

The Use of Relaxation Training and Biofeedback
to Increase Human Approach Responses in
Individuals with Schizophrenia

by

Clara Doerksen

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at the University of Manitoba in partial fulfilment
of the requirements for the degree of

Doctor of Philosophy

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**THE USE OF RELAXATION TRAINING AND BIOFEEDBACK TO
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BY

CLARA DOERKSEN

**A Thesis submitted to the Faculty of Graduate Studies of the University of Manitoba
in partial fulfillment of the requirements of the degree of**

DOCTOR OF PHILOSOPHY

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Abstract

The present research examined the effects of a relaxation/biofeedback treatment package on arousal levels of persons with schizophrenia to human-stimuli slides. A multiple-baseline design across subjects was used. Four subjects meeting the diagnostic criteria of the DSM III-R for schizophrenia (any type) were studied. During baseline sessions, heart rate was monitored while subjects were exposed to neutral-stimuli vs. human-stimuli slides. During a treatment phase, subjects experienced a four-part session twice weekly for approximately 12 weeks. Within each session, Part 1 consisted of monitoring heart rate to human-stimuli slides, Part 2 consisted of listening to a relaxation tape with music, Part 3 combined the relaxation tape with biofeedback concerning heart rate, and Part 4 consisted of a reassessment of heart rate to the human-stimuli slides. Following training, subjects were asked to listen to a relaxation tape on their own on a daily basis for one month prior to a one month follow-up assessment. Overall, results indicated a substantial decrease in the heart rate response in all four subjects to human-stimuli slides from prebaseline to follow-up. Three of the four subjects also demonstrated, on self-report questionnaires, a decrease of fear and anxiety concerning social interactions, and an increase in self-report of social interactions, with corroboration of these self-report measures by significant others. Finally, social validity assessments indicated considerable satisfaction with the results by all four subjects and their significant others.

To GM

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In memory of my much loved Silver

Silver, a six-year-old Blue Point Siamese, had to be released from her suffering in the late evening of September 7, 1995. Silver was a sweet and gentle cat. She had many a litter of kittens and was always the most nurturing and dependable mother for them.

I miss Silver and will always associate her passage with the day of my Ph.D. Oral Defense.

She is now purring, sunning herself, and sleeping on the window sills of heaven.

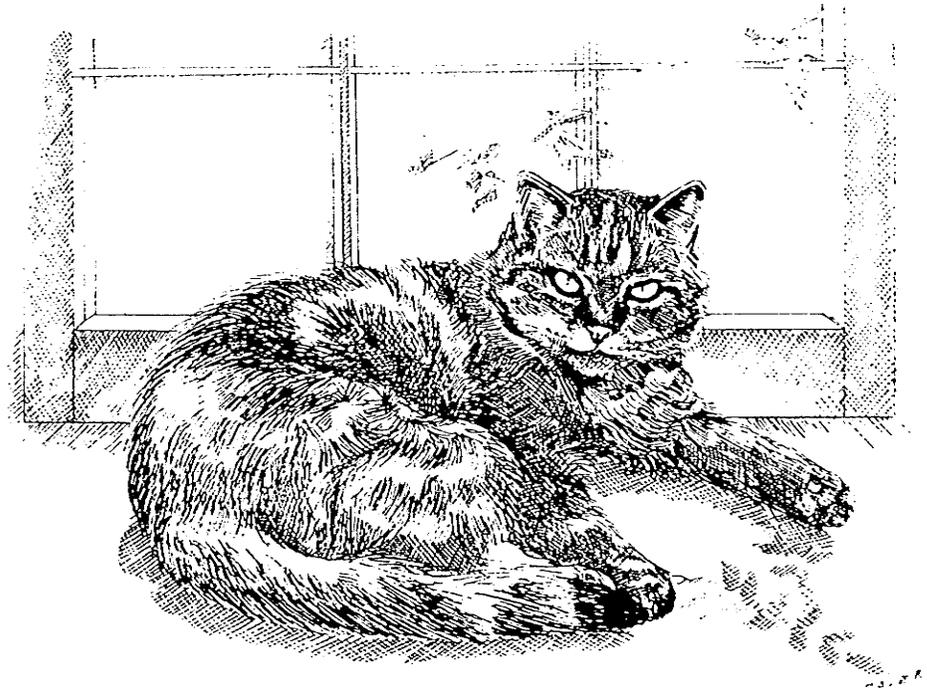


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The Use of Relaxation Training and Biofeedback to
Increase Human Approach Responses
in Individuals With Schizophrenia

