SPEECH COMMUNICATION IN THE OFFICE: THE EFFECTS OF BACKGROUND SOUND LEVEL AND ACOUSTICAL PRIVACY

by

CHEUK FAN NG
B.A., University of Manitoba, 1981

A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS

In the Department
of
Psychology

ACCEPTED
[redacted] STUDIE
DEAN
DATE Mar 25, 83

We accept this thesis as conforming
to the required standard

[redacted]
Dr. Robert Gifford

[redacted]
Dr. Ronald Rappe

[redacted]
Dr. Douglas Porteous

Supervisor: Professor Robert Gifford

ABSTRACT

Noise and lack of conversational privacy are major sources of dissatisfaction in contemporary offices with open plan designs. To attenuate the adverse effect of noise and to improve conversational privacy, music, constant humming or other artificial sounds have been introduced into offices. However, the impact of these sounds on office workers has not been adequately assessed.

The present study explores the effects of background sound level and acoustical privacy on the quality of and amount of speech communication in the office setting.

Speech communication is an essential activity in the office. Background sounds may interfere with or even block conversation if they are too loud or distracting. Yet moderate sounds can reduce the fear that a personal or confidential conversation will be overheard, thereby facilitating communication.

A 3 (Sound level) x 2 (Privacy) factorial design was used in this study. The dependent measures were Satisfaction

(measured by a self-report scale) and Amount of Speech (measured in terms of the amount of time spent conversing and the number of words spoken). The background sound (music) level was varied at mean levels of 38, 53 and 65 dBA and acoustical privacy was manipulated by the presence or absence of a "typist".

Participants were recruited from the general public to role-play job applicants in a job interview situation in a simulated office setting.

Sound Level and Privacy both significantly affected Satisfaction with speech communication. Satisfaction was significantly lower when the sound level was low. Lack of privacy apparently lowered Satisfaction in the low sound level condition only, suggesting that participants were afraid of being overheard. Amount of Speech was not significantly affected by either Privacy or Sound Level.

The difference in results of behavioral and verbal measures of communication suggests that there is a discrepancy between what people believe to be the impact of their environment on them and their actual behavior. An alternative explanation could simply be that the behavioral measures used in this study are not sensitive enough to detect the difference. The interview topics may not have

been sufficiently confidential to elicit reductions in the amount of participants' speech.

Examiners: [redacted]

Dr. Robert Gifford

[redacted]

Dr. Donald Hoppe

[redacted]

Dr. Douglas Porteous

[redacted]

CONTENTS

TITLE PAGE i

ABSTRACT ii

TABLE OF CONTENTS v

LIST OF TABLES vii

LIST OF FIGURES viii

ACKNOWLEDGMENT ix

page

INTRODUCTION 1

Speech Communication in the Office 1
Satisfaction and Productivity of Office Workers 3
Acoustical Environment 4
The Open Plan Office 5
Music and Sound Conditioning in the Office . 6
Interference with Speech Communication by Noise 9
Definition of Noise 9
Speech Masking 9
Effects on Speech Communication 11
Noise Level 12
Acoustical Privacy 14
Conversational or Confidential Privacy . . . 14
Adaptive Behaviors 16
Conflict between Communication and Privacy . . 17
Personality Traits 19
Summary 19

METHOD 22

Experimental Design 24
Subjects 24
Equipment and Material 24
Procedure 27

RESULTS 31

Satisfaction Scale 31
Amount of Speech 31
Score on Need for Affiliation 32
Satisfaction with Speech Interaction 32
Amount of Speech in the Interview 34
Correlation between Satisfaction and Amount of Speech 35

DISCUSSION 36

REFERENCES 46

APPENDICES 55

LIST OF TABLES

Table page

1. Means and Standard Deviations of Satisfaction Scores. 41
2. Tests of Significance for Satisfaction. 42
3. Means and Standard Deviations of Amount of Speech . . 43

LIST OF FIGURES

Figure page

1. Model Relationship between Quality of Speech Communication, Noise Level and Talker-to-Listener Distance 12

2. Hypothesized Relationship between Satisfaction/ Amount of Speech and Background Sound Level and Privacy 20

3. Satisfaction with Acoustical Environment as a Function of Background Sound Level and Acoustical Privacy (Item 1) 44

4. Satisfaction with Acoustical Environment as a Function of Background Sound Level and Acoustical Privacy (Item 7) 45

ACKNOWLEDGMENT

I acknowledge the Sara Spencer Research Foundation for its financial support of this project.

May I express my gratitude to Dr. Gifford, my supervisor. His advice and general guidance were, of course, invaluable to the completion of this thesis. But without his unceasing encouragement and friendliness, this exercise would have been an even harsher ordeal. He is not only a teacher to me, but a friend as well.

I wish to thank Dr. Hoppe and Dr. Porteous for their comments as well.

I would also like to thank Mrs. Gail Woods for conducting the interviews.

A word of thanks must go to several fellow students and personnel of various departments on campus for their advice and assistance in recording and other technical problems.

INTRODUCTION

The present study explores the effects of background sound level and acoustical privacy on the perceived quality of and objective amount of speech communication in the office setting.

Speech Communication in the Office

One essential office activity is speech communication, including telephone conversations, interviews, giving and receiving instructions and discussions. The interaction may be either face-to-face or mediated by electronic devices; work-oriented or merely casual conversation among co-workers (Parsons, 1976).

Office workers spend a substantial amount of time in speech communication. For example, Chapanis (1971), citing Klemmer's (1970) analysis of the daily work activities of 3000 employees at the Bell Telephone Laboratory, reported that 43% of their work time was spent in speech communication (including 35% in face-to-face communication and 8% in telephoning). The clerks in Mercer's (1979) study spent an average of 40% of their total time (60% of their

time in the office) in talking about work and talking socially. Fucigna (1967) studied the day-to-day activities of three adminstrative employees and reported that 40% of their time was spent on discussions and the phone.

Communication among employees and clients is one of the basic foundations of both employee satisfaction and organizational effectiveness. Effective communication requires faithful transmission of the content from the sender to the receiver (Mitchell, 1978). Obviously, anything that blocks or distorts the reception of a message reduces the quality of interaction and may lower the motivation to converse.

In normal circumstances, oral communication is more efficient than written communication. Chapanis, Ochsman, Parrish and Weeks (1972) found that problems were solved over twice as quickly in face-to-face communication as in type- written communication. More specifically, speech communication is a valuable organizational behavior worthy of study. And yet, actual speech communication in the office has not been studied in any systematic manner.

Satisfaction and Productivity of Office Workers

The impact of physical environmental factors on the satisfaction and productivity of office workers represents a relatively new area of research. A national survey conducted in the United States (Louis Harris & Associates, 1978) reported that 70% of the office workers attributed the improvement in the quality of working life over the last ten years in part to a better office environment. A great majority (92%) perceived a connection between their personal satisfaction with their office surroundings and their performance.

The design professions have introduced various innovative concepts in office design, such as the open-plan office, piped-in-music and, more recently, sound conditioning. However, the underlying assumptions about users' behaviors in relation to their design products have rarely been evaluated. Manning (1965, cited in Brookes & Kaplan, 1972) wrote , "At present, design decisions affecting the social environment of office buildings are made almost entirely on the basis of expectation or personal prejudice, rather than knowledge (p. 389)". This statement, though nearly twenty years old, perhaps still describes today's situation.

Acoustical Environment

Technological advances, including dramatic increases in the number of new office machines, have significally altered the acoustical environment of offices in the last thirty years. The acoustical environment of an office should ideally satisfy three conditions (Bains, 1976; Lewis & O'Sullivan, 1974):

1. Speech communication: face-to-face and telephone communication must be clearly understood by the people involved.

2. Normal (acceptable) speech privacy: the environment should allow reasonable freedom from distracting sounds (Cavanaugh, Farrell, Hirtle & Watters, 1962).

3. Confidential speech privacy: the environment should allow private conversations to be carried out without being overheard (Cavanaugh et al., 1962).

Some surveys suggest that contemporary offices fall far short of these ideal requirements. For example, 41% and 23% of the office workers in the Louis Harris and Associates (1978) survey believed that the ability to concentrate without noise and other distractions and conversational privacy to be the first and fourth priorities for an office to function effectively. Yet they rated their own work environment the lowest on these two items (among 17 items).

The Open Plan Office. In particular, dissatisfaction with the acoustical environment has been the major complaint from employees working in open-plan offices. The open-plan office, which originated in Germany in the middle 1950s, has become increasingly popular and is gradually replacing the private solid-walled office. About 80% of the executives and design professionals in the Louis Harris and Associates study (1978) felt that open-plan offices will be more common than conventional offices by the end of the 1980s. Proponents of the open office claim that its major advantages are flexibility in the workplace arrangement, enhanced communication and social interaction, lower cost and improved environmental conditions such as greater access to windows [Boje, 1971 (cited in Boyce, 1974)].

Despite these alleged advantages, the majority of subsequent surveys of employees working in these offices (e.g., Becker, Gield, Gaylin & Sayer, 1982; Brookes & Kaplan, 1972) and post-occupancy evaluations (e.g., Hedge, 1981; Nemecek & Grandjean, 1973) indicate that noise disturbance, lack of visual and auditory privacy and distractions from work can be major flaws in these offices. For example, 35% of the 519 employees in the Nemecek and Grandjean (1973) survey of 15 different open-plan offices in Switzerland reported severe disturbance by noise while 45%

reported slight disturbance. Apparently, the prime sources of noise disturbance are conversation (Boyce, 1974; Hedge, 1981; Nemecek & Grandjean, 1973) and office machines (Hedge, 1981; Nemecek & Grandjean, 1973). A few studies (e.g., Sundstrom, Herbert & Brown, 1982) have reported no increase in perceived noise after relocation to an open plan office.

