) Teleconferencing and Leadership Emergence.
- (b) Distance, Gaze and the Intimacy Equilibrium Model in Video-Mediated and Face-to-Face Dyads.
- (c) Intersubjectivity: A Concept and Methodology for Communication Studies.
- (d) Variation in Person Perception as a Function of Cultural Differences Between Encoder and Decoder.
- (e) Comparing Social Influence and Intersubjectivity in Three Communication Conditions.
- (f) An Assessment of Differential Intersubjectivity in Five Communication Conditions.
- (g) An assessment of Intersubjectivity in Equivalent Groups.
- (h) Consequences of Reduced Information Rates for Person Perception in a Video Medium.
- (i) An Effect of the absence of Colour Cues on Person Perception in the Video Medium.
- (j) Content Analysis of Cross-Media Studies.
- (k) A Demonstration of Age-Related Differences in the Preference to Tele-conference.
- (l) Video Feedback and Self-Assessment of Communication Effectiveness.
- (m) Determining the Effect of Self-Focused Attention on Communication Task Performance.

consensus across media conditions. When used in an assessment battery, the intersubjectivity analyses offered some tests which were of varying power, robustness, conservativeness but, nevertheless, having conceptual complementarity. Method A, for example, was extremely sensitive in detecting group differences, while Method C was perhaps excessively conservative; the necessity for both extremes of assessment techniques may have a parallel in a familiar methodological dilemma, namely, that of committing Type I and Type II errors. When performing cross-media comparisons in shared understanding, one, of course, wants to avoid rejecting the null hypothesis when it is true (Type I) but, equally, one does not want to fail to reject the null hypothesis when it is false (Type II). Teleconferencing literature is replete with null results and some sensitive method of detecting subtle media differences was called for.

Many of the reported intersubjectivity analyses employed semantic differential rating scales. The main focus of attention was on variance differences rather than mean differences. Semantic differential was favoured because the response scales were relatively straightforward to produce, subjects seemed familiar with their use and the analysis of data generated in this manner was not unduly complicated. Guidance was received from the substantial history of semantic differential use as a research tool in social psychology.

Several times in the thesis, a stated objective was to identify the most useful dependent variables for communication studies. The intersubjectivity analyses emerged as reliable and, seemingly, valid communication indexes. They appeared to offer some advantages over other derived scores and over subject attitude responses, being less susceptible to subject response dispositions (e). The relative viability of dependent measures in content analyses was considered (j). The measures which showed greatest stability (in terms of intercorrelations and proportion of variance shared) were typically those which have been used in past content analyses. With respect to future content analyses of mediated interactions, suggestions were made for improving certain measurements using automated techniques. Other concepts presented

assessment challenges such as the meaning of interpersonal distance in mediated settings. A multifaceted approach proved useful; distance was examined with respect to (a) estimations in feet of actual distance between persons, (2) a semantic differential component which described distance using 13 bipolar adjectives, and (3) subject attitude reports with respect to both perceived psychological distance and perceived physical distance (b). A useful method of comparing retinal image size for both mediated and face-to-face interactions was devised. It was found that, for example, a 2 metre distance between communicators could be simulated by adjusting the camera lens and its distance to the mediated communicators.

Establishing the standardized person perception test seems to have been a worthwhile endeavour, providing results which eventually were compared across different experiments (d, h, i, m, g). Useful and interpretable results were found when using the a priori scoring method and, to a lesser extent, the scoring criterion based on intragroup modal judgments. As well, the word perception test provided a useful covariate when used to partition effects that could have arisen due to language proficiency, reading ability, motivational factors, etc. Other applications of this test procedure are planned and other investigators have expressed an interest in this procedure for teaching and/or research purposes (Dr. J. Farley, Bedfordshire Area Health Authority and Dr. J. Kellett, St. George's Hospital Medical School, London).

The "real-distance" teleconference study suffered major methodological shortcomings, the most serious of which was the inability to assign randomly subjects from a single population to the experimental conditions. This basic requirement of the experimental method made suspect the subsequent analysis procedures. Perhaps, the use of covariates would offer statistical control where methodological control is difficult or impossible (e, j). Estimating the effects of intervening variables and using repeated measures within subjects, may add to rigour even where different subject populations are involved. Current methods of programme evaluation may help to guide these endeavours.

Application. Strong evidence showed that social psychological and human factors can be influenced in significant ways during technological intervention.

Counterintuitive results demonstrated that changes to human communication processes were not easily second-guessed and that empirical testing was necessary. Emergent leaders were less influential (a), and homeostatic social drives continued to regulate interpersonal factors such as intimacy (b). While varying to some extent as a function of medium, intersubjectivity was surprisingly high in certain video-mediated interactions (f). Human communicators exhibited unexpected reactivity e.g., feeling close to each other when distance had been overcome through communication (b); on the other hand, they were not so easily able to overcome the impact of self-focused attention as evoked by video cameras during mediated interaction (b, k, l, m). Moreover, social norms which were thought to regulate the level of interpersonal gaze during face-to-face interactions seemed to perform a less essential regulatory function for the management of intimacy in mediated circumstances. Hence, mediated communicators gazed at each other more and this provided the potential for concentrated information reception over the visual channel (b, j). Ample evidence showed that nonverbal social cues can be adequately transmitted through the video medium (d, f, h, i).

With respect to the quality of audio-video communication links and their influence on social interaction, two conclusions might be drawn. First, there was the suggestion that increased verisimilitude to face-to-face interaction is necessary if the same extent of coordination and synchronization of verbal, paraverbal and nonverbal cues are to be accomplished in mediated communication. This is the argument which implies that the richer the communication channel, the better it will be for interpersonal communication. Evidence from the reported studies (a, i, h, j) indicated that there was insufficient quality in transmission of both audio and visual cues. For example, communicators did not have the confidence in the coordination of their discourse to risk interrupting each other's conversation; the interactions were more formal. However, a second approach to the question of communication fidelity stems from the consideration of optimal information rates. This may be of greater consequence in the short term as even more consideration is given to the effects of video bandwidth compression (h). There was strong evidence in support of the notion that with video of 15 frames per second comparable

communication effectiveness can be achieved as with the full bandwidth of 30 frames per second. Even at 1 frame per second, the rate provided important social information (h). As expected, the actual content of the communication determined whether more information or less information was necessary; rapidly changing content needed more frequent sampling than did content which changed slowly. An optimal frame rate, namely, one which sent neither too much nor too little information for effective communication, achieved the maximal communality of perception or shared understanding.

The potential usefulness of this notion might be illustrated in the results of another study. It was shown that cultural differences between the encoder and the decoder can influence the effectiveness of their communication. If only salient information were communicated between them, there may be increased similarity in their perceptions. This assumes that subtle micro-cues add a degree of ambiguity to the interpretation of behavioural acts. In another application, communality of impressions might be monitored using intersubjectivity analyses and, with feedback, the perspectives of negotiators might be shaped in order to achieve greatest consensus about a mutual problem. At this point of maximal agreement, negotiators might be informed so that they could attempt to reach a compromise that would be mutually satisfactory.

It seems impossible to predict the form of future communication technology. However, some current problems to be overcome may be identified. First, as already suggested, improvements should be made to the video characteristics. Further consideration should be given to image size and implications of it for perceived distance between communicators. The contribution of colour cues might be examined in depth and more exact technological solutions to the problem of eye contact should be pursued. With the latter, combining the camera lens and monitor into a single unit through the use of fibre optics may be one answer. A general suppression of technological impact would seem advantageous. This might include the use of self-correcting cameras that could home-in on the communicators thereby removing the need for self-reference monitors which are used to compose the output image. The "absent" camera would assist in giving the hardware a low profile. As to

audio quality, the ultimate system should permit open microphones between communicators without any risk of audio feedback and without the necessity of voice activated switches. It should have improved tone, balance and volume characteristics.

The question of bandwidth compression and amount of information which can be transmitted efficiently would be solved to a large extent with the advent of fibre optics. It has been estimated that with glass wire carriers and laser signals, up to 1,000 simultaneous two-way channels of full bandwidth information can be transmitted via a wire no thicker than a human hair. This raises another important matter to consider about future technologies; namely, how might one predict the social impact these changes will have upon our lives. The answer to this and other important communication questions will need to be addressed while there is still time to influence the direction of change in tomorrow's society.

Theory. Certain established theories from social psychology made contributions to this thesis by providing guidelines and conceptual formulations. It was not intended that these theories should themselves be tested, rather, they suggested some hypotheses for experiments and assisted in the interpretation of results. For example, some of Bales's (1953) work on leader emergence was replicated in face-to-face groups while mediated groups remained leaderless (a). There was apparent empirical consistency with notions put forth by Argyle and Dean (1965) in their Intimacy Equilibrium Model (b, f); Mehrabian's (1971) immediacy concept found some support (b, f) as did some of the hypotheses advanced by Mehrabian and Reed (1968) concerning determinants of communication accuracy (d, f, h). The theory of objective self-awareness as presented by Duval and Wicklund (1972) proved useful and promises to reappear in future communication studies (b, k, l). Schlosberg's three dimensions of emotion (1954) and circle (1952) continue to make a contribution to the study of nonverbal communication (h). Further, the work of Ekman and Friesen (1969, 1975), and Ekman, Friesen and Ellsworth (1972) on facial expressions, the barrage of non-verbal cues, and micro- and macro-affect displays were particularly useful (h).

The model of mediated communication which was outlined early in the

thesis, served its intended function of defining research objectives, clarifying relationships within complex communication systems and assisting in the explication of empirical analogues. A case in point would be consideration given to impact of self-focused attention during video-mediated interaction (k, l, m). The model illustrated that person, medium and task factors are quite inextricable.

Among the more useful theoretical notions to emerge was the concept of intersubjectivity. According to this concept, communication effectiveness might be defined in terms of communality of impressions and shared understanding achieved in a particular communication situation or between particular communicators (c). Methodologies were developed to translate this notion into useable procedures. These were tested and found to yield interpretable results (d, e, f, h, i). The problem of establishing a priori criteria of accurate communication might be relieved by the employment of elicited criteria which would take the form of homogeneity of impressions and shared understanding. Thus, effective communication need not be assessed in absolute terms such as "correct-incorrect" but in relative terms such as "common-unique". Applications for such a technique would seem widespread in communication studies

The notion of optimal information rates may stir some theoretical interest. Further investigations may show that, where the aim is to produce similarity of impressions, a moderate rate of information is necessary. There would seem to be a point on the information rate continuum at which most perceivers will receive the necessary salient information without feeling overwhelmed by it. While this notion is not a new one to social psychology, its importance is not often considered. The support offered for the operation of optimal information rates in person perception was substantial (h).

Occasionally, there were empirical challenges to common sense notions about mediated human behaviour. It was thought, for example, that technological links would prove to be a formidable intimacy barrier between communicators. However, the evidence suggested that under some circumstances, mediated interaction can seem less remote than in situations where face-to-face persons are seated too far apart (b). Little evidence could be found of

communicator adaptation to mediated interaction even though it might be expected to occur as persons became accustomed to the situation. The fifth session of mediated discussions appeared to be similar to the first session (a, j, l). Long-term studies would be required before conclusions could be drawn about the adjustments made by participants to this form of communication.

At other times, notions of common sense received support. Dynamic displays of nonverbal communicative acts were perceived more effectively than were static displays (h). The presence of colour cues in a video display made a contribution to the homogeneity of impressions formed of target persons (i). Reliable evidence in the form of a negative correlation between filled pauses (thought to indicate the speaker's desire to continue to hold the floor in conversation) and the frequency of interruptions was found (j).

In conclusion. Social psychology and telecommunications seem now to be inseparable. If progress in technological areas were to halt suddenly, a multitude of questions would still remain to occupy the energies and research activities of interested social psychologists. However, technological developments in communication show no signs of flagging; on the contrary, they are accelerating with added impetus from such developments as microsystems technology. The impact of communication on our social world promises to be enormous and occurring sooner than is commonly expected. The quotation which introduced this chapter is nearly three decades old (Wiener, 1950), but never has it been more appropriate than today. For the coming decade, its truth will have been understated.

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Appendix A

Additional Information About Methodology For:
"Distance, Gaze and the Intimacy Equilibrium Model
in Video-Mediated and Face-to-Face Dyads"

Additional information about the methodology for the experiment "Distance, Gaze and the Intimacy Equilibrium Model in Video-Mediated and Face-to-Face Dyads discusses:

1. The rationale and statistical decision to perform analyses without partitioning the variance to consider the sex/dyad effect.
2. The method for determining equivalence of the retinal image in the face-to-face and video-mediated conditions.
3. The human relations problems used in the experimental task.
4. The postexperiment questionnaire.