Schizophrenia affects more than 50,000 Canadians (Teehan, 1991) and afflicts one out of every one hundred Americans (Mueser & Gingerich, 1994; Torrey, 1983). The health and social care costs of schizophrenia approach three billion dollars yearly (Beiser & Iacona, 1990). In the past, schizophrenia has been considered a homogeneous disease (Kraepelin, 1917); over time, however, it has come to be seen as a group of related disorders (Bleuler, 1911). Descriptions of schizophrenia have evolved historically (Andreason, N.C. 1994b, 1995). Kraepelin's definition characterized the disease of "dementia praecox" by its "early onset of severe functional disturbances and a deteriorating and irrecoverable clinical course" (Rosen, Fox, & Gregory, 1972). Bleuler introduced the term "schizophrenia" to clarify how this syndrome of related disorders (Bleuler, 1917) manifested itself primarily in disturbances of particular psychological processes. These primary symptoms have come to be known as the "four A's" of schizophrenia:

- a) autism (turning inward, away from the external world),
- b) ambivalence (towards themselves and others, finding it difficult to trust others),
- c) disturbances in affect (flat affect, labile mood, out of keeping with reality),
and
- d) associations (looseness, distorted logic, fragmentation, concreteness and overinclusiveness in thinking) (Amchin, 1991; Rosen, Fox, & Gregory,

1972).

At present, the DSM-III-R (1987) provides a synthesis of these approaches, with a focus on specific clinical diagnostic criteria (Amchin, 1991) of the disorder.

These diagnostic criteria include the following symptoms:

- a) a minimal duration and differential response to somatic therapy,
- b) a presence of a specific family pattern,
- c) a tendency toward onset in early adult life,
- d) a recurrence of the disorder, and invariably,
- e) a deterioration in social, interpersonal, and occupational functioning (DSM-III-R, 1987, p. 187).

Arriving at a consensual description and definition of schizophrenia has been a major task of mental health professionals over a period of many decades. Briefly recounting that history contributes to our understanding of schizophrenia.

Historical Perspective

There has been a broad diversity in the inclusiveness of clinical and research definitions of schizophrenia (Gift, Strauss, Ritzler, Kokes, & Harder, 1980; Spitzer, Endicott, & Robins, 1978). Even a short synopsis of these definitions is astounding in its multiplicity (Bellak, 1979). As noted earlier, the word "schizophrenia," meaning "splitting of the mind," was coined by Bleuler (1911), to include what the German psychiatrist, Kraepelin (1917) had considered dementia praecox. For Kraepelin, dementia praecox included four specific subdivisions: paranoid dementia, hebephrenia, catatonia, and simple dementia. Bleuler maintained that in all of these subdivisions, the "split" was manifested in four primary symptoms in the "four A's"

namely: affect, autism, ambivalence, and associations (Rosen et al., 1972).

Therefore, even after all these years, the so-called "four A's" are still considered by many to be the cardinal features of schizophrenia and remain an integral feature of the current standard nomenclature.

Although definitions of schizophrenia today distinctly resemble those of Bleuler and Kraepelin (Andreason, 1994a; Teehan, 1991), the disorder had a much broader definition during the post-war years. Menninger (1948) who was a guiding force in the publication of the Diagnostic and Statistical Manual (DSM) in 1951, viewed mental illness on a continuum, rather than as unique entities of concrete disorders; thus, the psychosocial model of mental illness gained dominance in the diagnosis of schizophrenia. Psychiatrists during the post-war years were influenced by Menninger's psychosocial theory as the model for describing mental illnesses. The DSM-I stated that all functional psychiatric diagnoses were characterized as "reactions" (Wilson, 1993). Because the psychosocial model did not clearly demarcate between the ill and the well, researchers were unable to obtain adequate funding for research; consequently, the definition for mental disorders became increasingly concretized. Nevertheless, as recently as 1968, definition and diagnostic criteria of the DSM-II were still inadequate. Members of the American Psychiatric Association became increasingly aware of the unreliability of psychiatric diagnoses and the need for greatly improved diagnostic criteria for all mental illnesses.