Music and Sound Comditioning in the Office. One approach designed to attenuate the adverse effect of disturbing noises is to mask these noises with constant humming or "acoustic perfume", such as those made by ventilation equipment or by piping in music (Bell, Fisher & Loomis, 1976; Mackenzie, 1975).

Silence, at the other end of the sound continuum, can apparently be excessive too. For example, some managers in Goodrich's (1982) survey who worked in private offices explained that they did not have enough privacy because the background was too quiet. A survey of 11 landscaped offices in England (Keighley, cited in Keighley & Parkin, 1979) showed that background noise from office activities can have a useful masking effect. Where there was a relatively high office background noise level (about 50 dBA), about 80% of the respondents were satisfied with the acoustic climate as far as freedom of distraction from distant conversation and their own conversation being overheard are concerned. The

authors suggest that, where the naturally occurring background noise is not high enough or sufficiently continuous to provide a stable masking effect, a scund conditioning system should be introduced to provide the office with, as examples, steady humming or nature sounds (Keighley & Parkin, 1979; Pile, 1977) or music (Kryter, 1970).

In other words, piped-in-music, humming or nature scunds can apparently serve two purposes:

1. To mask unpleasant, distracting sounds in the office such as sounds made by office machines, movement of furniture, and outsiders' conversation, etc., and

2. To provide office workers with conversational or confidential privacy.

However, user reactions to sound conditioning systems in actual offices indicate that this approach may not be as effective as anticipated. For example, in the Warnock (1973) field experiment, electronic masking sounds at different intensity levels (45-51 dBA, excluding normal office noises and conversation but slightly higher than the ambient sound level) were introduced intc an office section. To his surprise, the office workers unequivocally rejected the electronic masking system and preferred the quieter "unconditicned" office, indicating that the masking scund was an unwarranted intrusion.

Similar reactions were expressed by office workers in the Keighley and Parkin (1979) experimental study of sound conditioning in which random noises, waterfall sounds and office noises were introduced into a small landscaped office. These office workers preferred to work in an office without sound conditioning. In another experiment, Warnock (1973) increased the level of masking sounds gradually without making the occupants aware of the change. When the level reached about 47 dBA, the sounds were noticed and complaints were made about them. Edwards and Kowalewski (1975) also reported overall levels of background sound system above 48 dBA to be objectionable.

The findings of these studies suggest the possibility that these humming, "natural" or musical sounds that are introduced into offices to mask other disturbing office noises may, in fact, interfere with certain office activities. One obvious candidate for these activities is speech communication, which is, as described earlier, an essential activity in the office. As Mackenzie (1975) suggests, annoyance with noise may be an expression of frustration over the disruption of tasks or interference with speech communication. Under these circumstances, the introduced sound becomes a noise, which is frequently defined as an unwanted sound.

Interference with Speech Communication by Noise

Definition of Noise. The definition of noise as an unwanted sound presents a problem because it incorporates a subjective evaluation. One person's music may be another person's noise. To clarify this problem, Landy and Trumbo (1980) use the term "sound" to refer to any auditory stimulus, and define noise as irrelevant sound, that is, any sound which is irrelevant to the task at hand. Thus, any irrelevant sound, whether it is a telephone ring, a bang on the door or even music, is a noise when people are attempting to communicate.

Speech Masking. One of the ways in which noise can interfere with speech communication is through direct masking of the message by noise (Dunn, 1981). Masking is defined as interference with the perception of wanted sounds by unwanted sounds. Its effectiveness is measured in terms of degradation of the intelligibility of speech in the presence of noise.

The existing literature on speech masking by noise has focused on the identification of physical variables that are most detrimental to the perception of sound (e.g., noise intensity level, noise frequency spectrum, physical distance between talker and listener, room acoustics) and

physiological attributes (e.g., the vocal effort of the talker, the hearing acuity of the listener) (Kryter, 1970).

Relatively little attention has been paid to the psychological aspects. One noteworthy exception is the work of Glass and Singer (1972) which demonstrated that predictability and controllability of a noise are significant psychological factors in the evaluation of noise annoyance. Dunn (1981) suggests that speech intelligibility is higher when interruptions by noise are predictable. The psychological effects of speech masking by noise on human behavior have not been adequately explored.

Laboratory studies of speech masking have typically used single syllables, words or, at the most, sentences as the test material. Natural conversation or meaningful discourse have never been used. Sumby and Pollack (1954) found that speech intelligibility increased as the size of the test word list decreased. As a shorter test list offers fewer alternative answers, it seems obvious that mere guessing would have produced higher intelligibility. When a task requires the use of auditory signals or speech, noise at any intensity level sufficient to mask or interfere with the perception of these signals or speech will reduce performance in the task (Landy & Trumbo, 1980; Miller, 1974). In a study by Jones and Broadbent (1979), pairs of

housewives performed an oral proofreading task in conditions of loud and soft office noises. It was reported that loud office noises produced slower proofreading and more overall errors than soft office noises. It is likely that, in a natural conversation, redundancy and contextual continuity might reduce the interference effect of noise on speech communication, despite the low percentage of intelligible words.

Effects on Speech Communication. The prime concerns of the present study are the motivation and satisfaction of the communicators with their office speech interactions. The inability to clearly distinguish what is said might reduce engagement in a verbal discourse (Jones, Chapman & Auburn, 1981) or can result in a rejection in participation in social gatherings by an individual (Farr, 1972). This could be an over-exaggeration. However, it is reasonable to predict that communicators would be less motivated to talk in a noisy setting, whether the noise be "normal" office noise, introduced constant humming sounds, or music.

Noise Level. The quality of speech communication is closely tied to the noise level and the talker-to-listener distance. Refer to Miller's (1974) simplified chart (see Figure 1 below) based on Webster's prediction curve (cited in Kryter, 1970).

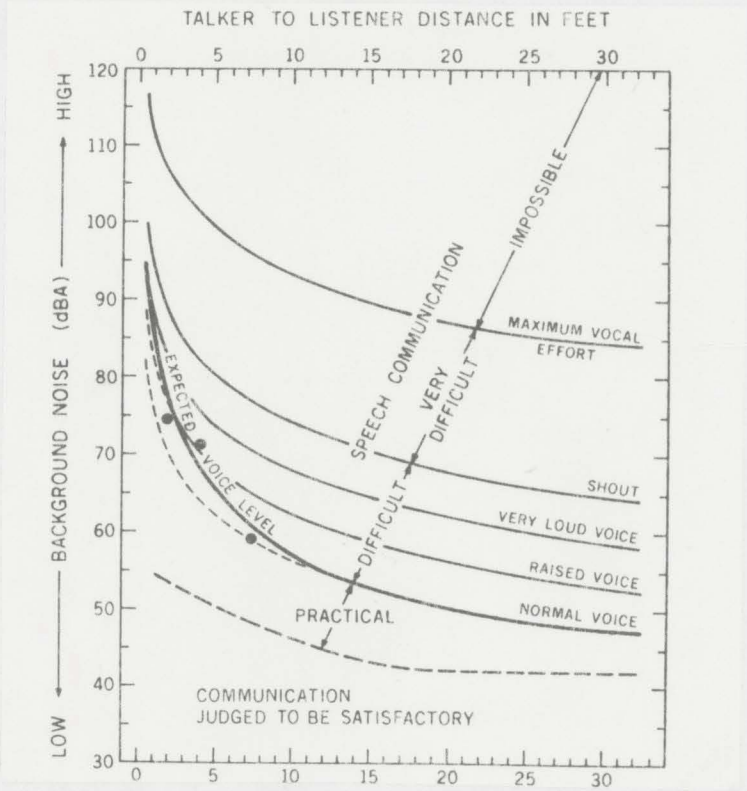


Figure 1. Model Relationship between Quality of Speech Communication, Noise Level and Talker-to-Listener Distance.

For a given distance, say 1.5 metres, for normal face-to-face conversation, communication can be practically carried out at 50 to 65 dBA, but a noise level below 50 dBA is judged to be satisfactory. However, the derivation of this curve assumes a male articulate speaker with vocal power of 65 dBA and a listener with perfect hearing acuity (Miller,

1974). In practice, the noise level for satisfactory communication may be lower.

Surveys (e.g., Beranek, 1956) reported that 55 dBA was the desired maximum noise level in an office. Sixty-seven percent of the workers listed telephoning and talking as the activities most affected by noise levels exceeding this desired maximum. Hedge (1981) also reports that 57% of the employees working in a landscaped office in England find telephone conversation difficult. Apparently, the noise level in these offices is high enough to interfere with speech communication. Unfortunately, the actual noise level was not reported in the Hedge (1981) study. However, a rough guide can be provided by Boyce (1974), Keighley (1970) survey of 40 offices in England, Hay and Kemp (1972) and Nemecek and Grandjean (1973). The average noise level is in the region of 50-55 dBA, with the peaks at 58-65 dBA.