Mixed sex pairs were used, partly because the highest measures of gaze are to be found in this dyadic condition (Argyle & Ingham, 1972) but, more importantly, because many of the questionnaire items used concentrated on estimates of interpersonal intimacy. It was felt that such a judgment task might be unnecessarily complicated if the dyad composition did not involve opposite sexes. Studies of gaze have established the importance of sex effects and the ability of dyad members to influence each other (Argyle & Cook, 1976; Argyle & Dean, 1965; Ellsworth & Ross, 1975; Exline, 1963; Exline, Gray & Schuette, 1965; Kendon & Cook, 1969; Kleinke, Bustos, Meeker & Staneski, 1973). The sex difference often demonstrated empirically is the tendency for females to gaze more during discussion than males. However, there is no empirical reason to suppose that sex differences found in face-to-face interactions will generalize to mediated settings since this type of interaction may occur without the benefit of established norms to guide interaction. Ellsworth and Ross (1975) observed:

The sex of the speaker and of the listener accordingly becomes more relevant when a culture deems different levels of self-disclosure or intimacy appropriate for men than it does for women in the same situation. Thus sex differences will occur frequently when the level of intimacy created or demanded by the communication situation is uncomfortably high for one sex but not for the other sex. But no such differences will appear

when situational demands for intimacy are comfortable for men and women alike, and they may also disappear when the situation becomes uncomfortable for both sexes. (p. 609)

A possible sex effect and dyad effect were confounded in this experimental design and could not be considered independently. By dyad effect was meant the mutual influence of dyad members on each other. For example, if one person was talking, the other person was usually listening (Kendon & Cook, 1969). These factors are important but they require specific empirical attention with hypotheses directing their investigation. It was recognized, in the present study, that subjects within dyads were conceptually meaningful units for analysis, and that they may be more useful than supposedly standardized encounters with experimental confederates. The assumption was that this confounded sex/dyad effect would not exert a significant influence on behaviour or questionnaire ratings, nor would it produce a significant interaction with the other independent variable, the communication condition. This assumption was tested and verified in a preliminary analysis before proceeding with the analyses reported. As reflected in Table 1, the F ratios were clearly nonsignificant and the proportion of variance explained was negligible. Intra- and extradyadic correlations were compared for opposite sex pairs (still within experimental condition) using a priori behavioural and attitudinal indicators which were (a) preference to work with the other person again, (b) percentage of gaze while talking, (c) percentage of gaze while not talking, (d) "intimate-remote" item from the semantic differential, and (e) perceived psychological distance. Correlations of all these indicators were modest or low; the extradyadic correlations were slightly stronger and more positive than the intradyadic correlations. This might suggest that a sex/dyad effect was operating counter to the influence of the treatment effect, namely, the communication condition. A nonparametric analysis of the direction of difference (male versus female) within all dependent variables showed no significant effect ($\chi^2 = 2.69$, $p = .65$). To ascertain if there were systematic sex differences in the degree of differentiation among means within the groups, variance scores were computed for the

males and females on each dependent variable. A related t test was used to test this possible sex difference and, once again, it did not show one sex having greater intergroup differences than the other ($t = .24$, $df = 11$, $p = .81$). From this manipulation check, it seemed clear that a sex/dyad effect did not operate systematically so as to violate assumptions or mislead the interpretation of results when analysed as a one-way MANOVA (a CR-5 design, Kirk, 1968).

Photographically, it was possible to determine the equivalent head-and-shoulders retinal image produced in the 2 metre and 3 metre face-to-face conditions and then to simulate this image size in the mediated conditions (see Figures 1 and 2). There has been some evidence to show that people underestimate the size of a face displayed on a video monitor (Stapley, 1972). The video camera lens was located 20 to 25 cm above the point of eye contact with the person on the video monitor. Subjects were seated approximately 1.7 metres from the video monitor and this created an eye contact versus camera lens disparity of between 6 and 9 degrees; this disparity was small enough to produce an adequate semblance of eye contact between communicators. Aagaard, van der Avoort and de Vrijer (1977) found an eye contact versus camera lens disparity of less than 3 degrees to be "unnoticeable", less than 12 degrees to be "not unusual", and a well-known commercial video telephone to have a 7.5 degree of disparity. The distancing of subjects from the video monitors was determined by multiplying the monitor size by 4, which gave acceptable picture resolution on a 625 line video system (McManamon, 1975).

Insert Table 1 and Figures 1 and 2 about here

Table 1
Two-Way Partition of Variance
in Seven Dependent Variables

Dependent Variable	A Effect ^a		B Effect ^b		A B Effect	
	<u>F</u>	<u>ω^2</u>	<u>F</u>	<u>ω^2</u>	<u>F</u>	<u>ω^2</u>
1	2.47*	.13	1	0	1	0
2	3.72**	.52	1.68	.03	1	0
3	2.91**	.18	1	0	< 1	0
4	5.55***	.31	1	0	1.38	.03
5	2.71*	.15	1	0	< 1	0
6	2.91**	.16	1	0	< 1	0
7	2.39*	.12	1	0	1.17	.01

^a Groups I to V.

^b Sex/dyad.

F = F ratio from ANOVA using CRF-52 design (Kirk, 1968).

ω^2 = Estimate of strength of association.

*p < .10; **p < .050; ***p < .01.

1. Percentage of gaze while talking.
2. Social distance component of the semantic differential.
3. Evaluative component of the semantic differential.
4. Perceived physical distance.
5. Perceived psychological distance.
6. Preference to work with the other person again.
7. Feelings of confrontation with the other.

Figure 1. Determining Equivalent Retinal Image in 2 Metre Conditions.



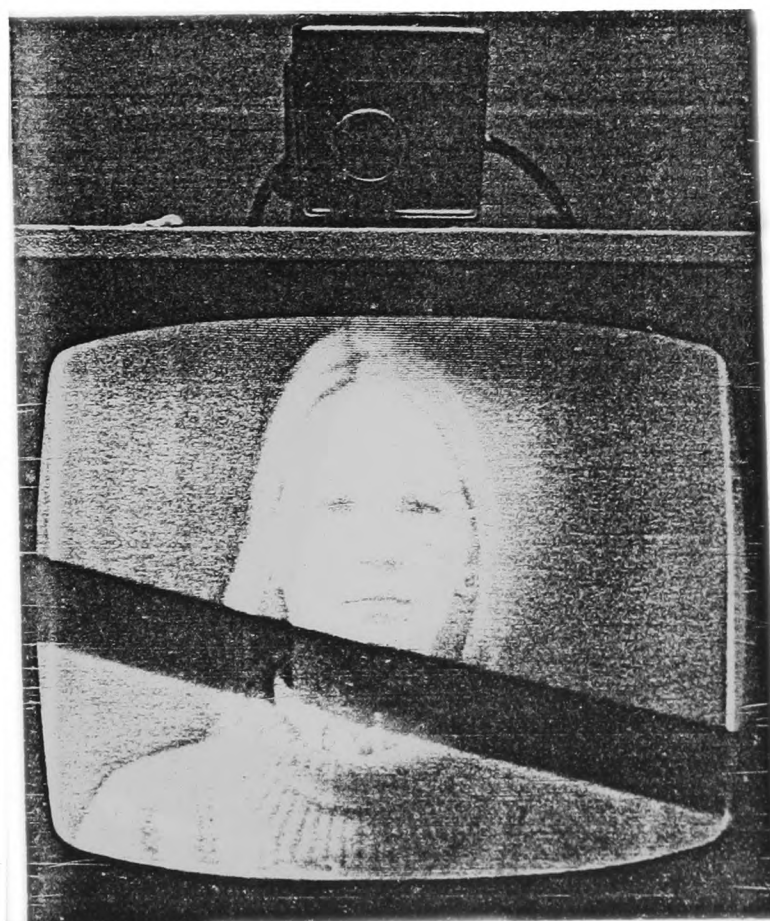
Face-to-Face Distance $2\frac{1}{3}$ Metres



Face-to-Face Distance 2 Metres



Face-to-Face Distance $1\frac{2}{3}$ Metres



Video-Mediated Distance 2 Metres

Figure 2. Determining Equivalent Retinal Image in 3 Metre Conditions.



Face-to-Face Distance $3\frac{1}{3}$ Metres



Face-to-Face Distance 3 Metres



Face-to-Face Distance $2\frac{1}{3}$ Metres



Video-Mediated Distance 3 Metres

Experimental Task: Four Human Relations Problems

The experimental task involved discussing the following four human relations problems. The order of the problems was determined at random but held constant across the five experimental conditions.

Read onto the audiotape by the female experimenter:

1. Our neighbours have violent arguments which go on day and night. Last week I saw the wife with a big red cut on her face and a black eye. My husband says we should mind our own business and not interfere, but I want to call the police when I hear them fighting because I'm afraid the husband may seriously injure or even kill his wife someday. Under what circumstances, if any, is a neighbour justified in sending for aid when the aid has not been requested?

Read onto the audiotape by the male experimenter:

2. I think my roommate at college is emotionally disturbed. He is always very nervous and depressed. He seldom speaks to anyone. At night, sometimes, he screams in his sleep. Everything he owns is under lock and key. Last week, by accident, I spilled hot coffee over one of his books and he accused me of doing it intentionally. I advised him to seek professional help, but he told me to mind my own business. Am I right in thinking he needs help? Under what conditions, if any, should I seek help for him without his knowledge?

Read onto the audiotape by the female experimenter:

3. Collections are always being taken up for someone at my office. The contribution is usually only 50 pence or so which I can easily afford. But I resent having to donate just so I won't look cheap. It seems that the person who usually "asks" is one of my bosses and this makes it doubly hard to refuse. Am I just being selfish? If not, how should I go about refusing without an embarrassing scene?

Read onto the audiotape by the male experimenter:

4. We own a small, women's clothing store. It is doing reasonably well, but a continual problem is trying to keep the goodwill of our customers and keep the merchandise clean. Teenage girls frequently stop by the store and try on many articles of clothing just for the fun of it. When the teenagers come in without their parents, they rarely buy anything, but many of their mothers are good customers. How would you suggest we handle this problem?

POSTEXPERIMENT QUESTIONNAIRE

Communications Studies
Oxford University

The following scales are designed to assess feelings and attitudes towards the discussion that you have just completed. Even if some of them seem strange or inappropriate, it is very important that you complete them all. Work rapidly through the scales, without pausing more than a few seconds on each one, and without returning to one you have already completed. Please place a cross at the point on the scale which you consider most appropriate, for example...

old ____ : ____ : ____ : **X** : ____ new

Did you find the discussion:

relaxed ____ : ____ : ____ : ____ : ____ uneasy

closed ____ : ____ : ____ : ____ : ____ open

public ____ : ____ : ____ : ____ : ____ private

free ____ : ____ : ____ : ____ : ____ constrained

intimate ____ : ____ : ____ : ____ : ____ remote

rough ____ : ____ : ____ : ____ : ____ smooth

slow ____ : ____ : ____ : ____ : ____ fast

cooperative ____ : ____ : ____ : ____ : ____ competitive

pleasant ____ : ____ : ____ : ____ : ____ unpleasant

unsatisfactory ____ : ____ : ____ : ____ : ____ satisfactory

agreeable ____ : ____ : ____ : ____ : ____ disagreeable

cold ____ : ____ : ____ : ____ : ____ warm

meaningful ____ : ____ : ____ : ____ : ____ meaningless

passive ____ : ____ : ____ : ____ : ____ active

secure ____ : ____ : ____ : ____ : ____ insecure

personal ____ : ____ : ____ : ____ : ____ impersonal

- easy ____ : ____ : ____ : ____ : ____ difficult
- hazy ____ : ____ : ____ : ____ : ____ clear
- foolish ____ : ____ : ____ : ____ : ____ wise
- informative ____ : ____ : ____ : ____ : ____ uninformative
- successful ____ : ____ : ____ : ____ : ____ unsuccessful
- untrustworthy ____ : ____ : ____ : ____ : ____ trustworthy
- informal ____ : ____ : ____ : ____ : ____ formal
- friendly ____ : ____ : ____ : ____ : ____ unfriendly
- insensitive ____ : ____ : ____ : ____ : ____ sensitive
- sociable ____ : ____ : ____ : ____ : ____ unsociable
- boring ____ : ____ : ____ : ____ : ____ interesting
- comfortable ____ : ____ : ____ : ____ : ____ uncomfortable
- emotional ____ : ____ : ____ : ____ : ____ unemotional
- confusing ____ : ____ : ____ : ____ : ____ understandable
- good ____ : ____ : ____ : ____ : ____ bad
- unfair ____ : ____ : ____ : ____ : ____ fair
- complicated ____ : ____ : ____ : ____ : ____ simple
- inspiring ____ : ____ : ____ : ____ : ____ uninspiring
- unreliable ____ : ____ : ____ : ____ : ____ reliable

How far apart were you and the other person in terms of physical distance separating you?

near ____ : ____ : ____ : ____ : ____ far

Estimate the distance that separated you. ____ feet

How far apart were you and the other person in terms of psychological distance separating you?

near ____ : ____ : ____ : ____ : ____ far

Did these problem-solving sessions give you a feeling of "confrontation" with the other person?

not at all ____ : ____ : ____ : ____ : ____ a great deal

During these problem-solving sessions, do you feel that you performed effectively in terms of:

Giving or Receiving Information
not at all ____ : ____ : ____ : ____ : ____ a great deal

Communicating Facial Expression
not at all ____ : ____ : ____ : ____ : ____ a great deal

Forming an Impression of the Other Person
not at all ____ : ____ : ____ : ____ : ____ a great deal

Getting to Know the Other Person
not at all ____ : ____ : ____ : ____ : ____ a great deal

Arriving at a Solution to the Problem
not at all ____ : ____ : ____ : ____ : ____ a great deal

Exchanging Opinions
not at all ____ : ____ : ____ : ____ : ____ a great deal

Generating Ideas
not at all ____ : ____ : ____ : ____ : ____ a great deal

Creating Close Contact with the Other Person
not at all ____ : ____ : ____ : ____ : ____ a great deal

Convincing the Other Person of Your Viewpoint
not at all ____ : ____ : ____ : ____ : ____ a great deal

To what extent did the communication situation (e.g. the laboratory environment) influence the ratings that you have made on this questionnaire?

not at all ____ : ____ : ____ : ____ : ____ a great deal

To what extent did your own communicative skills influence the ratings that you have made on this questionnaire?

not at all ____ : ____ : ____ : ____ : ____ a great deal

Would you be willing to work on a similar communication experiment with the other person who took part in this experiment?

not at all ____ : ____ : ____ : ____ : ____ a great deal

Would you have any objection to having videotapes of today's interaction viewed by other persons?

not at all ____ : ____ : ____ : ____ : ____ a great deal

Have you any general comments about this experiment?