With the advent of the DSM-III in 1980, and the publication of the DSM-III-R in 1987, the medical model was reinstated as the main source of diagnoses of mental

illnesses. Psychiatrists now had an accepted and standardized language to describe what they observed in their patients.

However, dynamic discussion has continued in this area. McFarlane (1991) maintains that the most suitable explanation of schizophrenia is a disorder of central nervous system functioning, comprised of associated deficiencies in ventral tegmental arousal centers, dorsolateral prefrontal cortical association areas, hippocampal attention areas, and limbic affective areas. Torrey (1983) and Torrey, Bowler, Taylor and Gottesman (1994) are all strong proponents of the medical model approach, and argue that schizophrenia is a "brain disease," the accompanying symptoms of which include "impairment in thinking, delusions, hallucinations, changes in emotions, and changes in behaviour." This position compares schizophrenia with cancer, as analogous biological entities, and is premised upon the assertion that while it is known that there are numerous varieties of cancer of the brain, it can, therefore, be assumed that there are, as well, numerous varieties of schizophrenia of the brain. In the same vein, Taylor (1987) and Hales and Hales (1995) insist that schizophrenia is a biological disease, and note that family and friends should be reassured that the illness is not primarily due to poor parenting or stressful environmental events.

Alternatively, others have asserted that schizophrenia is more likely best accounted for as resulting from an interaction between predisposition and environmentally-induced risk (Beiser & Iacona, 1990; Hogarty, Anderson, Reiss, Kornblith, Greenwald, Javna, & Madonia 1986). That is, despite their notoriety, biochemical explanations of schizophrenia are judged as largely a matter of

speculation and conjecture, and the preeminence of environmental events, albeit within such a causal hypothesis, would clearly seem to be the more significant factor (Brodsky, 1963). From this perspective, a definition of schizophrenia which is founded exclusively on a biological model becomes improbable (Beiser & Iacona, 1990).

Diagnosis

In terms of diagnosis, the current clinical depiction of schizophrenia remains markedly similar to the characteristics first specified by Emil Kraepelin nearly one hundred years ago (Teehan, 1991). Of note is that the chronicity of schizophrenia has been connected with "an insidious onset marked by gradual social withdrawal and personality deterioration" (Beiser and Iacona, 1990; Erlenmeyer-Kimling & Cornblatt, 1987; Goldberg, Gold, Greenberg, Griffin, Schulz, Pickar, Kleinman & Weinberg, 1993).

More specifically, individuals who have been diagnosed with a schizophrenic disorder have a number of characteristic symptoms which involve several psychological processes. The DSM-III-R (p.189) itemizes these symptoms as follows:

- a) disturbances in the content and in the form of thought and perception,
- b) flat or inappropriate affect,
- c) disturbed sense of self,
- d) disturbance in goal-directed activity,
- e) disturbances in psychomotor behaviour, and
- f) disturbances in interpersonal functioning and in relationship to the external

world.

Furthermore, in defining schizophrenia from a clinical perspective, the DSM-III-R asserts that this disorder has a minimal duration of six months, and includes an active phase wherein psychotic symptoms are manifested. Notably, the individual functions below the highest level previously achieved, and evidences a cluster of characteristic symptoms involving multiple psychological processes such as distortions in thought and perception, flattened affect, and impaired interpersonal functioning.

Within the last several years, the added diagnosis of positive and negative symptoms has become in vogue (Crow, 1980; Fenton & McGlashan, 1994; Mueser & Gingerich, 1994; Oke, Saatchi, Allen, Hudson, & Jervis, 1994; Rubin & Harrow, 1993; Slade, 1990). The positive symptoms are listed as hallucinations, delusions, and a thought disorder described as "bizarre-idiosyncratic thinking" (Rubin & Harrow, 1993, p. 245). The negative symptoms are listed as apathy, anhedonia, alogia, affective flattening, avolition, and social withdrawal (Bentall, 1990; Marder & Meibach, 1994; Mueser & Gingerich, 1994; Rubin & Harrow, 1993).