In contrast, Keighley (1970) reported that very few respondents who made free comments mentioned the effect of noise on speech communication. Without giving any evidence, Nemecek and Grandjean (1973) commented that speech communication cannot be impaired by background noise at the level measured in their study (43-53 dBA).

To mask unpleasant office noises, introduced sounds or music must be at least the same intensity level as the noise to be masked. This is why the intensity level of music was varied from 38 to 65 dBA in the present study (i.e., within typical range of office noise levels).

Acoustical Privacy

Privacy involves control of access to oneself or one's group. It includes the ability to regulate the transmission of information to others and to control input from others (Altman, 1975) or from the environment (Margulis, 1977).

Privacy in general (e.g., Sundstrom, Burt & Kamp, 1980) and acoustical privacy in particular (Louis Harris & Associates, 1978; Parsons, 1976) is desired by many office workers, especially those in the middle or upper ranges of the organizational hierarchy. Lack of acoustical privacy has been reported as the leading complaint about open plan offices in a number of surveys (e.g., Becker et al., 1982; Brookes & Kaplan, 1972; Goodrich, 1978; Hedge, 1981).

Conversational or Confidential Privacy. As described above, one aspect of privacy concerns the ability to regulate the transmission of information to others. Sundstrom et al. (1982) found a significant correlation (r

= .46, $p < .01$) between communication effectiveness in the office and satisfaction with privacy. This suggests that the ability to hold a conversation in confidence contributes to satisfaction with communication. In the Louis Harris and Associates national survey (1978) and the Marans and Spreckelmeyer (1982) case studies of office workers, conversational privacy was the worst-rated aspect of their workplace.

Being overheard is a frequent problem: about 90% of the workers in Goodrich's (1978) study, including clerical and middle-level management, felt that they could be overheard to some extent. Even upper-level executives, who had doors and full-height partitions in their offices, complained of this problem. Among those who must carry on confidential office conversations in the Nemecek and Grandjean (1973) study, 75% believed their conversations were overheard, and 11% reported that confidential conversations were impossible. Eighty-four percent of the respondents in the Hedge (1981) study agreed that it was easy for others to overhear private conversations in the open plan office. So were many employees in the Oldham and Brass (1979) interview survey. They said it was impossible in an open plan office to engage in a private conversation.

Adaptive Behaviors. People do, of course, develop certain behaviors to cope with inadequate privacy. The results of one study (Holahan, 1978) in a simulated counselling setting demonstrated that reduced privacy decreased client self-disclosure. Not surprisingly, subjects gave less of their personal histories involving sensitive information when interviewed in open as compared to more private settings.

Little attention has been paid to the impact of inadequate level of privacy in the office. Becker et al. (1982) compared the behaviors of college professors who had private offices, shared private offices and open plan offices. These types of offices supposedly provide different degrees of privacy. Professors who had open plan offices reported restricting (a) their topics of discussion, (b) the feedback they gave to students and (c) their freedom to criticize and praise others in their offices.

When we can overhear others or are aware that other people might be listening, we may assume that our conversation can be overheard as well. Steele (1973) reported casually that when office workers could hear their adjoining workers, their own behaviors were constrained to non-noise producing activities. Similar effect in row-housing has been reported, e.g., in Kuper (1953). Where

there is inadequate privacy, people may move closer to converse, lower their speech level, or even talk less. In other words, lack of conversational privacy may inhibit speech communication (Business Week, 1978).

The present study focuses on this last adjustment that office workers make. It is hypothesized that the fear of a confidential or personal conversation being overheard will (1) lower the perceived quality of and (2) lower the objective amount of speech communication in offices.

Conflict between Communication and Privacy

The requirements for ease of communication and adequate acoustical privacy are conflicting. Where speech can be heard clearly above the level of background noise, its intelligibility is high and conversation can easily occur. A gradual reduction of intelligibility makes it increasingly difficult to communicate but increases privacy. An office designer should provide an acceptable balance between the two (Lewis & O'Sullivan, 1974).

Keighley and Parkin (1979) attempted to test the existence of this conflict by conducting a field experiment lasting three weeks. Sounds were introduced into the office through loudspeakers to improve an excessively quiet office.

If an introduced sound is loud enough, then distant conversations will be masked and overhearing will be prevented. At the same time, if the introduced sound is too loud, it may be a major nuisance itself. The problem is to find a noise level which is both effective and acceptable.

Keighley and Parkin define "acceptability" as the perceived degree to which the office makes conversation easy. "Effectiveness" is estimated from subjects' satisfaction with the sound of others' telephone and face-to-face conversations, and from the perceived privacy of confidential discussion. Acceptability and effectiveness appear to be synonymous with Lewis and O'Sullivan's concepts of communication and privacy described earlier.

The results of the Keighley and Parkin (1979) study indicated that sound conditioning was not unacceptable, but ineffective. They had hypothesized the existence of an optimum noise intensity level which is effective and at the same time acceptable to office workers, yet they failed to find this optimum level. Instead, when overall satisfaction, acceptability and effectiveness scores were plotted against sound levels, these curves were parallel to each other. In addition, acceptability and effectiveness sum to indicate employees' overall satisfaction with the acoustical environment. It should be noted that the sound

level of these introduced sounds were very low (34-46 dBA, even lower than the ambient noise level of the occupied office at 45-55 dBA). The low level of introduced sounds may account for the ineffectiveness in providing the office workers with greater acoustical privacy.

Personality Traits

It has been demonstrated that individuals who have a high need for affiliation verbalize more. For example, Gifford (1982) reported a significant correlation ($r = .40$, $p < .01$) between scores on affiliation and verbalization. In order to partial out any effect due to need for affiliation, a 16 item scale of Jackson's (1974) Personality Research Form was adminstered to the participants in the present study.

Summary

The present study explores the effects of sound level and acoustical privacy on the quality of and amount of speech communication in the office. Background sound (music in this case) should interfere with speech communication between the intended partners in a conversation. The higher the sound level, the greater the interference and thus, the smaller the amount of speech and the lower the perceived satisfaction with the interaction.

At the same time, the background sound masks the conversation, providing acoustical privacy. The less the fear in communicators of their conversation being overheard, the less inhibitedly they should converse (Pile, 1977). This statement assumes, of course, that the communicators are aware of the presence of others and that the intended conversation is personal or confidential. If it is, some degree of privacy is desired by the communicators. Thus, it is hypothesized (see Figure 2 below) that:

(1) There is an inverse relationship between background sound level and (a) satisfaction with and (b) amount of speech communication.

(2) At any given background sound level within normal office ranges, a setting with a high degree of acoustical privacy increases (a) satisfaction with and (b) amount of speech communication.

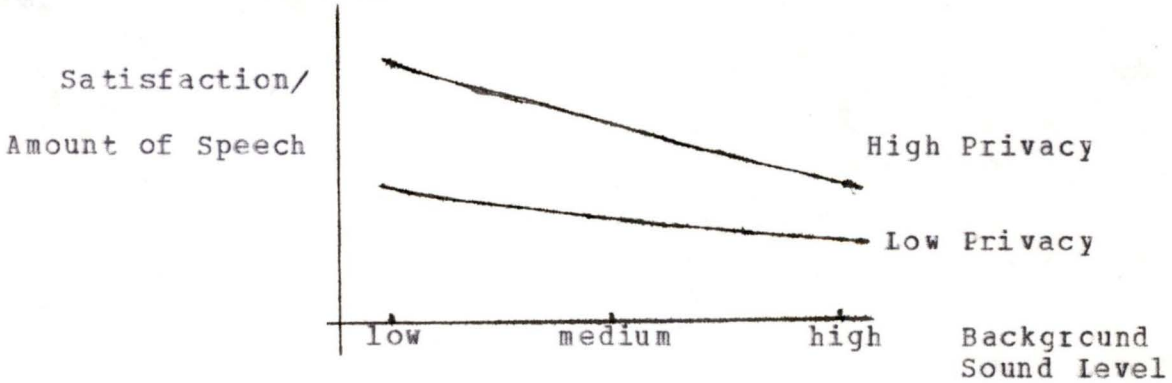


Figure 2. Hypothesized Relationship between Satisfaction/ Amount of Speech and Background Sound Level and Privacy

In essence, the present study differs from previous studies in two ways:

1. A specific organizationally-valued behavior, i.e., speech communication, is studied instead of general satisfaction with the acoustical environment.

2. Behavioral measures, i.e., the amount of time spent communicating and the number of words spoken, are used to supplement the self-report measure of quality of interaction.

METHOD

Most of the research on office worker satisfaction with work environments and, in particular, with open plan offices has used self-report techniques, usually attitude surveys (Boyce, 1974; Goodrich, 1978; Hedge, 1981; Maran & Spreckelmeyer, 1982; McCarrey, Peterson, Edwards & von Kulmiz, 1974; Nemecek & Grandjean, 1973; Sundstrom et al., 1982; Sundstrom, Town, Brown, Foreman & McGee, 1982). Some of these attempts to compare conventional and open plan offices have been post-occupancy evaluations in which employees recall their earlier work environments and compare them with their current ones. Others have better research designs, including pre- as well as post-relocation evaluations (Boyce, 1974; Brookes & Kaplan, 1972; Hundert & Greenfield, 1969; Sundstrom et al., 1982). While the self-report method can be an effective way of identifying problems of enquiry and subsequent formulations of hypotheses, self-reports may not be accurate indicators of the behavioral effects of noise.