STOP

Please answer the following questions based on the videotape recordings that you have just seen.

Tape Number One:

How effective was this subject in the performance of the experimental task?

not at all effective ____ : ____ : ____ : ____ : ____ extremely effective

Did this subject appear to be at ease with the television communication system?

not at all ____ : ____ : ____ : ____ : ____ a great deal

Tape Number Two:

How effective was this subject in the performance of the experimental task?

not at all effective ____ : ____ : ____ : ____ : ____ extremely effective

Did this subject appear to be at ease with the television communication system?

not at all ____ : ____ : ____ : ____ : ____ a great deal

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Appendix B

Person Perception and Word Perception Tests: Rationale, Derivation and Methodology

This author has devised a standardized experimental task in order to study several factors which were thought to influence the use of the video channel in teleconferences. The two main parts of the task comprised (a) a person perception task (PPT), and (b) a word perception test (WPT). There was considerable challenge in developing the former as it was based on the judgment of nonverbal social cues. The complexities of such problems have been demonstrated in social psychology. With the latter test, it was relatively straightforward to establish criteria for measuring the ability and accuracy of word perception.

Person perception test. Several strategies have been used in recent years for the study of emotional expression. Frijda (1969) and Stringer (1973) have reviewed the various approaches and found three main orientations. These were (a) the dimensional approach, (b) the categorical or clustering approach, and (c) the hierarchical approach. The present methodology considered the first.

Schlosberg's (1952, 1954) dimensional approach is perhaps the best known. He identified three dimensions for the analysis of any facial emotion:

1. Attention-Rejection. "Attention is exemplified by surprise, in which all receptors are maximally open to stimulation. Rejection is the best term we have found for the other end of this axis; it is shown most clearly in contempt and disgust, in which eyes and nostrils appear to be actively shutting out stimulation" (1952, p. 230).

2. High-Low Activity. "The term activate means a bit more than to make active; the dictionary tells us that it also means to make reactive. Activation would seem to be a very good name for what emotion does to us; the angry man overreacts to stimulation. Strong emotion thus represents one end of a continuum of activation; the other end, the conditions of minimum activation, is found in the sleeping man who doesn't respond to stimulation (1954, p. 82). General level of activation, has its low end in sleep, its middle ranges in alert attention, and its high end in the strong emotions" (1954, p. 87).

3. Pleasantness-Unpleasantness. "Pleasantness-unpleasantness... needs no further explanation" (1952, p. 230). The enduring viability of

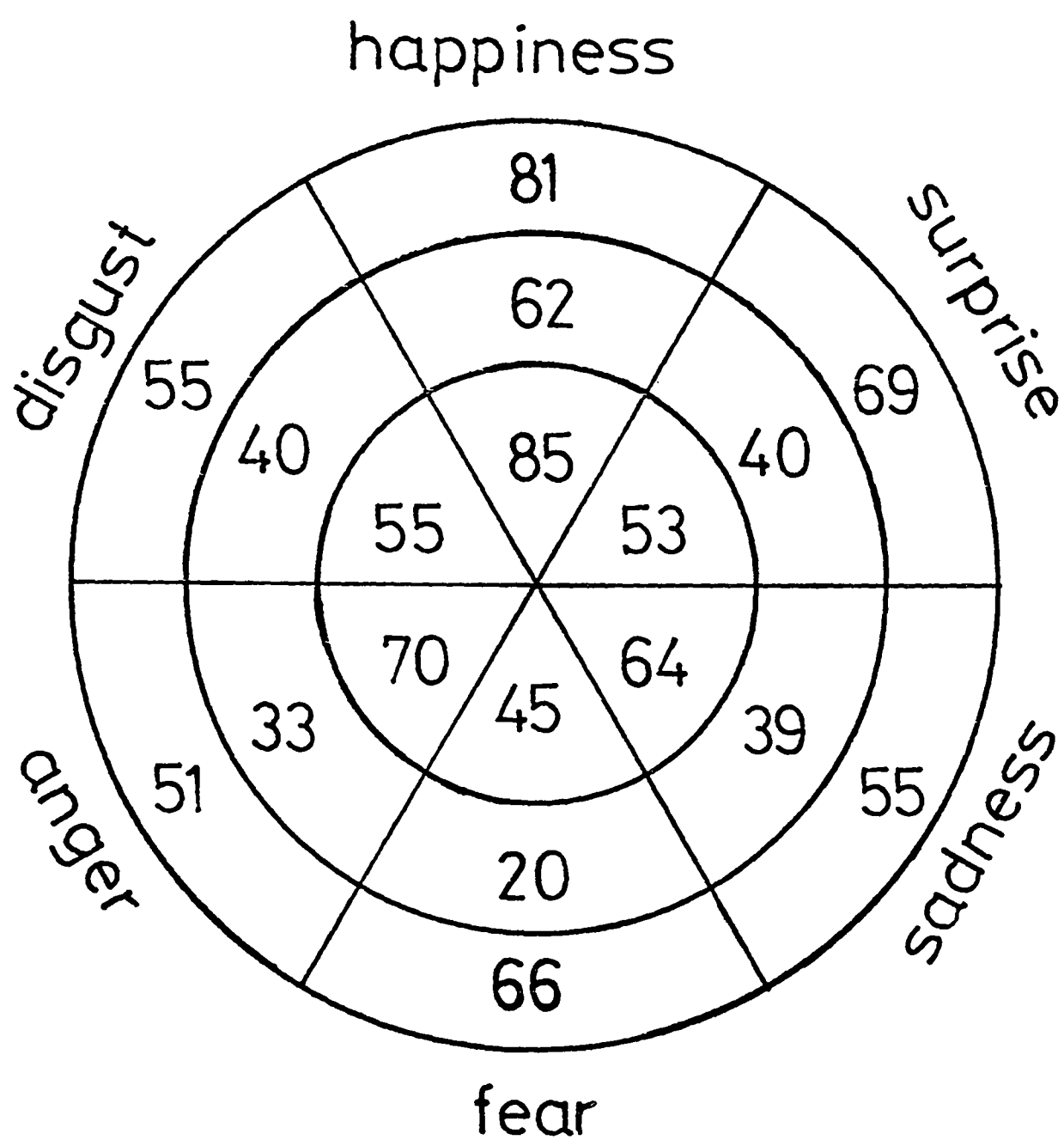
these dimensions has been demonstrated in numerous studies which followed (e.g. Abelson & Sermat, 1962; Stringer, 1973; Thorngate, 1971).

Another reason for building on Schlosberg's early work in the derivation of this test was that he investigated the relative "confusability" of particular facial emotions. The Schlosberg (1954) circle arranges six basic categories of emotions so that similar segments are beside each other (see Figure 1). He found that fewer errors in the judgment of emotion were made across nonadjacent segments than across adjacent segments. Thus, in the application of this test, it was expected that classifications of emotion within a single circle segment (e.g., joy versus love), would be less consistent than classification across adjacent segments (e.g., joy versus surprise), and the latter should be less consistent than classification across nonadjacent segments (e.g., joy versus sorrow). This manipulation, it was thought, would contribute a useful index of person perception in subsequent studies.

Insert Figure 1 about here

In the development of PPT, the objective was to produce a series of interactions which appeared to be between an encoder and an imaginary other person both of whom were communicating over a teleconference system. The encoder would display an emotional reaction evoked by the other person (e.g., surprise, anger, etc.). In turn, two encoders (one male and one female) were seated at a teleconference node in the Wired City Laboratory at Carleton University, Ottawa. Only those situational or contextual cues associated with a teleconference were provided. No extraneous objects appeared in the foreground, and a blue curtain used as the backdrop remained the same. The head, shoulders, chest, arms and hands of the encoder were clearly visible and were used at times to convey emotion nonverbally. The encoders, actors hired from a university drama society, were accustomed to portraying emotion using only nonverbal cues. Each reaction was practised several times before filming and each one, with slight variation, lasted approximately ten seconds. The film did not have an audio track; however,

Figure 1. Schlosberg Circle.



Mean Percentage Accuracy of Sending and Receiving Emotion

- Outer ring: Summary of results of nine studies on accuracy sending by Ekman, Friesen and Ellsworth (1972).
- Centre ring: Results of study on accuracy sending by Zuckerman, Lipets, Koivumaki and Rosenthal (1975).
- Inner ring: Results of present study of consistency receiving.

Summary
Rank-ordering: Happiness, surprise, disgust, sadness, anger and fear.

if the encoders wished to verbalize while expressing any of the emotional reactions, they recited the alphabet thereby holding constant any cues which might be gained by lip-reading.

The twelve emotional reactions depicted twice by each encoder and recorded on film were:

1. affection	7. shame
2. enjoyment	8. dislike
3. happiness	9. distress
4. interest	10. fear
5. surprise	11. sadness
6. anger	12. no emotion or neutrality

The list was formed after reviewing works by several researchers who have considered this issue (e.g., Ekman & Friesen, 1965; Frijda, 1969; Schlosberg, 1952; Stringer, 1973; Thompson & Meltzer, 1964). This author did not intend to enter the debate concerning the number of discrete emotions communicable via facial expression. In creating the test, no account was taken of what emotion was intended by the encoders; no attempt was made to establish an absolute accuracy criterion. The interpretation of the emotions was based on consensual understanding and these deductions were made more on aesthetic than scientific grounds.

Nine-second segments of the expressive scenes were edited together so that each stimuli was introduced by a number followed by a six-second interval which allowed time to classify the reaction. The 19 odd-numbered stimuli showed the male encoder and the 19 even-numbered stimuli showed the female; there was a total of 38 scenes.

The assembled film was viewed by ten judges (5 males and 5 females) from the Department of Experimental Psychology, University of Oxford Subject Panel. To optimize the viewing conditions, the film was projected in super-8 colour format onto a 4' x 5' screen; in the applications of the test, the stimulus material was displayed in videotape format. Without time constraints, the judges were asked to generate labels for what they saw depicted in each stimulus. For example, stimulus 1 was described as having an intense discussion, arguing with someone, being insulted, correcting someone who has misinterpreted something, making a point in a political argument, etc. The judges also classified the stimulus items

according to the six-way classification of the Schlosberg (1954) circle, as shown in the inner ring of Figure 1. The degree of agreement in these judgments depended on the type of emotion being judged (correlation of .85 for happiness, but only .45 for fear). This appeared to be consistent with earlier studies (Ekman, Friesen & Ellsworth, 1972; Zuckerman, Lipets, Koivumaki & Rosenthal, 1975).

To produce another level of analysis that would focus on the Schlosberg (1954) dimensions, an assistant who was blind to the research hypotheses that followed, classified each stimulus item as belonging to one or the other extreme for each of the dimensions. The result was that each stimulus had a three-way classification as shown in Table 1.

Insert Table 1 about here

As one might expect, there was overlap of dimensions within the 38 test items (e.g., 68% of the items depicted unpleasant while 16% depicted high activity, attention and unpleasant). To yield this level of analysis, it seemed appropriate to treat each dichotomized dimension as a separate dependent variable in some of the investigations which were to follow.

Questionnaire for PPT. Three versions of the questionnaire were devised (see Questionnaires I, II and III). It was thought that three parallel forms of the PPT would make possible repeated measures studies. Questionnaire I was compiled from the labels generated by the judges; some of the labels were altered to be fully appropriate, partially appropriate, partially inappropriate or fully inappropriate. The subjects' task in subsequent studies would be to indicate the extent of their agreement with these labels. Questionnaires II and III offered a choice of two adjectival descriptors for each stimulus plus provision for indicating "uncertain" (???) and "not appropriate" (n/a). The most commonly perceived descriptor was paired with another descriptor from within the same Schlosberg circle segment (e.g., irate-displeased), from an adjacent segment (e.g., overjoyed-surprised), or from a nonadjacent segment (e.g., elated-sullen). The scoring key, included later, shows the weighted scores for either the seven

Table 1
Person Perception Test Items Classified
According to Three Schlosberg Dimensions

Item Number	Attention- Rejection		Pleasant- Unpleasant		High- Low Activity	
	<u>A</u>	<u>R</u>	<u>P</u>	<u>U</u>	<u>H</u>	<u>L</u>
1	X			X	X	
2	X		X		X	
3		X		X		X
4		X		X	X	
5	X		X		X	
6		X		X		X
7		X		X	X	
8		X		X	X	
9		X		X		X
10		X		X	X	
11	X			X	X	
12		X		X		X
13		X		X		X
14	X		X		X	
15	X			X	X	
16		X		X		X
17	X			X	X	
18	X		X		X	
19		X		X		X
20		X		X		X
21	X		X			X
22		X		X	X	
23		X		X		X
24	X			X		X
25		X		X		X
26	X		X			X
27		X	X			X
28		X		X		X
29	X		X		X	
30		X		X		X
31	X			X	X	
32	X		X		X	
33	X		X			X
34		X		X	X	
35	X			X	X	
36	X		X		X	
37	X		X		X	
38		X		X		X

scale positions (Questionnaire I) or the four-way classification choices (Questionnaires II and III). These weightings were empirically derived by having three groups of eight judges (4 males and 4 females) view the PPT and respond using the three questionnaire versions. A second scoring technique for all three questionnaires was also possible. Test items scored by the second method could be weighted according to the degree of consensus demonstrated within any group of test-takers. This index of intragroup agreement would have to be generated after the test was administered.

Semantic differential ratings of the encoders' personalities. By the end of the PPT, subjects would have viewed each encoder depict 19 emotional reactions. From this experience, it seemed reasonable to assume that subjects would have formed some impression of the encoders' personalities. These impressions might be reflected in the subjects' semantic differential ratings (see Questionnaires IV and V). Data from the ratings could be analyzed for both location differences (i.e., group mean) and dispersion (i.e., group variance) differences.

Word perception test. It was recognized that there could be various factors which might influence subjects' performances of the PPT. In certain investigations, some of these factors would be theoretically irrelevant and would introduce error variance into the evaluation process (e.g., individual differences in motivation, test anxiety, reading proficiency in English, etc.). A word perception test might serve to provide a useful covariate in order to separate person perception performance and certain biasing influences.

Ten arrays of letters were filmed, with white letters on a black background. The arrays consisted of five letters in the vertical direction and six letters in the horizontal direction (see Figure 2). Two words could be found in each stimulus array located in a horizontal direction. The words, three or four letters in length, were prompted by cues (see Questionnaire VI).

Insert Figure 2 about here

Figure 2. Stimulus Arrays for Word Perception Test.

1. SADAUR
MNEADA
UMAYEW
TZSOVG
KECATV

6. JHSLGA
EOYAVN
NGOLDE
OJUDOG
YEXNED

2. ZLIPAO
SHJEAI
MIORED
AKIXEU
YHLGIM

7. DJRFSU
BOREYE
QSGFAJ
TXKTSN
KLIONH

3. WQJOKL
GEHBAC
ADJEAR
VFOXIM
RUKILZ

8. ICAPGQ
HPBLUE
AGAJEO
NOVDFX
EUDTEN

4. EWSYRD
VGARML
QVSCJR
FRUSIX
EDAKRP

9. TNDLEG
LHFDGQ
SLCIDP
NIPASL
KONEFC

5. ALSHOO
TOETVN
AWUZAE
CUOVMD
LROSEA

10. WJTNOS
DISCBQ
RVOPIK
AJULYE
UPIGEO

Each stimulus array was presented for ten seconds with a six-second interval in which to respond. Correct responses are shown in the WPT scoring key.

Physical description of PPT. It remains to describe the finished product of the PPT. A blue-grey background curtain appeared in all of the scenes. Both encoders were Caucasians, about 20 years of age, pleasant in appearance. The female had blonde hair and wore a pastel green sweater over a pink blouse. The male had medium brown hair and beard and wore a reddish-brown sweater.

Acknowledgment

I wish to thank Inta Guild for her assistance in the compilation of the tests, and also to acknowledge the cooperation of the Wired City Laboratory, Carleton University, Ottawa, in the preparation of the stimulus material.

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Scoring Key for Person Perception Test

Stimulus Number	Questionnaire Version I	Questionnaire Version II	Questionnaire Version III
1	7 6 5 4 3 2 1	6 0 2 0	6 0 2 0
2	7 6 5 4 3 2 1	0 0 8 0	0 0 8 0
3	1 2 3 4 5 6 7	2 0 6 0	2 6 0 0
4	7 6 5 4 3 2 1	0 0 8 0	4 0 4 0
5	7 6 5 4 3 2 1	0 6 2 0	8 0 0 0
6	1 2 3 4 5 6 7	2 0 6 0	0 6 2 0
7	1 2 3 4 7 6 5	8 0 0 0	0 0 8 0
8	5 6 7 4 3 2 1	4 4 0 0	6 0 2 0
9	1 2 3 4 5 6 7	2 6 0 0	4 4 0 0
10	5 6 7 4 3 2 1	6 0 2 0	2 0 6 0
11	5 6 7 4 3 2 1	0 0 8 0	0 0 8 0
12	5 6 7 4 3 2 1	2 6 0 0	0 4 4 0
13	1 2 3 4 5 6 7	0 4 4 0	0 0 8 0
14	7 6 5 4 3 2 1	0 0 8 0	0 0 8 0

Stimulus Number	Questionnaire Version I	Questionnaire Version II	Questionnaire Version III
15	5 6 7 4 3 2 1	8 0 0 0	8 0 0 0
16	5 6 7 4 3 2 1	0 8 0 0	0 0 8 0
17	5 6 7 4 3 2 1	2 0 6 0	6 0 2 0
18	7 6 5 4 3 2 1	8 0 0 0	0 0 8 0
19	1 2 3 4 7 6 5	8 0 0 0	0 2 6 0
20	7 6 5 4 3 2 1	4 0 4 0	0 0 8 0
21	7 6 5 4 3 2 1	6 2 0 0	6 2 0 0
22	1 2 3 4 5 6 7	0 0 8 0	0 0 8 0
23	5 6 7 4 3 2 1	4 2 2 0	0 2 6 0
24	1 2 3 4 5 6 7	6 2 0 0	4 4 0 0
25	5 6 7 4 3 2 1	8 0 0 0	4 0 4 0
26	5 6 7 4 3 2 1	4 0 4 0	0 0 8 0
27	1 2 3 4 5 6 7	0 8 0 0	6 0 2 0
28	1 2 3 4 5 6 7	0 0 8 0	0 0 8 0
29	5 6 7 4 3 2 1	4 0 4 0	6 2 0 0

Stimulus Number	Questionnaire Version I	Questionnaire Version II	Questionnaire Version III
30	7 6 5 4 3 2 1	8 0 0 0	8 0 0 0
31	1 2 3 4 7 6 5	2 0 6 0	2 0 6 0
32	1 2 3 4 5 6 7	6 2 0 0	6 2 0 0
33	5 6 7 4 3 2 1	8 0 0 0	8 0 0 0
34	5 6 7 4 3 2 1	0 0 8 0	0 0 8 0
35	7 6 5 4 3 2 1	8 0 0 0	8 0 0 0
36	5 6 7 4 3 2 1	8 0 0 0	8 0 0 0
37	1 2 3 4 7 6 5	8 0 0 0	0 8 0 0
38	7 6 5 4 3 2 1	2 4 2 0	2 0 6 0

Scoring Key for Word Perception Test

Stimulus Number	Cue	Correct Response
1	an animal a month	CAT MAY
2	a colour part of the body	RED LIP
3	part of the body an animal	EAR FOX (OX)
4	a number part of the body	SIX ARM
5	a flower part of the body	ROSE TOE
6	a metal an animal	GOLD DOG
7	part of the body an animal	EYE LION
8	a colour a number	BLUE TEN
9	a number part of the body	ONE LEG
10	a month an animal	JULY PIG

QUESTIONNAIRE I

Person Perception

In a moment you will view a videotape that contains very brief displays of feelings, reactions and emotions demonstrated by two people. You are asked to make judgments of these feelings, reactions and emotions shown in 38 scenes. On the pages which follow there are short descriptions of each scene. Here is an example:

40.		enjoying a discussion	??	___
	very			very
	appropriate	___ : ___ : X : ___ : ___ : ___ : ___		inappropriate

The number to the left corresponds to the scene. Please make certain that your responses in the questionnaire are in step with the numbers of the scene.

You are asked to judge the appropriateness of the short description written above the seven-point scale. You indicate your response by placing an in one of the seven positions on the scale. If you are not certain of how appropriate the description is for the scene, you may indicate this by placing an beside the "??". Please turn the page and wait for the video-tape to begin.

Name _____

1.

making a point in an argument

?? ____

very
appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very
inappropriate

2.

greeting a long lost friend

?? ____

very
appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very
inappropriate

3.

talking to a cheerful person

?? ____

very
appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very
inappropriate

4.

concerned about an ill friend

?? ____

very
appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very
inappropriate

5.

being introduced to someone

?? ____

very
appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very
inappropriate

6.

pleasantly surprised with a gift

?? ____

very
appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very
inappropriate

7.

waiting in a dentist's office

?? ____

very
appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very
inappropriate

8. about to try an exam ?? ____

very very
appropriate ____ : ____ : ____ : ____ : ____ : ____ : ____ : ____ inappropriate

[illegible]

10. having difficulty communicating ?? ____

very
appropriate : : : : : : : very
inappropriate

11. seeing someone assaulted ?? ____

very very
appropriate ____ : ____ : ____ : ____ : ____ : ____ : ____ inappropriate

12. trying to understand something ?? ____

 very very

appropriate ____ : ____ : ____ : ____ : ____ : ____ : ____ inappropriate

13. showing great relief ?? ____

very very
appropriate : : : : : : : inappropriate

14. told she has won a contest ?? ____

 very very
appropriate _____ : _____ : _____ : _____ : _____ : _____ : _____ inappropriate

15. wishing to express an opinion ?? ____

very
appropriate : : : ____ : ____ : ____ : ____ very
inappropriate

16. receiving criticism ?? ____

very
appropriate : : : : ____ : ____ : ____ very
inappropriate

17.

	told something unbelievable	?? ____
very appropriate	: : : : :	very inappropriate

18. trying to start a conversation ?? ____

very
appropriate ____ : ____ : ____ : ____ : ____ : ____ : ____ very
inappropriate

19. feeling physically exhausted ?? ____

very
appropriate ____ : ____ : ____ : ____ : ____ : ____ : ____ very
inappropriate

[illegible]

21. expressing affection for close friend ?? ____

very
appropriate ____ : ____ : ____ : ____ : ____ : ____ : ____ very
inappropriate

22.

feeling pity for another person

?? ____

very appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very inappropriate

23.

unwilling to cooperate

?? ____

very appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very inappropriate

24.

expressing jealousy

?? ____

very appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very inappropriate

25.

contemplating a philosophical question

?? ____

very appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very inappropriate

26.

being interviewed for a job

?? ____

very appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very inappropriate

27.

feeling lonely

?? ____

very appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very inappropriate

28.

relieved at having passed an exam

?? ____

very appropriate

____ : ____ : ____ : ____ : ____ : ____ : ____

very inappropriate

29.	mistaking someone's identity	?? ____
very appropriate	____ : ____ : ____ : ____ : ____ : ____ : ____	very inappropriate
30.	bored by conversation	?? ____
very appropriate	____ : ____ : ____ : ____ : ____ : ____ : ____	very inappropriate
31.	patiently explaining a point	?? ____
very appropriate	____ : ____ : ____ : ____ : ____ : ____ : ____	very inappropriate
32.	feeling very unlucky	?? ____
very appropriate	____ : ____ : ____ : ____ : ____ : ____ : ____	very inappropriate
33.	offered a unique opportunity	?? ____
very appropriate	____ : ____ : ____ : ____ : ____ : ____ : ____	very inappropriate
34.	insulted by a question	?? ____
very appropriate	____ : ____ : ____ : ____ : ____ : ____ : ____	very inappropriate
35.	threatened with a gun	?? ____
very appropriate	____ : ____ : ____ : ____ : ____ : ____ : ____	very inappropriate

36. introduced to an exciting person ?? ____

very very
appropriate ____ : ____ : ____ : ____ : ____ : ____ : ____ inappropriate

37. showing kindness towards an old person ?? ____

very
appropriate ____ : ____ : ____ : ____ : ____ : ____ : ____ very
inappropriate

38.

listening to bad news

?? ____

very
appropriate ____ : ____ : ____ : ____ : ____ : ____ : ____

very
inappropriate

QUESTIONNAIRE II

Person Perception

In a moment you will view a videotape that contains brief displays of feelings, reactions or emotions demonstrated by two people. Your task will be to judge what feeling, reaction or emotion has been demonstrated in each of 38 scenes. On the pages which follow there are classification choices offered to you. Here is an example:

40.

annoyed

surprised

n/a

???

The number to the left corresponds to the scene. Please make certain that your responses in the questionnaire are in step with the numbers of the scenes.