Relatively little field research has been conducted to evaluate the introduction of sound conditioning. Two

exceptions are studies by Keighley and Parkin (1979) and Warnock (1973). Quasi-experimental laboratory approach has been used more frequently (e.g., Oldham & Brass, 1979; Young & Berry, 1979).

Systematic behavioral observation has, on rare occasions, been used in addition to a questionnaire survey and interview (Becker et al., 1982). In view of the difficulty in getting cooperation from organizations to conduct a field research in a well controlled manner, a simulated laboratory approach will be used in the present study.

It is clear that neither laboratory experiments nor naturalistic studies in actual offices can in themselves provide convincing evidence of noise-induced psychological effects on speech communication. To date, reports from case studies have suggested causal links between some variables and speech communication. It is time to confirm or disconfirm these links in laboratory settings. To understand the impact of environmental factors in naturalistic settings, a combination of laboratory and naturalistic methodology is required. Obviously, a laboratory simulation approach is a compromise between experimental approach which permits strict control over variables and naturalistic approach which has greater ecological validity.

Experimental Design

The present study uses a 3 x 2 between-subject factorial design. The independent variables are the sound level of music (low, medium and high) and acoustical privacy (high vs. low). The dependent measures are (1) amount of speech communication, measured in terms of the amount of time spent communicating and the number of words spoken; and (2) a self-report scale of quality of interaction. To reduce variance due to personality traits, the score on Jackson's (1974) Need for Affiliation Scale is used as a covariate.

Subjects

The 97 participants included actual and prospective office, technical or social service workers from the general public and the University of Victoria campus. They were recruited through advertisements in newspapers, posters on campus and Canadian Employment Centers. Each subject received a small honorarium ($ 7.50) for participating.

Equipment and Material

Background Sound. A selection of instrumental music similar to the Muzak type of office or elevator music was recorded on one channel of a high quality cassette tape

(Sony UCX 90 CrO2) using a high quality tape recorder (Sony TCFX 30). A list of the musical selections are in Appendix A. The absence of information content (lyrics in this case), a potential source of distraction, is an important component of background masking sound (Cowell, 1974).

Slow, intermittent typing sounds (including turning of the carriage and insertion of paper) were recorded on the other channel of the tape. The quality of recording was good enough to make the typing sound real, i.e., to give an illusion that someone was actually typing. To facilitate sound level calibration, a pure tone was recorded at the very beginning of the tape.

Calibration of Sound Levels. The instantaneous sound levels of the music channel of the tape were measured with a sound level meter (Bruel & Kjoer Type 2203) at intervals of 15 seconds for a period of 30 minutes. The mean level was computed. The pure tone, the sound level of which can be measured precisely, serves as a reference tone. By measuring the sound level of the pure tone and adjusting the volume control of the amplifier, the desired levels of music could be ascertained in relation to the pure tone and calibrated.

The sound level of the typing recording was adjusted to a realistic level (45-50 dBA measured at the participant's position). The sound level of music was varied while keeping the sound level of typing constant at 45-50 dBA. This was accomplished by adjusting both the volume control and the balance control of the amplifier at the same time.

An effort was made to ensure that the typing sounds could be heard during pauses in the music. However, on the whole, the typing sounds occur so infrequently that they did not increase the overall sound level.

Simulated Office. In order to achieve a higher level of experimental control than would be possible in a real-life situation, a laboratory simulation of an office setting was set up. A section of the laboratory was divided with partitions of about 2 metres high into a small reception area and an interview room where the simulated office task, i.e., job interviewing, was conducted. The audio equipment, including two loudspeakers, a tape-recorder and an amplifier, was housed in the remaining part of the laboratory, out of sight of the participants. Refer to Appendix B for a plan of the laboratory. A small portable tape-recorder and a microphone were hidden in the desk drawer and under the desk, respectively. They were used to record the interview between the interviewer and the participant.

Manipulation of Acoustical Privacy. Acoustical privacy was manipulated by the presence or absence of typing sounds. When participants heard slow, intermittent typing sounds coming from across the partitions, they were aware that someone else was present and that their interview could be overheard by an outsider, the "typist". In the absence of typing sounds, they would believe that there was adequate privacy because no one was around.

A manipulation check in the post-interview questionnaire (Appendix F, item 4) showed a difference in response to the question about the degree of privacy the participants felt they had. 'Very adequate' was the most frequent answer (48%) in subjects in the High Privacy condition. In the Low Privacy condition, the majority (53%) felt that they had "reasonable" privacy.

Procedure

Each participant was assigned randomly to one of the six conditions. There were 17 in one condition and 16 in each of the other five conditions.

The purpose of the study was disguised by leading participants to believe that it was a study of job interviews. Participants were told that they would play the

role of job applicants. The post-interview questionnaire (Appendix F, item 5) indicated that 72% of the participants would behave in "very much" or "almost exactly" the same way in the real-life situation. To control experimenter bias, the interviews were conducted by an interviewer who was blind to the hypotheses of the study.

The volume control and balance control knobs were adjusted to their proper positions, depending on the condition to which the participant had been assigned. In the High Privacy condition, the channel on which the typing sounds were recorded was disconnected, so that no typing sounds were heard.

Each participant, on arrival at the laboratory, was instructed to knock on the door three times. This gave the interviewer enough time to turn on the tape-recorder and the amplifier before the participant was allowed to enter the simulated office.

The participant was escorted by the interviewer to the reception area. The "job applicant" read the instructions for the experiment (Appendix C), then selected one of the four job positions (community project officer, management trainee, clerk or research assistant) that the participant would actually apply for in the real-life situation and

completed an application form (Appendix D). The "job applicant" was instructed to go into the interview room on completion of the application form. The participant then took an assigned seat across a desk from the interviewer. The interviewer-to-participant distance was kept constant at 1.5 metres throughout the interview. The interviewer turned on the portable tape-recorder hidden in the desk drawer without making the participant aware of it.

The job interview then began. The interviewer asked a standardized list of questions (Appendix E) that are moderately personal in nature and are typically asked in job interviews (Fear, 1978; Lopez, 1975). The post-interview questionnaire (Appendix F, item 6) shows that 63% of the participants felt that the interview questions were "personal" or "intimate" in nature. No substantive responses to the participants' answers were made by the interviewer, nor did she ask additional questions, unless the situation rendered it absolutely necessary. As the job applicant replied, the interviewer jotted down brief notes, smiled, maintained eye-contact or said 'uh-huh' to acknowledge that she was listening to the job applicant. In short, an attempt was made to keep her verbal and non-verbal behaviors as consistent as possible across all applicants. The interview was recorded on audio tape for analysis later.

After the interview was over, the participant completed the post-interview questionnaire (Appendix F) which included questions about their satisfaction with the interview, the physical environment of the office, and manipulation and validity check items. Jackson's (1974) Need for Affiliation scale (Appendix G) was completed as well. The participant's consent for the custody of the recording was obtained (see Appendix H). If the participant refused to give consent, the recording was erased in the participant's presence.

RESULTS

Satisfaction Scale

The answers to Item 1 (Given the scunds in this room, were you able to express what you wanted to say in the interview?) and Item 7 (The background sound inhibited my desire to talk in the interview.) were significantly correlated ($r = .60$, $p < .01$). For both items, a scere of 1 indicates extreme ease of talking and a score of 5 indicates extreme inhibition by the background sound.

Amount of Speech

Time Spent Conversing. The amount of time (in seccnds) that each participant spent answering each of the interview questions was measured with a stcp watch from the tape. Timing began as soon as the subject uttered the first word until the end of the reply. Natural pauses between phrases or sentences were included in the amount of time spent. The time spent on all 15 questions were summed to give the total time.

Number of Words Spoken. The answer to each of the questions was transcribed and the number of words was counted. The number of words for each question was summed to give the total number of words spoken.

Score on Need for Affiliation

Need for affiliation was scored as indicated in Appendix I. A high score (maximum 16) indicates a high need for affiliation. The internal reliability (alpha) of the scale was $r = .52$.

Satisfaction with Speech Interaction

A 2 x 3 MANOVA (Nie, Hull, Jenkins, Steinbrenner & Bent, 1975) was performed on the data from 97 participants, with the two items on Satisfaction as the dependent measures and Need for Affiliation as a covariate. The five contrasts were:

1. privacy : low = high
2. sound level : low = medium
3. 1/2 (sound level: low + medium) = high
4. interaction of (1) and (2)
5. interaction of (1) and (3).

No significant correlation between the dependent measures and Need for Affiliation was found. The means and standard deviations of Satisfaction scores are reported in Table 1. The results (see Table 2) clearly show that there are significant main effects of both background sound level [F (2, 89) = 9.81, $p < .01$; F (2, 89) = 5.68, $p < .01$) and degree of privacy F (2, 89) = 4.51, $p < .05$]. This indicates a monotonic relationship between Satisfaction and Sound Level. Examination of the means at Table 1 indicates further that it is an inverse relationship. There is a relatively large reduction in satisfaction as the scund level increases from low level to medium level, but as the sound level increases further to about 65 dBA, the reduction is satisfaction is smaller. This suggests that people are most sensitive to changes from low to medium sound level. Table 1 also shows that subjects were more satisfied when they had more privacy.