A scene may be classified one of four ways. Two descriptors are offered for each scene. In the example above, the two descriptors were "annoyed" and "surprised". If you felt that scene 40 could be classified one of these ways, you would place an **X** in the box which corresponds to your judgment of the best descriptor. It is possible that neither of those descriptors would be appropriate for that scene. If that were the case, then you might wish to indicate "neither appropriate" by placing an in the box marked "n/a". The remaining classification choice is the "???" which indicates that you are not certain of what was demonstrated in the scene.

Throughout this Person Perception task, your aim should be to achieve the highest possible overall score. For every correct choice, you gain two points, for every incorrect choice, you lose one point. Usually, one of the two descriptors is the correct choice, however, the "n/a" classification may also be the correct choice. If you select the "???" classification, you do not gain or lose points. Please turn the page and wait for the videotape to begin.

Name _____

correct = 2 points incorrect = -1 point ??? = 0 points

1.		irate displeased		n/a ???
2.		elated hospitable		n/a ???
3.		indignant distrustful		n/a ???
4.		pensive grieving		n/a ???
5.		intimidated contemptuous		n/a ???
6.		attentive thoughtful		n/a ???
7.		apprehensive indignant		n/a ???
8.		shy patient		n/a ???
9.		resentful jealous		n/a ???

correct = 2 points incorrect = -1 point ??? = 0 points

10.	☐	indignant	☐	n/a
	☐	angry	☐	???
11.	☐	dejected	☐	n/a
	☐	astounded	☐	???
12.	☐	pensive	☐	n/a
	☐	disgusted	☐	???
13.	☐	repulsed	☐	n/a
	☐	discouraged	☐	???
14.	☐	hopeful	☐	n/a
	☐	delighted	☐	???
15.	☐	outraged	☐	n/a
	☐	terrorized	☐	???
16.	☐	frightened	☐	n/a
	☐	loathing	☐	???
17.	☐	agitated	☐	n/a
	☐	menacing	☐	???
18.	☐	coy	☐	n/a
	☐	happy	☐	???

correct = 2 points incorrect = -1 point ??? = 0 points

19.	☐	worried	☐	n/a
	☐	alarmed	☐	???
20.	☐	bored	☐	n/a
	☐	contemptuous	☐	???
21.	☐	affectionate	☐	n/a
	☐	nervous	☐	???
22.	☐	annoyed	☐	n/a
	☐	sympathetic	☐	???
23.	☐	uncooperative	☐	n/a
	☐	sullen	☐	???
24.	☐	astonished	☐	n/a
	☐	startled	☐	???
25.	☐	worried	☐	n/a
	☐	bewildered	☐	???
26.	☐	coy	☐	n/a
	☐	shy	☐	???
27.	☐	horrified	☐	n/a
	☐	uneasy	☐	???

correct = 2 points incorrect = -1 point ??? = 0 points

28.	☐	relieved	☐	n/a
	☐	ashamed	☐	???
29.	☐	amused	☐	n/a
	☐	embarrassed	☐	???
30.	☐	bored	☐	n/a
	☐	brokenhearted	☐	???
31.	☐	angry	☐	n/a
	☐	impatient	☐	???
32.	☐	happy	☐	n/a
	☐	astonished	☐	???
33.	☐	perplexed	☐	n/a
	☐	sober	☐	???
34.	☐	resentment	☐	n/a
	☐	anxiety	☐	???
35.	☐	threatened	☐	n/a
	☐	worried	☐	???
36.	☐	affectionate	☐	n/a
	☐	agitated	☐	???

correct = 2 points incorrect = -1 point ??? = 0 points

37.	☐	seductive	☐	n/a
	☐	apprehensive	☐	???
38.	☐	bewildered	☐	n/a
	☐	offended	☐	???

QUESTIONNAIRE III

Person Perception

In a moment you will view a videotape that contains brief displays of feelings, reactions or emotions demonstrated by two people. Your task will be to judge what feeling, reaction or emotion has been demonstrated in each of 38 scenes. On the pages which follow there are classification choices offered to you. Here is an example:

40.

annoyed
surprised

n/a
???

The number to the left corresponds to the scene. Please make certain that your responses in the questionnaire are in step with the numbers of the scenes.

A scene may be classified one of four ways. Two descriptors are offered for each scene. In the example above, the two descriptors were "annoyed" and "surprised". If you felt that scene 40 could be classified one of these ways, you would place an **X** in the box which corresponds to your judgment of the best descriptor. It is possible that neither of those descriptors would be appropriate for that scene. If that were the case, then you might wish to indicate "neither appropriate" by placing an in the box marked "n/a". The remaining classification choice is the "???" which indicates that you are not certain of what was demonstrated in the scene.

Throughout this Person Perception task, your aim should be to achieve the highest possible overall score. For every correct choice, you gain two points, for every incorrect choice, you lose one point. Usually, one of the two descriptors is the correct choice, however, the "n/a" classification may also be the correct choice. If you select the "???" classification, you do not gain or lose points. Please turn the page and wait for the videotape to begin.

Name _____

correct = 2 points incorrect = -1 point ??? = 0 points

1.	☐	irate	☐	n/a
	☐	excited	☐	???
2.	☐	panic	☐	n/a
	☐	hospitality	☐	???
3.	☐	distrustful	☐	n/a
	☐	indignant	☐	???
4.	☐	brokenhearted	☐	n/a
	☐	sad	☐	???
5.	☐	cheerful	☐	n/a
	☐	unnerved	☐	???
6.	☐	envious	☐	n/a
	☐	afraid	☐	???
7.	☐	indignant	☐	n/a
	☐	apprehensive	☐	???
8.	☐	nervous	☐	n/a
	☐	shy	☐	???
9.	☐	resentful	☐	n/a
	☐	ashamed	☐	???

correct = 2 points incorrect = -1 point ??? = 0 points

10.	☐	angry	☐	n/a
	☐	indignant	☐	???
11.	☐	excited	☐	n/a
	☐	astounded	☐	???
12.	☐	repulsed	☐	n/a
	☐	joyless	☐	???
13.	☐	disgusted	☐	n/a
	☐	discouraged	☐	???
14.	☐	outraged	☐	n/a
	☐	delighted	☐	???
15.	☐	angry	☐	n/a
	☐	excited	☐	???
16.	☐	frightened	☐	n/a
	☐	ashamed	☐	???
17.	☐	threatening	☐	n/a
	☐	agitated	☐	???
18.	☐	happy	☐	n/a
	☐	coy	☐	???

correct = 2 points incorrect = -1 point ??? = 0 points

19.	☐	shy	☐	n/a
	☐	gloomy	☐	???
20.	☐	depressed	☐	n/a
	☐	contemptuous	☐	???
21.	☐	affectionate	☐	n/a
	☐	proud	☐	???
22.	☐	satisfied	☐	n/a
	☐	sympathetic	☐	???
23.	☐	content	☐	n/a
	☐	uncooperative	☐	???
24.	☐	astonished	☐	n/a
	☐	jolted	☐	???
25.	☐	worried	☐	n/a
	☐	bewildered	☐	???
26.	☐	confident	☐	n/a
	☐	shy	☐	???
27.	☐	overjoyed	☐	n/a
	☐	surprised	☐	???

correct = 2 points incorrect = -1 point ??? = 0 points

28.	☐	scornful	☐	n/a
	☐	mournful	☐	???
29.	☐	startled	☐	n/a
	☐	tormented	☐	???
30.	☐	bored	☐	n/a
	☐	repulsed	☐	???
31.	☐	outraged	☐	n/a
	☐	impatient	☐	???
32.	☐	amused	☐	n/a
	☐	astonished	☐	???
33.	☐	perplexed	☐	n/a
	☐	displeased	☐	???
34.	☐	relief	☐	n/a
	☐	anxiety	☐	???
35.	☐	threatened	☐	n/a
	☐	worried	☐	???
36.	☐	affectionate	☐	n/a
	☐	annoyed	☐	???

correct = 2 points incorrect = -1 point ??? = 0 points

37.	☐	nervous	☐	n/a
	☐	disbelieving	☐	???
38.	☐	fearful	☐	n/a
	☐	discouraged	☐	???

QUESTIONNAIRE IV

We are interested in the overall impressions that you have formed of the two persons who were shown in the videotape. Please place an **X** on the scale point which corresponds to your impression of the personality of the male in the tape.

relaxed	___	:	___	:	___	:	___	:	___	:	___	:	___	uneasy
unfriendly	___	:	___	:	___	:	___	:	___	:	___	:	___	friendly
intimate	___	:	___	:	___	:	___	:	___	:	___	:	___	distant
untrustworthy	___	:	___	:	___	:	___	:	___	:	___	:	___	trustworthy
agreeable	___	:	___	:	___	:	___	:	___	:	___	:	___	disagreeable
comfortable	___	:	___	:	___	:	___	:	___	:	___	:	___	uncomfortable
informal	___	:	___	:	___	:	___	:	___	:	___	:	___	formal
insensitive	___	:	___	:	___	:	___	:	___	:	___	:	___	sensitive
good	___	:	___	:	___	:	___	:	___	:	___	:	___	bad
personal	___	:	___	:	___	:	___	:	___	:	___	:	___	impersonal
cold	___	:	___	:	___	:	___	:	___	:	___	:	___	warm
emotional	___	:	___	:	___	:	___	:	___	:	___	:	___	unemotional
artificial	___	:	___	:	___	:	___	:	___	:	___	:	___	natural
confusing	___	:	___	:	___	:	___	:	___	:	___	:	___	understandable
unpleasant	___	:	___	:	___	:	___	:	___	:	___	:	___	pleasant
genuine	___	:	___	:	___	:	___	:	___	:	___	:	___	phony
unreliable	___	:	___	:	___	:	___	:	___	:	___	:	___	reliable
strong	___	:	___	:	___	:	___	:	___	:	___	:	___	weak
secure	___	:	___	:	___	:	___	:	___	:	___	:	___	insecure
boring	___	:	___	:	___	:	___	:	___	:	___	:	___	interesting
unsociable	___	:	___	:	___	:	___	:	___	:	___	:	___	sociable

N. B. Questionnaire V duplicated IV except that female preceded male.

QUESTIONNAIRE VI

Word Perception

In a moment you will be shown a videotape that contains ten arrays of letters which are six columns wide and five rows deep. The arrays are numbered individually, one to ten. By reading these letters horizontally in the usual fashion you may see some common words hidden in the rows as the example below illustrates.

J	C	O	W	K	E
M	P	N	S	U	F
F	I	V	E	Z	K
L	H	B	U	V	C
G	S	L	Y	E	T

Each array is displayed for only a few seconds. Your task will be to locate the hidden words which are suggested by the clues written to the right of the response space. Print the word in the same position in the response space as the word occupied in the row of the array. Thus, in the example below, FIVE is printed in the 2nd to 4th spaces.

eg.

F	I	V	E		

a number

	C	O	W		

an animal

Word Perception

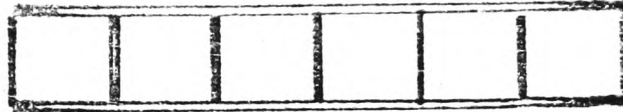
1.



an animal
- 

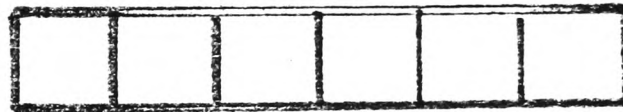
a month
2.



a colour
- 

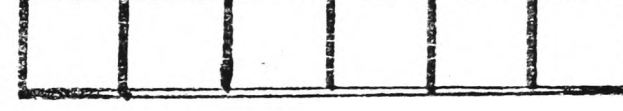
part of the body
3.



part of the body
- 

an animal
4.



a number
- 

part of the body
5.



a flower
- 

part of the body

6.



a metal



an animal

7.



part of the body

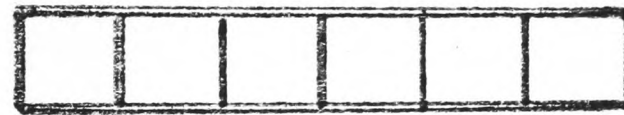


an animal

8.



a colour



a number

9.



a number



part of the body

10.



a month



an animal

Appendix C

International Arms Control and Disarmament Negotiations:
Procedure and Questionnaire Booklet

This negotiation procedure was adapted from a similar one adapted by Turnbull, Strickland and Shaver (1976)¹. It was devised in a manner that allowed persons without training in experimental methods to administer it in a controlled way, and to provide subjects with a meaningful and engaging experimental task. Instructions to subjects were audio recorded and printed in a booklet. Persons administering the experiment introduced the task but then intervened as little as possible with the programmed procedure.

Background information provided by the audio recording is shown on pages 1-3 (p.3 is a summary of negotiations between the two fictitious nations; the recording provided a detailed historical account). The recording then requested subjects to complete the prenegotiation questionnaire shown on pages 4-6 and continued with the briefing outlined on page 7. After 12 minutes of the negotiation session, subjects were informed that 3 minutes remained. The final recorded instruction asked subjects to complete the postnegotiation questionnaire as shown on pages 9-13. On completion, subjects were debriefed using a set procedure.

¹ Turnbull, A. A., Strickland, L. H., & Shaver, K. G. Medium of communication, differential power, and phasing of concessions: Negotiating success and attributions to the opponent. Human Communication Research, 1976, 2, 262-270.

NEGOTIATION EXPERIMENT

Today, you will be participating in an international arms control and disarmament negotiating session between two fictitious countries that shall be referred to simply as Nation A and Nation B. We are going to ask each of you to represent one of these countries at the disarmament talks today. Your task will be to role play the part of your nation's chief disarmament negotiator. In order to do this you will need to be briefed concerning the previous disarmament talks between Nation A and Nation B. It will be necessary for you to know the issues they discussed and their resolution. Accordingly, in a moment you will receive a briefing on the past ten years of arms control talks between the two countries.

Throughout today's negotiation session you will be asked to follow along in this booklet and proceed to subsequent pages only as you are told to do so. Hopefully, the written instructions in your booklet and the verbal instructions will be clear enough to enable you to follow along correctly.

You may begin by turning to page 2.

NAME: _____

Today you will be representing the nation shown on the card before you. As their chief disarmament negotiator it is extremely important that you understand the agreements reached in the past ten years, in order that you can later negotiate intelligently. It is also very important that you keep in mind your Nation's present ICBM (Intercontinental Ballistic Missile) level as you are being briefed. The present ICBM levels for each nation are:

Nation A	Nation B
968	954

Each ICBM has the destructive capability of 200,000 lives, and the population of each nation is approximately 100,000,000. Nation A and Nation B are nearly equal in terms of manpower, transportation, gross national product, GNP per capita, energy production, steel production and literacy. In other words, vis a vis each other, only the present ICBM levels are of central importance in determining each nation's military might. It should be added that for the past ten years the ratio of ICBMs between Nation A and Nation B has been approximately the same as it is now.

Remember, it is important to keep in mind your nation's and your adversary's military capability as you receive the historical account of the disarmament talks.

Page 3, to which you may now turn, contains an overview of the ten disarmament issues which have been extensively discussed in the post-World War II arms control talks. You may want to refer to this overview as you receive the briefing on the previous arms control and disarmament talks, which will be given by a student of International Affairs who has been closely following the talks between Nation A and Nation B.

ISSUES DISCUSSED AT EACH SESSION

1967	Nuclear Testing
1968	Military Bases on Foreign Soil
1969	Nuclear Free Zones
1970	Biological Warfare
1971	International Arbitrator
1972	Inspection Procedures
1973	Anti-ballistic Missiles
1974	Submarine Launched Ballistic Missiles
1975	Updated "Hot Line"

PRENEGOTIATION QUESTIONNAIRE

Your Nation _____

Nation A

968

Nation B

954

The purpose of this questionnaire is to see what expectations negotiators have about the up-coming talks prior to their taking place. Please respond to the questions on pages 4-6 now.

- 1. I would like to conclude this negotiation with a ____ % reduction of ICBMs for my nation and a ____ % reduction for the other nation.
- 2. I predict that my adversary would like to conclude this negotiation with a ____ % reduction of ICBMs for his own nation and a ____ % reduction for my nation.
- 3. I predict that, following this negotiation session, the reduction of ICBMs will be ____ % for my nation and ____ % for the other nation.

Obviously, many different factors contributed to the success or non-success of the previous talks. Since we are interested in some of these factors affecting negotiations, we would like you to state to what extent you think the factors listed on the following page influenced the negotiating outcomes. Out of 100 points please allot a certain number to each factor, with your total allotment of points equalling 100. If you do not think that a particular factor was at all important, you do not have to allot any points to it.

4. The other nation conceded to your nation on certain issues because of:
- a) its sincere desire for peace
 - b) your nation's persuasive negotiating
 - c) external considerations (i.e. national security, economic considerations, etc.)
 - d) characteristics of the communication setting for negotiation
 - e) chance

Total

5. Your nation conceded to the other nation on certain issues because of:
- a) its sincere desire for peace
 - b) the other nation's persuasive negotiating
 - c) external considerations (i.e. national security, economic considerations, etc.)
 - d) characteristics of the communication setting for negotiation
 - e) chance

Total

6. Below each nation several polar adjectives are listed. Please place an **X** on the scale point which corresponds to your feeling about the extent to which you think the adjectives describe your nation and your adversary.

Nation A

weak	___	:	___	:	___	:	___	:	___	:	___	:	___	strong
fair	___	:	___	:	___	:	___	:	___	:	___	:	___	unfair
cooperative	___	:	___	:	___	:	___	:	___	:	___	:	___	uncooperative
warlike	___	:	___	:	___	:	___	:	___	:	___	:	___	peaceful
good	___	:	___	:	___	:	___	:	___	:	___	:	___	bad
unresponsive	___	:	___	:	___	:	___	:	___	:	___	:	___	responsive
benevolent	___	:	___	:	___	:	___	:	___	:	___	:	___	uncharitable

Nation B

weak	___	:	___	:	___	:	___	:	___	:	___	:	___	strong
fair	___	:	___	:	___	:	___	:	___	:	___	:	___	unfair
cooperative	___	:	___	:	___	:	___	:	___	:	___	:	___	uncooperative
warlike	___	:	___	:	___	:	___	:	___	:	___	:	___	peaceful
good	___	:	___	:	___	:	___	:	___	:	___	:	___	bad
unresponsive	___	:	___	:	___	:	___	:	___	:	___	:	___	responsive
benevolent	___	:	___	:	___	:	___	:	___	:	___	:	___	uncharitable

turn to page 7

In a moment you will begin negotiating for bilateral ICBM reductions. You will have 15 minutes to reach an agreement. You must reach an agreement on a percentage reduction of ICBMs for each nation within this time period. Of course, the percentage reduction need not be the same for each country. Remember, a very large reduction might endanger your national security, yet, at the same time, a reduction of only 1-2% will benefit neither country.

As chief disarmament negotiator for your nation, you do not have to clear any proposal with other officials in your government. You have complete autonomy in decision-making and you alone are responsible to your country and its citizens. You are free to talk about anything you feel bears on the ICBM issue. However, please keep in mind the facts listed on the reference sheet (page 8). You may use the reference sheet as scratch paper during the negotiations.

Please begin the negotiation session now.

FACT SHEET

Present Armament Level:

Nation A		Nation B
968	ICBMs	954

- 1. Each ICBM has the destructive capability of 200,000 lives.
- 2. The population of each country is approximately 100,000,000 with urban and rural density the same.
- 3. You have the authority to accept or reject any proposal without checking with higher officials in your respective countries.
- 4. You are the only countries on the planet Earth with this number of armaments. At the moment, it is inconceivable that you would ever be threatened with an attack by a hostile third country.
- 5. You are negotiating for a one year period only.
- 6. During the negotiating session you will be working toward a certain percentage reduction of ICBMs for each country, which, of course, does not have to be the same for both Nation A and Nation B. Keep in mind that you should not go below a level detrimental to your country's national security, but that it is nevertheless advantageous to reduce the present level of ICBMs.

POSTNEGOTIATION QUESTIONNAIRE

The negotiation session is now finished. Would you please complete pages 9-13 which make up the postnegotiation questionnaire.

1. The other nation's final ICBM reduction was ____ %
and my nation's final ICBM reduction was ____ %
2. The other nation agreed to this ICBM reduction because of:
- a) its sincere desire for peace
 - b) my nation's persuasive negotiating
 - c) external considerations (i.e. national security, economic considerations, etc.)
 - d) characteristics of the communication setting for negotiation
 - e) chance

Total

3. My nation agreed to this ICBM reduction because of:
- a) its sincere desire for peace
 - b) the other nation's persuasive negotiating
 - c) external considerations (i.e. national security, economic considerations, etc.)
 - d) characteristics of the communication setting for negotiation
 - e) chance

Total

4. Below each nation several polar adjectives are listed. Please place an **X** on the scale point which corresponds to your feeling about the extent to which you think the adjectives describe your nation and your adversary.

Nation A

weak _____ : _____ : _____ : _____ : _____ : _____ : _____ strong

fair _____ : _____ : _____ : _____ : _____ : _____ : _____ unfair

cooperative _____ : _____ : _____ : _____ : _____ : _____ : _____ uncooperative

warlike _____ : _____ : _____ : _____ : _____ : _____ : _____ peaceful

good _____ : _____ : _____ : _____ : _____ : _____ : _____ bad

unresponsive _____ : _____ : _____ : _____ : _____ : _____ : _____ responsibe

benevolent _____ : _____ : _____ : _____ : _____ : _____ : _____ uncharitable

Nation B

weak _____ : _____ : _____ : _____ : _____ : _____ : _____ strong

fair _____ : _____ : _____ : _____ : _____ : _____ : _____ unfair

cooperative _____ : _____ : _____ : _____ : _____ : _____ : _____ uncooperative

warlike _____ : _____ : _____ : _____ : _____ : _____ : _____ peaceful

good _____ : _____ : _____ : _____ : _____ : _____ : _____ bad

unresponsive _____ : _____ : _____ : _____ : _____ : _____ : _____ responsive

benevolent _____ : _____ : _____ : _____ : _____ : _____ : _____ uncharitable

5. Please place an **X** on the scale point which corresponds to your feeling about the communication setting in which you have just negotiated.

relaxed	___ : ___ : ___ : ___ : ___ : ___ : ___	uneasy
friendly	___ : ___ : ___ : ___ : ___ : ___ : ___	unfriendly
unreliable	___ : ___ : ___ : ___ : ___ : ___ : ___	reliable
intimate	___ : ___ : ___ : ___ : ___ : ___ : ___	remote
untrustworthy	___ : ___ : ___ : ___ : ___ : ___ : ___	trustworthy
agreeable	___ : ___ : ___ : ___ : ___ : ___ : ___	disagreeable
comfortable	___ : ___ : ___ : ___ : ___ : ___ : ___	uncomfortable
informal	___ : ___ : ___ : ___ : ___ : ___ : ___	formal
insensitive	___ : ___ : ___ : ___ : ___ : ___ : ___	sensitive
rough	___ : ___ : ___ : ___ : ___ : ___ : ___	smooth
cold	___ : ___ : ___ : ___ : ___ : ___ : ___	warm
personal	___ : ___ : ___ : ___ : ___ : ___ : ___	impersonal
free	___ : ___ : ___ : ___ : ___ : ___ : ___	constrained
public	___ : ___ : ___ : ___ : ___ : ___ : ___	private
emotional	___ : ___ : ___ : ___ : ___ : ___ : ___	unemotional
cooperative	___ : ___ : ___ : ___ : ___ : ___ : ___	uncooperative
pleasant	___ : ___ : ___ : ___ : ___ : ___ : ___	unpleasant
hazy	___ : ___ : ___ : ___ : ___ : ___ : ___	clear
good	___ : ___ : ___ : ___ : ___ : ___ : ___	bad
unsatisfactory	___ : ___ : ___ : ___ : ___ : ___ : ___	satisfactory

6. (a) Do you feel that this communication system:

- i) Permitted the negotiators to conceal facial expressions?
not at all ____ : ____ : ____ : ____ : ____ : ____ : ____ a great deal
- ii) Contributed to the ease of agreement between the negotiators?
not at all ____ : ____ : ____ : ____ : ____ : ____ : ____ a great deal
- iii) Allowed you to ignore the requests made by the other negotiator?
not at all ____ : ____ : ____ : ____ : ____ : ____ : ____ a great deal
- iv) Created a sense of interpersonal contact between you and the other negotiator?
not at all ____ : ____ : ____ : ____ : ____ : ____ : ____ a great deal

(b) Compared with face-to-face negotiation, do you feel this communication system was:

greatly inferior ____ : ____ : ____ : ____ : ____ : ____ : ____ greatly superior

(c) Compared with telephone negotiation, do you feel this communication system was:

greatly inferior ____ : ____ : ____ : ____ : ____ : ____ : ____ greatly superior

(d) Did you feel close to or far from the other negotiator?

close to ____ : ____ : ____ : ____ : ____ : ____ : ____ far from

(e) Did you feel that you could understand the other negotiator's point of view?

not at all ____ : ____ : ____ : ____ : ____ : ____ : ____ a great deal

(f) Did you feel that the other negotiator could understand your point of view?

not at all ____ : ____ : ____ : ____ : ____ : ____ : ____ a great deal

7. A final page asked for "General Comments".

Teleconferencing and Leadership Emergence¹

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An attempt was made to assess the role of medium of communication on leadership differentiation in discussion groups. Groups of undergraduates met on five different occasions to solve human relations problems, either in face-to-face discussion situations or over video conferencing networks. In face-to-face conditions development of leadership took almost a classic form, with sociometric measures systematically related to behavioral indexes; in the video (teleconference) conditions, role differentiation tendencies were sharply curtailed, and the relationship of sociometric indexes with indexes of verbal output were greatly diminished. Speculations about how mediated communication may affect differentiation processes are offered.

INTRODUCTION

No lengthy documentation is needed to demonstrate that many of the important social psychological phenomena occur over periods of time longer or more frequent than the average laboratory experiment. Although the study of the dyad has its advantages in terms of control and manipulation, much of the "classic" social psychological experimentation (e.g., see Cartwright & Zander, 1953) has three features: (a) it has involved groups with more than two members, (b) these groups meet for more than one

¹The research reported here was supported by Research Contract No. Sp3-0123 from the Canadian Department of Communications.