Univariate F-tests showed that background sound level significantly affected both Satisfaction items ($p < .01$). However, Privacy was significant on Item 7 only ($p < .01$), indicating that privacy affected the response to Item 7 only.

The Sound Level x Privacy interaction effects are non-significant [F (2, 89) = 0.45, $p = .64$; F (2, 89) = 2.18, p

=.12]. However, Privacy appears to play a more critical role when the background sound level is low (about 38 dBA) than when it is high (about 65 dBA) (refer to Figures 3 and 4). People seem to be less satisfied in quiet situations when they feel they might be overheard.

Amount of Speech in the Interview

The data of six participants were discarded because of technical problems in recording the interviews, leaving data for 91 participants.

A MANOVA (Nie, et al., 1975) was performed, with the amount of time spent talking and the number of words spoken as the dependent measures and Need for Affiliation as a covariate. The same contrasts as in the Satisfaction analysis were used. The means and standard deviations are reported in Table 3. The correlation between the two dependent measures is very high (r = .95, p < .01). But the correlations between the dependent measures and Need for Affiliation were non-significant. No significant main effects [Privacy: F (2, 89) = 0.56, p = .57; Sound Level: F (2, 89) = 0.07, p = .93; F (2, 89) = 1.39, p = .25] or interaction effects [F (2, 89) = 0.29, p = .75; F (2, 89) = 0.10, p = .90] are found.

Correlation between Satisfaction and Amount of Speech

None of the correlations between the two items on Satisfaction and the two measures of Amount of Speech was significant (Item 1 with Time: r = .04, p =.35; Item 1 with Number of Words r =.08, p = .23; Item 7 with Time: r = .10, p = .17; Item 7 with Number of Words: r = .11, p = .14).

DISCUSSION

In general, participants' self-reported satisfaction with their speech interaction in the given acoustical environment lends support to the hypotheses. The lower the background sound level, the higher the satisfaction, regardless of the degree of privacy. The effect at higher sound levels is apparently smaller than at lower levels. The drastic drop in satisfaction in the Medium condition is consistent with findings from previous studies (e.g., Warnock, 1973) that office workers find introduced humming sounds irritating at about that level. At the low background sound level, satisfaction was apparently higher in the high privacy condition. This suggests that the fear of being overheard has an effect on the satisfaction with interaction.

The results imply that job applicants prefer to be interviewed in a relatively quiet (below about 53 dBA) and acoustically private environment. This is difficult to accomplish in open plan offices.

The results of the behavioral measures fail to support the hypotheses. One explanation could be that, although people <u>believe</u> that the acoustical environment has an impact

on their behavior, their actual behavior measured might not be affected at all. Results of the present study show very low correlations between self-report and behavioral measures. Research work along the same lines, such as studies on the impact of music on industrial workers (e.g., Gladstones, 1969) suggest that factory workers have higher morale when music is played, but there is no increase in productivity.

In respect of Amount of Speech, the results disagree with Holahan's (1978) study. Their clients disclosed less about themselves in a counselling situation when interviewed in open than when interviewed in private. An alternative explanation is that the dependent measures used in this study might not be sensitive enough to detect the behavioral differences, if any. It could be that people still talk as much in noisy settings as in quiet settings, but that they talk about more negative things as a result of frustration or annoyance with the acoustical environment. A content analysis of the replies would reveal whether there was a qualitative difference. Such analysis is, however, beyond the scope of this thesis. The subjects may have exhibited other forms of adaptative behaviors such as varying their speech volume, rather than varying their amount of speech output.

Another explanation is that the role-playing interview situation did not require a high degree of conversational privacy. Although 63% of the participants said they felt that the interview questions were personal or intimate, the questions may not have been sufficiently confidential to elicit significant reductions in the amount of talking. Although role-playing is a widely used technique in social psychology, one still wonders whether role-playing elicits the same behaviors that a real-life situation does.

Manipulation of the privacy variable was not as effective as anticipated. An analysis of the answer to the manipulation check question indicates only a one-point difference in the degree of perceived privacy in the High and Low Privacy conditions. Some participants probably did not believe that there was someone around or thought the typist wouldn't bother listening. It might have been better to have someone actually present and listen to the interviews.

The correlation between the two items of the Satisfaction scale is not as high as they were expected ($r = .60$, $p < .01$). They were meant to measure the same construct. It appears that Item 7 is a more direct question whereas Item 1 is broader in nature.

Social Implications

In everyday situations, many interactions between employees and clients are similar in nature to the role task in this study, that is, they necessitate a certain degree of acoustical privacy. Two examples are: a supervisor giving performance evaluation feedback to an employee, and meeting a bank officer to discuss the possibility of securing a loan or mortgage.

Directions for Future Research

As described earlier, the impact of physical environmental factors on the satisfaction and productivity of office workers is a relatively new area of research. There is a lack of theoretical formulations about the underlying process.

The present study is exploratory in nature. Its results suggest a number of questions which are worthy of pursuing in the future. Is satisfaction with and amount of speech communication affected by:

1. Privacy requirements of role tasks (ranging from highly sensitive or confidential topics of discussion to very casual conversation)?

2. Types of office sounds, i.e., mechanical sounds (e.g., office machines, air-conditioning and lighting systems) and human sounds (e.g., conversation and body movement)?

3. Number and activity of the outsiders? Does variation in these affect perception of the probability of being overheard?

A complementary approach to the whole issue of the impact of office sounds on satisfaction and productivity of workers is to allow them to adjust their acoustical environment to what they prefer. The acoustics literature includes studies using this approach to the problem of determining preferred noise level while performing tasks of different complexity (e.g., Bryan & Tolcher, 1976) or imagining the performance of tasks that require different privacy requirements (e.g., Cavanaugh et al., 1962). Recent trends in environmental psychology research (cf., Russell & Ward, 1982) indicate a growing consensus that participants should have greater control over the situation in studies, rather than be passive targets of experimenter-controlled stimuli.

TABLE 1

Means and Standard Deviations of Satisfaction Scores.

Background Sound Level	Privacy Low	Privacy High	Total
	Item 1: Ability to Talk in the Interview		
Low (38 dBA)	3.88 / 0.96	4.38 / 0.62	4.13 / 0.84
Medium (53 dBA)	3.25 / 1.06	3.50 / 0.97	3.38 / 1.01
High (65 dBA)	3.35 / 0.70	3.00 / 0.97	3.18 / 0.85
Total	3.49 / 0.97	3.63 / 1.02	3.56 / 0.98
	Item 7: Inhibition to talk in the Interview		
Low (38 dBA)	3.25 / 1.00	4.38 / 0.89	3.82 / 1.09
Medium (53 dBA)	2.38 / 1.20	3.00 / 1.26	2.69 / 1.27
High (65 dBA)	2.53 / 0.80	2.63 / 1.15	2.58 / 0.99
Total	2.72 / 1.08	3.34 / 1.33	3.02 / 1.23

Note:
Maximum score = 5.

TABLE 2

Tests of Significance for Satisfaction.

Multivariate Test (Wilks) with (2,89) Df.

	Roots	Approx. F	Significance
Privacy	1 to 1	4.51	.014 *
Sound Level (Low vs. Medium)	1 to 1	9.81	.000 **
Sound Level [1/2 (Low + Medium) vs. High]	1 to 1	5.67	.005 **
Need for Affiliation	1 to 1	0.44	.640

Univariate F-tests with (1,90) Df.

	Variable	F	Significance
Privacy	Item 1	0.38	.54
	Item 7	8.23	.005 **
Sound Level (Low vs. Medium)	Item 1	11.40	.001 **
	Item 7	17.60	.000 **
Sound Level [1/2 (Low + Medium) vs. High]	Item 1	8.72	.004 **
	Item 7	8.46	.005 **

* $p < .05$;
** $p < .01$.

TABLE 3

Means and Standard Deviations of Amcunt of Speech

	Privacy		
	Low	High	Total
Background Sound Level	Amount of Time in seconds		
Low (35 dBA)	254 / 198	294 / 149	274 / 176
Medium (53 dBA)	294 / 176	287 / 137	290 / 159
High (65 dBA)	322 / 212	311 / 262	317 / 238
Total	290 / 198	297 / 192	294 / 190
	Number of Words Spoken		
Low (35 dBA)	495 / 396	586 / 372	541 / 386
Medium (53 dBA)	561 / 319	599 / 290	580 / 305
High (65 dBA)	595 / 492	594 / 566	595 / 529
Total	550 / 411	593 / 425	572 / 409