²Requests for reprints should be sent to L. H. Strickland, Department of Psychology, Carleton University, Ottawa, Canada, K1S 5B6.

session, (c) the results seem to have more generality for "real world" events. One example of this sort of study involves the early work of Bales on the development of roles in problem-solving groups (for a summary, see Bales, 1958).

Early on, this work had clear implications for events outside the confines of the social psychological laboratory (e.g., Strodtbeck & Mann, 1956). From its inception it also had a prominent process component (Bales, 1950). Finally, it seems to have stood the test of time more successfully than most social psychological research. This seems a particularly appropriate context, then, to examine effects of mediated communication on group dynamics.

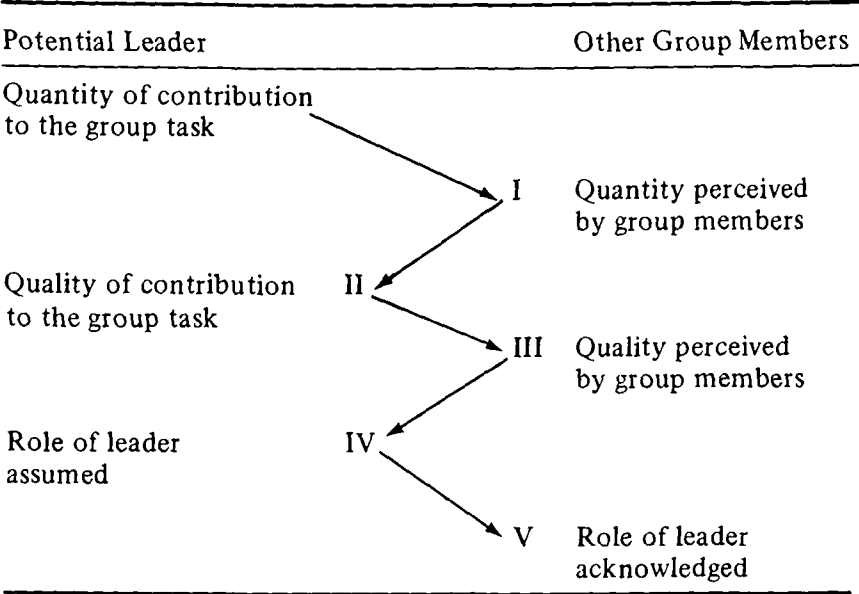
Although they still represent but a small proportion of research in social psychology, studies of the effects of mediated communication seem to be appearing with accelerated frequency. Some of this work has had a frankly descriptive and applied orientation (e.g., Dickson & Bowers, 1973; Williams, 1974; Chapanis, Ochsman, Parrish, & Weeks, 1972; Chapanis, 1975) in which the investigator generally focuses on changes in communications effectiveness that are attributable to changes in mode of communication (e.g., problem-solving in face-to-face interaction as opposed to audio, video, etc.). Another, somewhat smaller subset of studies has focused on *why* media effects often seem as strong as they do. This work has normally involved attention to such variables as nonverbal cues in interaction processes (for reviews, see Duncan, 1969; and Williams, 1977). No doubt, both the discovery of medium effects and specification of process variables will become more closely affiliated as opportunities for technologically mediated communication become as ubiquitous as they promise to be.

As promising as much of this work appears, however, it tends to suffer certain drawbacks. One observes that most experiments in this context involve a situation in which a subject interacts with another (a subject, an experimenter, or a confederate) either face-to-face or in another mode, for the duration of an experimental session, at the end of which some sort of measurement is taken; thus studies have generally been limited to the dyad and are generally no more than a single session in duration. The potential advantages of an "evolutionary" focus on mediated group dynamics, in the sense that they are represented in the leadership development process discussed above, become appealing.

LEADERSHIP AND NONVERBAL COMMUNICATION

In an attempt to reflect the results of previous research, Table I depicts a chronology of "natural" leadership emergence in task-oriented

Table I. A Chronology of Natural Leader Emergence in Task-Oriented Groups^a



^a I. Early in a group's problem-solving experience it is quantity of contribution that is most apparent to group members. If required to identify a leader at this point, quantity of ideas produced is the prime feature for discrimination (Bales, 1953; Bavelas, Hastorf, Gross, & Kite, 1965; Kirscht, Lodahl, & Haire, 1959; Morris & Hackman, 1969; Richardson, Mayhew, & Gray, 1969; Regula & Julian, 1973; Slater, 1955; Sorrentino & Boutillier, 1975).

II. With their verbal and nonverbal feedback the group communicates their acceptance of and support for the efforts of the most active member. The group reaction is perceived by this person (Pepinsky, Hemphill, & Shevitz, 1958) and his response is to generate even more ideas (Oakes, Droge, & August, 1960), which he states with greater confidence and power.

III. The contributions of the most effective group member, superior in both content and form, are perceived by the group (Stein et al., 1973; Stein 1975). Other members acknowledge the contributions via cues of social support, e.g., increased eye contact, and if required at this point to choose a leader, will use the quality of argument as a criterion for deciding leadership status (Burroughs et al., 1973).

IV. With the problem-solving task increasingly under his control (Bales, 1953; Bavelas, 1950; Howells & Becker, 1962), the most dominant group member assumes the role of leader.

V. Other group members are willing to acknowledge this role (Bavelas et al., 1965; Burroughs et al., 1973; Stein, 1975) and the process continues, gaining consensus and stability with an increase of task-related experience (Bavelas et al., 1965; Oakes et al., 1960).

groups. If the emphasis is placed upon mode of interaction between the emerging leader and other group members one can infer why a difference between video-mediated and face-to-face groups would be predicted. Video-mediated group members would have visual contact with each other but would, because of camera placement, normally lack eye contact (see Figure 1). It is known that eye contact is an extremely important channel for interpersonal influence (Kendon, 1967; Argyle & Cook, 1976) and that it may play an important part in leadership emergence (Burroughs, Schultz, & Autrey, 1973; Stein, Geis, & Damarin, 1973; Stein, 1975). We suppose that without eye contact a potential leader would have reduced social feedback in the form of nonverbal cues (NVC) and thus would not experience as much normally supportive reaction to his ideas. Moreover, reduced NVC among other group members might be expected to impair the evolution of consensus as to which group member is producing the best ideas. It has been demonstrated that when eye contact is possible NVC may be effectively communicated via video systems (Shea & Rosenfeld, 1976). However, other research has suggested that even with a semblance of eye contact subjects interacting via video systems may be less concerned about the influence attempts of others, and that this may occur because of a reduction in perceived interpersonal dominance, potency, and assertiveness when interaction is via video systems (Guild, 1976). One would expect this effect to be exaggerated when the video system does not permit eye contact; interactions with visual plus audio contact (but not eye contact) may be worse than audio contact alone, owing to a disruption of the regulatory function of gaze when visual cues are present but ambiguous (Short, Williams, & Christie, 1976). Comparing face-to-face and telephone interactions, Stephenson, Ayling, and Rutter (1976) concluded that without visual communication, interactions tend to be task-oriented and depersonalized. The present study yielded an occasion to make salient an important distinction between visual contact and eye contact (mutual gaze), the former showing greatest similarity to an audio-only link and the latter showing greatest similarity to face-to-face encounters.

Thus the major hypothesis of this study is the prediction that video-mediated groups would have less dramatic leadership emergence than would face-to-face groups, as reflected either in behavioral indexes, or in sociometric indexes, or in both. Moreover, it was expected that a lack of leadership stability would be found across experimental sessions in the teleconference groups, while stabilization of leadership emergence over sessions would appear in the face-to-face groups.

The present study employed a procedure that was partially patterned after that of Bales (1958). Groups met a number of times to try to reach solutions to some human relations problems; they met either face-to-face or

over video networks. Records were kept of certain behavioral measures, and an attempt was made to relate these to several sociometric measures.

METHOD

Subjects

Forty male undergraduates volunteered to take part in an experiment on "Group Problem Solving" in the Wired City Simulation Laboratory at Carleton University. For their participation subjects received course credit in an introductory psychology course and payment at the rate of \$3.00 per session hour.

Procedure

Subjects were assigned randomly to 10 groups of four persons which met once a week for 5 weeks. Five of these groups communicated face-to-face while seated around a 4 X 5 foot table. A television camera inconspicuously located across the room permitted the videotaping of these groups. The other five groups communicated in a "teleconference" condition, in which each group member was situated at one of four interactive communication nodes. From the node and over separate monitors each subject had audio and video contact with each of the other members of his group. In each session group members were assigned randomly to one of the four nodes. Since closed-circuit television was the medium of communication, it was a simple matter to videotape the discussions of each group and then replay the sessions later to monitor activity indices, that is, the frequency and duration of interaction attempts. Figure 1 depicts a communication node as used in this experiment.

The task was for each group member to read a human relations problem and then to discuss it with other group members. The five problems were selected not because they have a single or accepted solution, but because they would spark lively interaction focusing on "true-to-life dilemmas." The order of presentation of these problems was randomly determined for each of the 10 groups. In all cases the group discussed one problem for about 20 to 30 minutes at each session. Following a discussion, group members anonymously ranked each other along the following dimensions: (1) the quantity of ideas in the just-completed discussion; (2) the quality of ideas in the just-completed discussion; (3) whom they would most

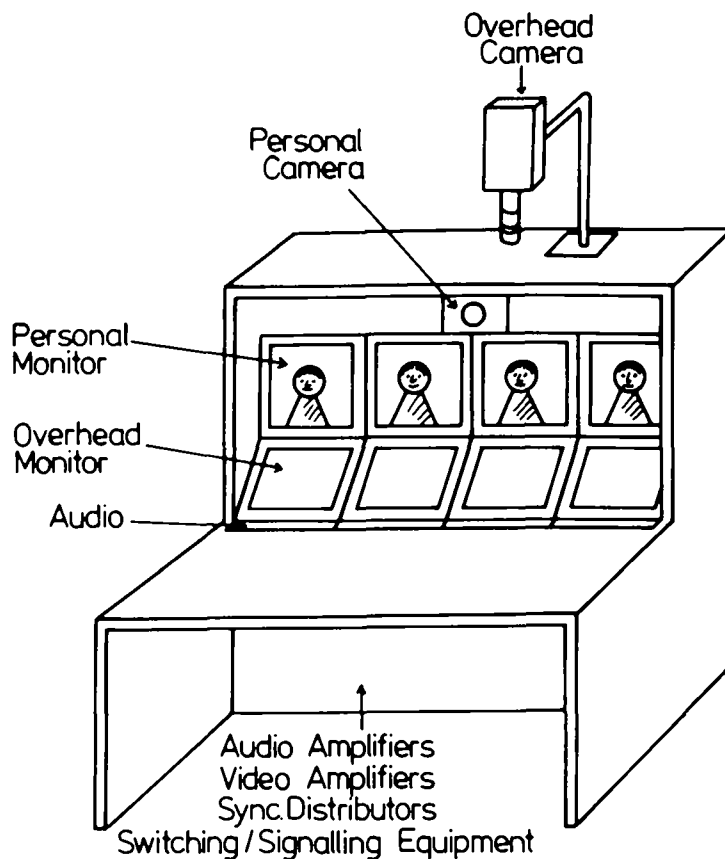


Fig. 1. Teleconference node.

like to work with again on a similar problem.^{3,4}. Subjects did not receive feedback from the experimenter as to how their performance had been rated by their fellow members of the group.

RESULTS

Two behavioral measures of interaction were employed: frequency of interaction attempts and the duration of these attempts. These scores were calculated by coders who viewed videotapes of each session. Video-mediated participants tended to have lower scores on both measures, but the effects were not strong enough to meet the usual significance criteria. Video-mediated subjects spoke a mean of 5.5 minutes per session with a mean interaction frequency of 56.75, while face-to-face subjects spoke 7.26 minutes, with a mean frequency of 72.83. These differences fall just short

³Both Turk (1961) and Marcus (1960) have long since pointed out the ambiguities which might arise from using "likeability" as this third index.

⁴Content-analytic procedures are presently being developed so as to make more use of actual behavioral measures, available from video tapes.

of significance for both duration [$F(1, 38) = 3.14, p < .08$] and frequency [$F(1, 38) = 2.95, p < .09$].

It was not meaningful to test for mean differences in the sociometric scores since these were based on ranks.

Degree of Role Differentiation

In order to assess the degree of role differentiation, the variance of the individual scores within each group was computed for each session. Analysis was then performed using these variances as the data points. The rationale for this measure might best be explained by illustrating it with the example of the speaking duration score. If a strong leadership hierarchy does emerge in a group and if leadership is dependent upon talking, some members will tend to monopolize the discussion while the lower-status members will remain relatively silent, leading to a high variance of interaction in that group. In a group with no role differentiation the discussion time will be more equitably shared and the variance will be low.

A summary of the analysis of these role differentiation indicators is presented in Table II. The direction of the difference was the same for all measures, i.e., less within-group variance under mediated conditions. The effect was strong for both behavioral measures, but for only one of the sociometric measures, namely, preferability. The possible significance of this pattern of results will be discussed below.

Examination of Figure 2 shows how, in face-to-face conditions, graphs relating sociometric data to behavioral data closely resemble those displayed by Bales (1958). The resemblance seems not to be diminished because we employed four-man, not five-man groups, and because we employed "future partner preference" in place of "liking." These effects evidence a dramatic disappearance for the mediated communication groups.

Table II. Variances of Scores Within Groups (Averaged over Sessions)^a

	Frequency	Duration	Quantity	Quality	Preferability
Mediated	5.27	2.97	3.88	3.65	2.91
Face-to-face	13.78	8.80	4.96	4.01	4.24
$F(1, 8)$	4.98	8.08	2.73	.47	7.03
p	.06	.02	.14	.51	.03

^aFor this analysis, a variance score was computed for each group of subjects and became the datum for a one-way ANOVA for each of the five dependent variables. F and p values shown are those associated with specific ANOVAs and thus do not represent a ratio of the average variances themselves.

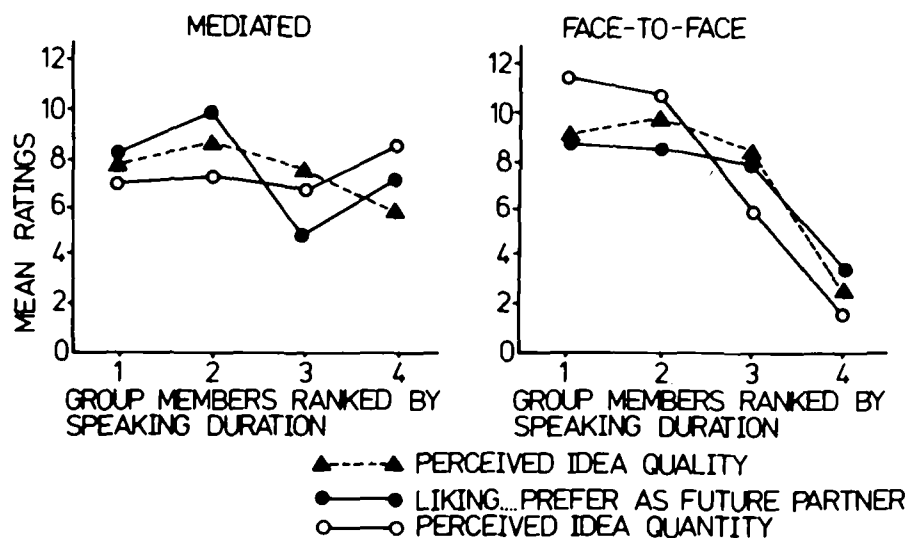


Fig. 2. Sociometric leadership indices and interaction.

Stability of Roles over Sessions

One may also ask whether or not any existing leadership hierarchy remains stable over time. This was assessed by computing a coefficient of concordance on the ranks of the members in each group over the five sessions. With five groups in each condition and five dependent measures to be assessed for stability, 25 values of *S* were computed for each condition. In face-to-face groups 19 of the *S* values were significant (i.e., reached a critical value of 62.6 for *K* = 5, *N* = 4 and *p* < .05) with an average value of 72.1. Of the video-mediated groups, only four reached this value with an average *S* value of 33.7. There is less session-to-session consistency in both performance of and attribution toward group members in the mediated communication treatment.

Figure 3 shows the mean variance in group-member rankings over five sessions. Member performance varied more across sessions in the mediated groups than in the face-to-face groups. This was true for each of the five dependent variables. An overall “leadership score,” a composite of rankings on the five measures, was calculated for each of the four subjects, in each group. The data were searched across variables and sessions to identify the overall “best” and “worst” group members, using this score. The differences between highest and lowest scores were examined for each session, as shown in Figure 4. Clearly, these differences were greater for face-to-face groups, and statistical analysis established that the differential was reliable (paired *t* = 3.24, *df* = 4, *p* < .05, two-tailed test). The figure also shows that the leadership role was reasonably *stable* and no more pronounced with increased group experience. In fact, there is a slight tendency towards a

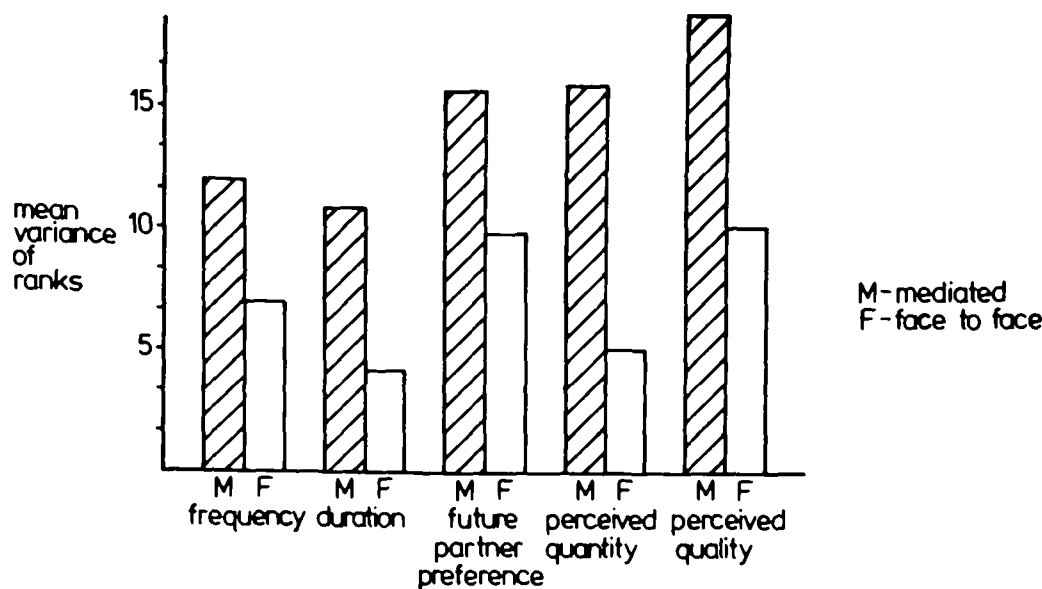


Fig. 3. Variability in leadership indices over sessions.

lowering of the “leadership index” in the fifth session, and this is in contradiction to step five of the “chronology of natural leader emergence in task-oriented groups” (see Table I). Since our index was derived from ordinally scaled data, Figure 4 provides no indication of possible absolute differences in leader performance.

It was possible that a node effect might have accounted for the lack of stability in the hierarchy of video-mediated groups, since participants were assigned randomly to the nodes of the system at the start of each session. This possibility was also tested with coefficients of concordance. This time,

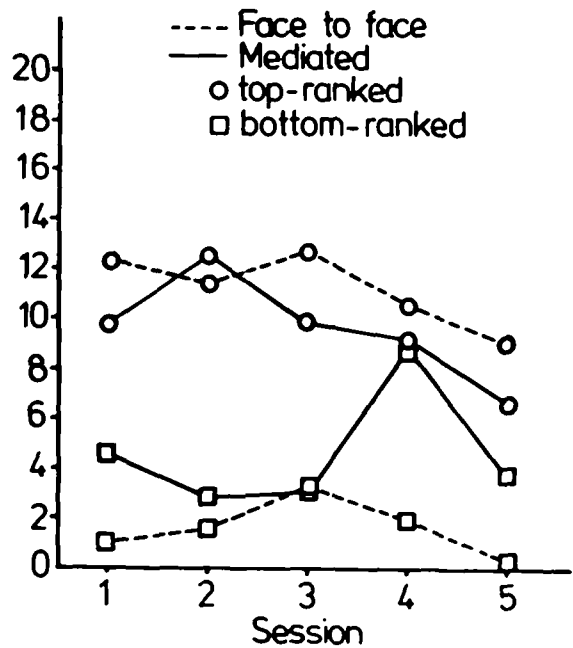


Fig. 4. Average composite scores for top- and bottom-ranked subjects in each group.

however, rankings were assigned to the nodes rather than group members. Only two of the 25 analyses showed significant stability and it was not even the same node in both instances. Thus, it is possible to disregard a systematic node effect as an explanation for the results.

Intercorrelations of Measures

The final analysis was an assessment of estimated variance shared by the five dependent measures. The values of r^2 appear in Table III with face-to-face groups presented above the diagonal and mediated groups below the diagonal. A clear pattern is apparent. The behavioral measures shared more variance with the sociometric scores in the face-to-face groups, as shown in the first two rows above the diagonal. The communality is essentially missing in mediated groups, as indicated in columns 1 and 2 below the diagonal.

In the face-to-face situations the "preference to work with the other again" shared the greatest variance with quality (74%) and not quantity of ideas (60%), which may suggest the higher-order evolution in the chronology of leader emergence in these groups than in mediated groups, where the "preference" index shared only a moderate but equal portion of the variance with perceived idea quality and quantity (26%). With the mediated groups the communality of actual duration of interaction and perceived quantity of ideas was 50%, whereas with the face-to-face groups it was considerably stronger (72%). Speaker contribution to values of this index, while still discernible in the mediated interactions, was less obvious than in face-to-face situations. Perhaps of greatest significance, communality of variance between duration of participation and *quality* of ideas contributed was a respectable 62% in face-to-face conditions but only 8%

Table III. Estimates of Variance Shared by Dependent Variables^a

	1	2	3	4	5
1. Frequency of interaction	—	.53	.55	.40	.36
2. Duration of interaction	.12	—	.72	.62	.52
3. Perceived idea quantity	.06	.50	—	.66	.60
4. Perceived idea quality	.00	.08	.23	—	.74
5. Future preferability	.04	.06	.26	.26	—

^a Values of r^2 for face-to-face groups appear above the diagonal; for mediated groups, they appear below.

in mediated conditions. With mediated interactions, the usual relationship between the amount spoken and the quality of contribution either was not apparent or did not exist. The degree of association among the sociometric indexes was generally much lower in mediated groups ($\bar{X}$ of 25%) as compared with face-to-face groups ($\bar{X}$ of 67%). In fact, the overall association strength among all dependent variables was merely 16% in mediated groups but 57% in face-to-face groups. This is taken to support our hypothesis that group consensus with respect to indexes of leader emergence was less formed in the mediated groups as compared with face-to-face.

DISCUSSION

The results of this study may be summarized as follows: (1) a behavioral hierarchy emerged and maintained itself in face-to-face groups to a significantly greater extent than in mediated groups; (2) attributions of idea quality and attractiveness were related to behavioral measures of interaction quantity in face-to-face groups but not in mediated groups; (3) attributions of idea quantity, quality, and attractiveness, while related to one another in both conditions, were much stronger in the face-to-face conditions. Intra-group processes were strongly affected by the communication medium context.

At this point, any attempts to find a theoretical explanation for these results must, of necessity, be branded as highly speculative. Nevertheless, it may be worthwhile to offer some hypotheses as a guide to future research.

One possibility is that the context of mediated communication reduced the interpersonal cues (both verbal and nonverbal) to the extent that individuality of each group member is less salient to the participants. The chronology in Table I, which has suggested the manner in which subtle interaction processes contribute to the evolution of a leader, may be usefully recalled here. Previous research has shown that if externally imposed restrictions are placed upon idea generation (e.g., structured turn-taking), the salience of participation differentiation is obscured. Potential leaders simply have less opportunity to have their superior contributions recognized (Richardson et al., 1969). Moreover, the concept of "formality" (defined in terms of availability of social cues) in the use of communication systems may be pertinent (Morely & Stephenson, 1969, 1970). As an independent variable, "formality" has been manipulated both in terms of communication medium and restraints upon verbal interaction. Such restraints seem to increase the focus on *task* while decreasing attention to *interpersonal processes*. The video-mediated groups in the present study seemed to interact with similar restraints arising from the communication medium. To amplify

this interpretation of our results, we draw attention to (a) the apparent reduction of interpersonal consensus (with respect to leadership emergence) and (b) the apparent increase in focus upon the task (less time to arrive at a task solution). More recently, comparisons of face-to-face and telephone interactions have generated conclusions as follows: "visual communication has three main effects upon the content of exchanges: it encourages spontaneity and, hence, a more wide-ranging discussion, while at the same time promoting the adaptation of conventional role relationships by the participants" (Stephenson et al., 1976). From the present study, we would suggest that this statement is most appropriate for visual communication that permits interpersonal social influence, especially by way of mutual gaze and nonverbal cues. Our mediated groups had visual contact, of course, but not eye contact among group members. Unless contributions and influence attempts are clearly associated with specific people, no hierarchy can result.

Finally, we should discuss one of the variables, examination of which was seen as an advantage of this study, namely, adaptation to the mediated situation over time. We find no evidence that the mediated groups changed their behavior on any of our measures over sessions. This does not mean that adaptation cannot or does not occur. We may not have measured the relevant dimensions or provided enough experience with the system to allow the adaptation process to occur. Much longer and more sensitive studies are clearly required, particularly as the forecast improvements in video communication technology become actualities; however, it is clearly suggested here that the evolution of leadership structures, at least, may be radically affected by technological mediation of member interaction.

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BIOGRAPHICAL NOTES

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