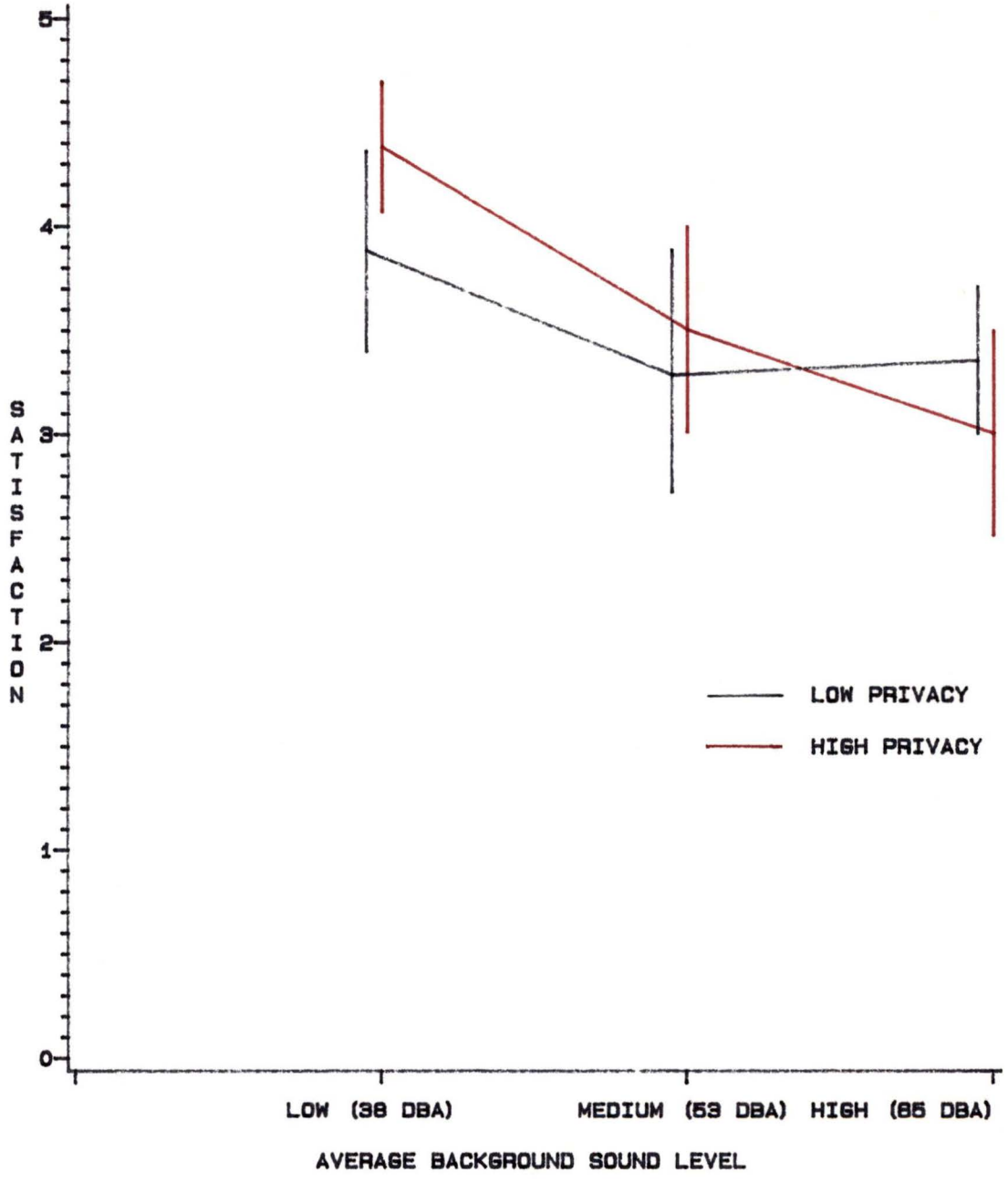


FIGURE 3. MEANS OF SATISFACTION WITH ACOUSTICAL ENVIRONMENT AS A FUNCTION OF PRIVACY AND BACKGROUND SOUND LEVEL: ITEM 1

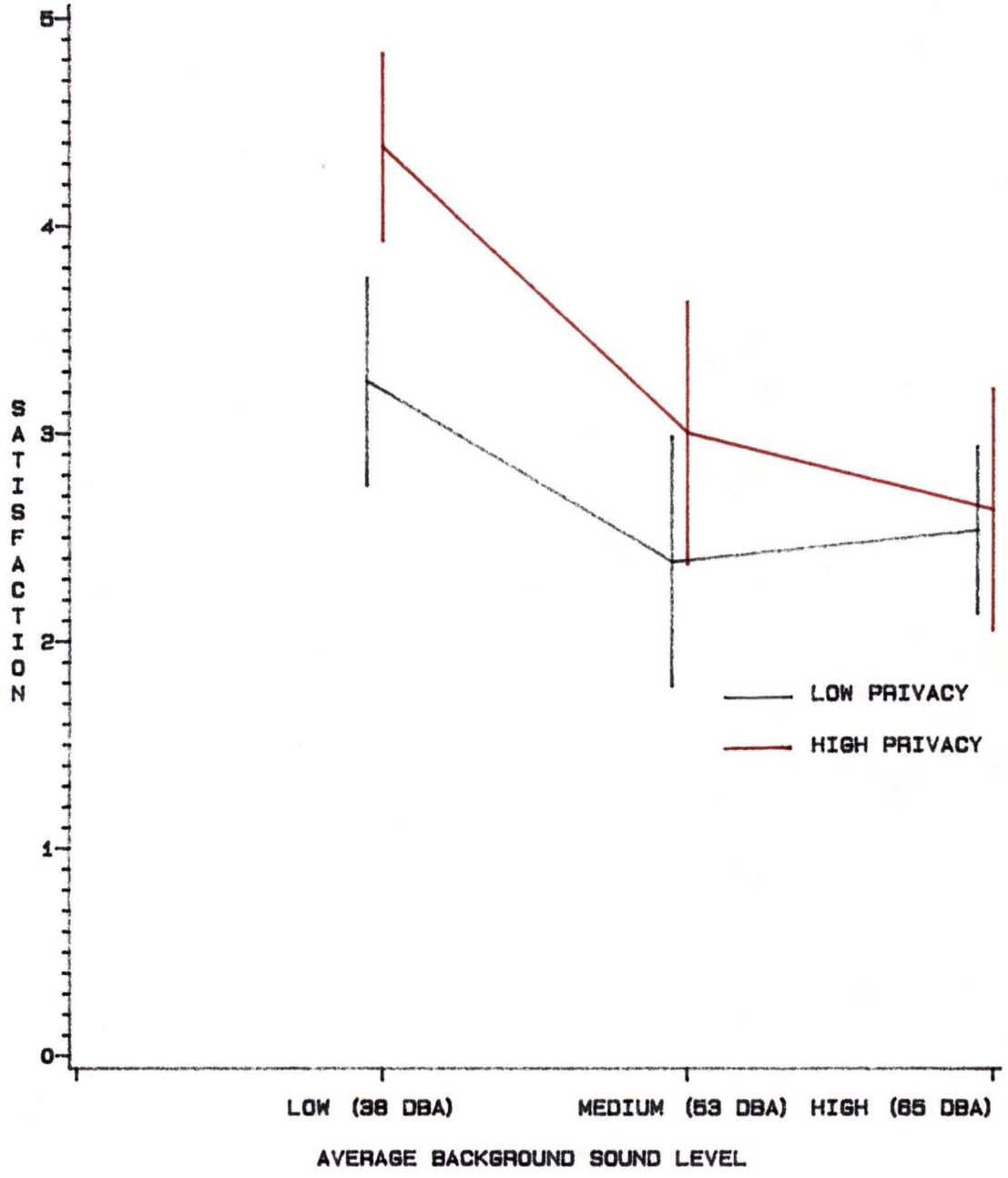


FIGURE 4. MEANS OF SATISFACTION WITH ACOUSTICAL ENVIRONMENT AS A FUNCTION OF PRIVACY AND BACKGROUND SOUND LEVEL: ITEM 7

REFERENCES

Altman, I. The environment and social behavior. Belmont, CA: Wadsworth, 1975.

Bains, A. The office environment: Acoustic factors. In F. Duffy, C. Cave, & J. Worthington (eds.) Planning office space. New York: Nichols Publishing Co., 1976.

Becker, F. D., Gield, B., Gaylin, K., & Sayer, S. Office design and organizational effectiveness. Unpublished manuscript, Cornell University, 1982.

Bell, P. A., Fisher, J. D., & Loomis, R. J. Environmental psychology. Toronto: Saunders, 1976.

Beranek, L. L. Criteria for office quieting based on questionnaire rating studies. Journal of the Acoustical Society of America, 1956, 28, 833-851.

Boje, A. Open plan offices. London: Business Books, 1971.

Boyce, P. R. User's assessments of a landscaped office. Journal of Architectural Research, 1974, 3, 44-62.

Bryan, M. E., & Tolcher, D. Preferred noise levels whilst carrying out mental tasks. Journal of Sound and Vibration, 1976, 45, 139-156.

Brookes, M. J. & Kaplan, A. The office environment: space planning and affective behavior. Human Factors, 1972, 14, 373-391.

Business Week. The trouble with open offices. 1978, 6, 84-88.

Cavanaugh, W. J., Farrell, W. R., Hirtle, P. W., & Watters, B. G. Speech privacy in buildings. Journal of the Acoustical Society of America, 1962, 34, 475-492.

Chapanis, A. Prelude to 2001: Explorations in human communication. American Psychologists, 1971, 26, 949-961.

Chapanis, A., Ochsman, R. B., Parrish, R. N., & Weeks, G. D. Studies in Interactive Communication: I. The Effects of Four Communication Modes on the Behavior of Teams During Cooperative Problem-solving. Human Factors, 1972, 14, 487-509.

Cowell, J. R. Sound conditioning in offices. The Architect, 1974, 12, 57-58.

Dunn, B. E. The noise environment of man. In H. W. Jones (ed.) Noise in the human environment, vol. 2. Calgary: Environment Council of Alberta, 1981.

Edwards, A. T., & Kowalewski, J. Open office acoustics - an engineering approach. Paper presented at the 89th meeting of the Acoustical Society of America, 1975.

Farr, L. E. Medical consequences of environmental home noises. In R. Gutman, People and buildings. New York: Basic Books, 1972.

Fear, R. A. The evaluation interview (2nd ed.). New York: McGraw Hill, 1978.

Fucigna, J. T. The ergonomics of offices. Ergonomics, 1967, 10, 589-604.

Gifford, R. Affiliativeness: A trait measure in relation to single-act and multiple-act behavioral criteria. Journal of Research in Personality, 1982, 16, 128-134.

Gladstones, W. H. Some effects of commercial background music on data preparation operators. Occupational Psychology, 1969, 43, 213-222.

Glass, D. C., & Singer, J. E. Urban stress. New York: Academic Press, 1972.

Goodrich, R. Office environment post-occupancy evaluation: A dialogue. Man-Environment Systems, 1978, 8, 175-190.

Goodrich, R. Seven office evaluations: A review. Environment and Behavior, 1982, 14, 353-378.

Hay, B., & Kemp, M. F. Measurements of noise in air conditioned, landscaped offices. Journal of Sound and Vibration, 1972, 23, 363-373.

Hedge, A. Office design: People's reaction to open plan. In R. Thorne & S. Arden (eds.) People and the man-made environment: building, urban & landscape design related to human behavior. Sydney: Department of Architecture, University of Sydney, 1981.

Holahan, C. J. Invasion of privacy and self-disclosure in a counselling setting. In Holahan, C. J. (Ed.) Environment and behavior: A dynamic perspective. New York: Plenum Press, 1978.

Hundert, A. T., & Greenfield, N. Physical space and organizational behavior. Proceedings of the 77th Annual Convention, American Psychological Association, 1969, 601-602.

Jackson, D. N. Personality research form manual. Goshen, NY: Research Psychologists Press, 1974.

Jones, D., & Broadbent, D. Side effects of interference with speech by noise. Ergonomics, 1979, 22, 1073-1081.

Jones, D. M., Chapman, A. J., & Auburn, T. C. Noise in the environment: a social perspective. Journal of Environmental Psychology, 1981, 1, 43-59.

Keighley, E. C. Acceptability of criteria for noise in large offices. Journal of Sound and Vibration, 1970, 11, 83-93.

Keighley, E. C., & Parkin, P. H. Subjective responses to sound conditioning in a landscaped office. Journal of Sound and Vibration, 1979, 64, 313-323.

Klemmer, E. T. Personal communication with Chapanis, A., March 20, 1970.

Kryter, K. D. The effects of noise on man. New York: Academic Press, 1970.

Kuper, L. Neighbour on the Hearth. In H. M. Proshansky, W. H. Ittelson, & I. G. Rivlin (eds.). Environmental psychology: People and their physical settings (2nd ed.). New York: Holt, Rinehart & Winston, 1976.

Landy, F. J., & Trumbo, D. A. Psychology of work behavior. Homewood, IL: Dorsey, 1980.

Lewis, P. T., & O'Sullivan, P. E. Acoustic privacy in office design. Journal of Architectural Research, 1974, 3, 48-51.

Lopez, F. M. Personal interviewing theory and practice (2nd ed.). New York: McGraw Hill, 1975.

Louis Harris and Associates. The Steelcase national study of office environments: Do they work? Grand Rapids, MI: Steelcase, 1980.

MacKenzie, S. T. Noise and office work: Employee and employer concerns. Athaca: New York State School of Industrial and Labor Relations, Cornell University, 1975.

Manning, P. (Ed.) Office design: A study of environment. Liverpool, England: the Pilkington Research Unit, University of Liverpool, 1965.

Marans, R. W., & Spreckelmeyer, K. F. Evaluating open and conventional office design. Environment and Behavior, 1982, 14, 333-351.

Margulis, S. Conceptions of privacy: Current status and next steps. Journal of Social Issues, 1977, 39, 5-21.

McCarry, M. W., Peterson, L., Edwards, S., & von Kulmiz, P. Transactions with the environment. Journal of Applied Psychology, 1974, 59, 401-403.

Mercer, A. Office environments and clerical behavior, Environment and Planning B, 1979, 6, 29-39.

Miller, J. D. Effects of noise on people. Journal of the Acoustical Society of America, 1974, 56, 729-764.

Mitchell, T. R. People in organizations: Understanding their behavior. New York: McGraw Hill, 1978.

Nemecek, J., & Grandjean, E. Results of an ergonomic investigation of large-space offices. Human Factors, 1973, 15, 111-124.

Nie, N. H., Hull, C. H., Jenkins, J. G., Steinbrenner, K., & Bent, D. H. Statistical Package for the Social Sciences, (2nd Ed.). New York: McGraw-Hill, 1975.

Oldham, G. R., & Brass, D. J. Employee reactions to an open-plan office: A naturally occurring quasi-experiment. Adminstrative Science Quarterly, 1979, 24, 267-284.

Parsons, H. M. Work environments. In I. Altman and J. F. Wohlwill (eds.), Human behavior and environment: advances in theory and research, (vol. 1). New York: Plenum Press, 1976.

Pile, J. F. The open office: does it work? Progressive Architecture, 1977, 6, 68-81.

Russell, J. A., & Ward, L. M. Environmental psychology. Annual Review in Psychology, 1982, 33, 651-688.

Steele, F. I. Physical settings and organization development. Mass: Addison-Wesley Publishing Co., 1973.

Sumby, W. H., & Pollack, I. Visual contribution to speech intelligibility in noise. Journal of the Acoustical Society of America, 1954, 26, 212-215.

Sundstrom, E., Burt, R. E., & Kamp, D. Privacy at work: Architectural correlates of job satisfaction and job performance. Journal of Academy of Management, 1980, 23, 101-117.

Sundstrom, E., Herbert, R. K., & Brown, D. W. Privacy and communication in an open-plan office: A case study. Environment and Behavior, 1982, 14, 379-392.

Sundstrom, E., Town, J. P., Brown, D. W., Foreman, A., & McGee, C. Physical enclosure, type of job, and privacy in the office. Environment and Behavior, 1982, 14, 543-559.

Warnock, A. C. C. Acoustical privacy in the landscaped office. Journal of the Acoustical Society of America, 1973, 53, 1535-1543.

Young, H. H., & Berry, G. L. The impact of environment on the productivity attitudes of intellectually challenged office workers. Human Factors, 1979, 21, 399-407.

Appendix A

Selection of Music used as stimuli

"A Swinging Safari" by R. Davis & his Button-Down Brass

"Fire & Rain" played by Hubert Laws

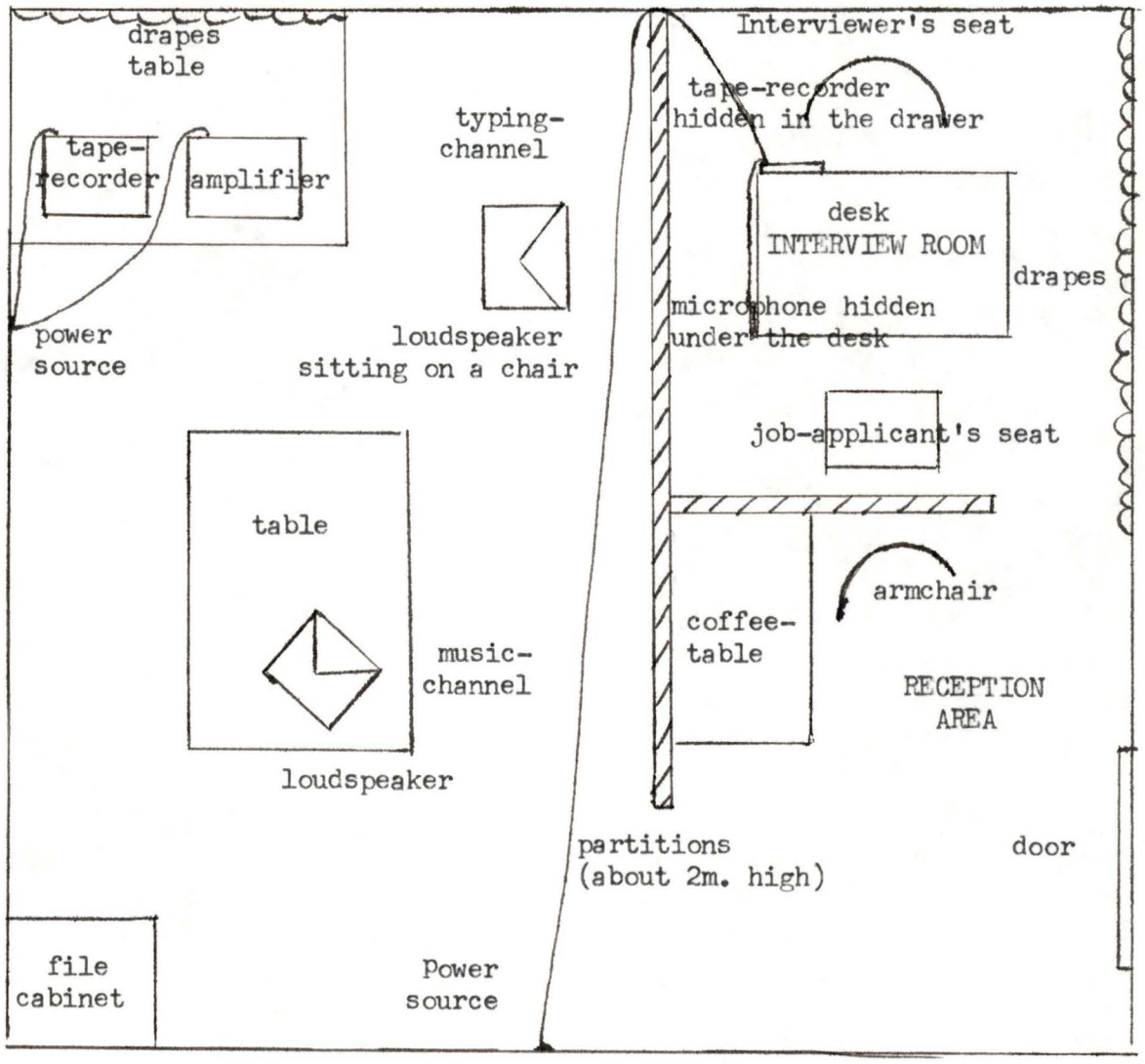
"Torna a Surrento" by Metropolitan Mandolins

"Brazil" by Morton Gould and his orchestra

"Passacaglia" in C Minor' played by Hubert Laws

Appendix B

A Plan of the Simulated Office



Appendix C

Title of Study:

Job Interview Techniques

General Instructions:

The purpose of this study is to better understand job interviews. You will take part in a job interview and take the role of a job applicant. Confidentiality will be ensured; your name will not be recorded.

Read the following advertisements carefully. Choose one of the positions that you might apply for in a real-life situation. Imagine that you would really like to get the job and are now actually appearing for an interview. Please complete the attached application form as well.

COMMUNITY PROJECT OFFICER

A challenging position now exists in a well-established non-profit organization. Responsible for planning and coordination of community projects for teenagers in Victoria. Other duties include publicity, finance budgeting, liasion with other organizations, supervision of staff and report writing.

Requirements:

* good general educational background, preferably some university.
* an outgoing personality; hardworking; self-motivated.
* sincere concern for teenagers
* preferably with experience in community work.

We offer:

- excellent salary and fringe benefits.
- good opportunities for advancement.

Apply to:

Canada Youth Association,
1 Douglas Street,
Victoria.

MANAGEMENT TRAINEE

A position now exists in a well-established bank in Victoria. To undergo training in various departments. Prospect of promotion to a Branch Manager on completion of the one-year training period.

Requirements:

* good general educational background.
* hardworking; self-motivated.
* good interpersonal and communication skills.
* previous work experience desirable.

We offer:

- excellent salary and fringe benefits
- good opportunities for advancement

Apply to:

Bank of Canada,
1 Douglas Street,
Victoria.

RESEARCH ASSISTANT

A position now exists in the Psychology Department of University of Victoria. Assist a member of the faculty in a survey study of attitudes towards housing in Greater Victoria. Duties include library research, interviewing householders and simple data analysis.

Requirements:

* interest in research work
* hardworking, self-motivated
* good communication skills
* willing to do outdoor work

We offer:

- excellent pay
- good training facilities

Apply to:

Psychology Department,
University of Victoria,
Victoria.

CLERK

An interesting position now exists in a well-established corporation in Victoria. Assist the General Manager in day-to-day administration. Duties include typing, filing, front-desk reception and other general office duties.

Requirements:

* good general educational background, minimum Grade 10.
* neat and accurate typing; minimum typing speed 40 w.p.m.
* hardworking, presentable appearance.
* similar work experience an advantage.

We offer:

- excellent salary and fringe benefits.
- good opportunities for advancement.

Apply to:

Canada National Corporation,
1 Douglas Street,
Victoria.

Appendix D

Application Form

Position:_____

Name:_____

Address:_____

Tel. No.:_____

Education:

Year	Institution

Work Experience:

Employment:

Period	Organization	Position held

Volunteer Work

Period	Organization	Position held

Other skills:

_____

Date _____

Signature: _____

Appendix E

Job Interview Questions

E. Have a seat.

Did you have any difficulty finding this room?

S:

E: You are applying for the position of ----------

Well, I would like to know something about your background.

S:

E: Tell me about your hobbies.

S:

E: Are you involved in any community activities?

S:

E: Were you ever elected to lead a group?

S:

E: What would you say have been your major accomplishments in life so far?

S:

E: What was there about (the participant's major accomplishment) that particularly appealed to you?

S:

E: What do you seek most out of a job?

S:

E: Have you had a regular job before?

S:

E: How did you happen to leave your last job?

S:

E: What aspects of the job did you find most stimulating and satisfying?

S:

E: What kind of relationship did you have with your supervisor?

S:

E: Looking back, what would you say were the two or three most difficult job problems you faced?

S:

Now then, what appeals to you about this job?

S:

E: How do you see this job fitting in with your career goals?

S:

E: So what do you think you have to offer us?

S:

E: Thank you for coming. It was a pleasure talking to you. Good bye now. Have a nice day.

Appendix F

Post-interview Questionnaire

Please circle the most appropriate answer to each of the following statements.

1. Given the sounds in this room, were you able to express what you wanted to say in the interview?

   1 definitely not

   2 no

   3 neutral

   4 yes

   5 definitely yes

2. What is your general impression of this room?

   1 very pleasant

   2 pleasant

   3 neutral

   4 unpleasant

   5 very unpleasant

3. What improvements to this room would you like to see?

   1 better heat insulation

   2 more furnishings

   3 more windows

   4 better sound insulation

   5 repaint in another color

   6 others? _____

4. How much privacy do you feel you have now?

1 none

2 very little

3 little

4 reasonable

5 very adequate

6 complete privacy

5. To what extent would you have behaved in the same manner if you were actually attending a job interview in a real-life situation?

1 almost exactly

2 very much

3 much

4 not much

5 very little

6. Would you say the questions asked in the interview were:

1 very intimate

2 intimate

3 personal

4 impersonal

5 very impersonal

7. The background sound inhibited my desire to talk in the interview.

1 agree strongly

2 agree

3 neutral

4 disagree

5 disagree strongly

Appendix G

Personality Test Form

Instructions:

Read each of the following statement and decide whether or not it describes you.

If you agree with a statement or decide that it does describe you, put a T in the space provided beside that statement number.

If you disagree with a statement or feel that it is not descriptive of you, put a F in the space provided.

ANSWER EVERY STATEMENT either true (T) or false (F), even if you are not completely sure of your answer.

_____ 1. I am quite independent of the people I know.

_____ 2. I choose hobbies that I can share with other people.

_____ 3. I seldom put out extra effort to make friends.

_____ 4. I go out of my way to meet people.

_____ 5. I don't really have fun at large parties.

_____ 6. People consider me to be quite friendly.

_____ 7. I would not be very good at a job which required me to meet people all day long.

_____ 8. I truly enjoy myself at social functions.

_____ 9. When I see someone I know from a distance, I don't go out of my way to say hello.

_____ 10. I spend a lot of time visiting friends.

_____ 11. Sometimes I have to make a real effort tc be sociable.

_____ 12. My friendships are many.

_____ 13. I don't spend much of my time talking with people I see every day.

_____ 14. I trust my friends completely.

_____ 15. Often I would rather be alone than with a group cf friends.

_____ 16. I try to be in the company of friends as much as possible.

Appendix H

Job Interview Study

Consent Form

I, ---------- hereby give my consent to Cheuk Ng (the experimenter) to retain the tape-recording of my interview for the purpose of analysis.

---------- ----------

Date Signature

Appendix I

Scoring of Need for Affiliation Scale

Each statement gets a score of 1 if it corresponds to the following:

Statement	Answer
1	F
2	T
3	F
4	T
5	F
6	T
7	F
8	T
9	F
10	T
11	F
12	T
13	F
14	T
15	F
16	T

Note: T : true

F : false

VITA

Surname: NG Given Name: CHEUK FAN

Place of Birth: HONG KONG Date of Birth: October 22, 1952

Educational Institutions Attended, with Dates of Entering and Leaving:

UNIVERSITY OF MANITOBA, WINNIPEG 1978 to 1981

UNIVERSITY OF VICTORIA, VICTORIA 1981 to 1983

Degrees, Diplomas, Etc., Awarded, with Dates and Names of Institution:

B.A. (Honors) 1981 University of Manitoba, Winnipeg

Honors and Awards

Sara Spencer Research Foundation Fellowship, 1982.

Publications:

Robert Gifford, & Cheuk Fan Ng. The relative contribution of visual and auditory cues to environmental perception. Journal of Environmental Psychology, 1982, 2, 275-284.

Cheuk Fan Ng, & Robert Gifford. A multisensory approach to environmental perception. Presented at the Annual Convention of the Canadian Psychological Association, Winnipeg, June 1983.

PARTIAL COPYRIGHT LICENSE

I hereby grant the right to lend my thesis (the title of which is shown below) to users of the University of Victoria Library, and to make single copies only for such users or in response to a request from the library of any other university, or similar institution, on its behalf or for one of its users. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by me or a member of the University designated by me. It is understood that copying or publication of this thesis for financial gain shall not be allowed without my writtem permission.

Title of Thesis

Speech Communication in the Office:

The Effects of Background Sound Level and Acoustical Privacy

Author [redacted]

Cheuk Fan Ng

2nd Sept., 1983.

Date