Furthermore, researchers are beginning to consider the cognitive deficits of schizophrenia as equally debilitating and are focusing on cognitive remediation (Ahmed & Goldman, 1994; Firth, 1993; Green, 1993; Spaulding, 1993). These deficits include memory loss, information-processing loss, lack of insight, confusion, problem-solving difficulties, lack of motivation, impairment in attention and concentration, perceptual and social distortions (Green, 1993; Lysaker & Bell, 1995; Mueser & Gingerich, 1994; Penn, 1991; Stuve, Erickson, & Spaulding, 1991).

All of these symptoms, experienced in isolation or concurrently, are extremely stressful for the individual with schizophrenia and others who interact with her/him (Backlar, 1994; McFarlane, 1991). The resultant difficulty in interpersonal relationships is often reported as one of the most onerous burdens of the disorder. In addition, it has been observed that problems in interpersonal functioning precede the actual onset of the disorder (Erlenmeyer-Kimling & Cornblatt, 1987; Strauss, Carpenter, & Bartko, 1974; Teehan, 1991). And in some instances, it remains a continuous symptom of the disorder (Carpenter & Strauss, 1979). For example, researchers indicating positive outcome measures, will usually note the importance of improved social and occupational functioning (Glynn & Meuser, 1986; Goldstein, 1987; Liberman, Wallace, Blackwell, Eckman, Vaccaro, & Kuehnel, 1993). Despite the well-established fact that individuals with schizophrenia have difficulties with relationships prior to the onset of schizophrenia, as well as during and after treatment, few studies have specifically attempted to modify this behaviour.

Theories Pertinent to the Etiology of Schizophrenia

An overview of the principal theories which describe the etiology of schizophrenia will follow. Similar to the evolutionary process of establishing diagnostic criteria for schizophrenia, there has been a profusion of etiological theories of schizophrenia which have been both diverse and varied. Therefore, this critique will address a selection of the most germane of these theories.

Biochemical Theories

There are innumerable biochemical theories which attempt to explain the

cause(s) of schizophrenia (see Cromwell & Snyder, 1993, pp. 17-74; Meltzer, 1979, pp. 45-135). The dopamine hypothesis, the predominant biological theory, posits that schizophrenia is the result of a higher than normal amount of the neurotransmitter, dopamine, in the brains of certain individuals (Bernheim & Lewine, 1979; Paillère-Martinot, Lecrubier, Martinot & Aubin, 1995; Oke, Carver, & Adams, 1993, Wilson & Claussen, 1993; Wise & Stein, 1973). The search for the precise dopamine neurotransmitter that contributes to schizophrenia is continuing. Wilson and Claussen (1993) indicate that "within the next few years we are likely to see the introduction of new medicines for clinical use which offer more therapeutic benefits to more individuals, while causing fewer side effects...Genetic engineering, and new discoveries for brain science offer hope for the future" (p. 9).

However, after twenty-five years of research, and despite the advances in the methodological sophistication of biochemical research, the dopamine hypothesis "offers less firm ground for understanding the action of psychotropic drugs ... that they were believed to do only a few years ago" (Bellack, 1979). A modified version of the dopamine hypothesis is provided by Alford (1986) who states that regardless of whether or not schizophrenia has a biochemical basis, it has been shown that "the single most effective form of treatment for the actively psychotic schizophrenic is neuroleptic pharmacotherapy" (p. 644). He asserts as well, that the individual with schizophrenia is, nevertheless, left with behavioural excesses and deficits that can only be modified through personal and group therapy and rehabilitation programmes (Van Hassel, Bloom & Gonzalez, 1982).

A brief reference needs to be made to some of the latest techniques now available to promote research into the mental illness. Andreason (1994) indicates that new technologies are now available in neuroscience, molecular biology, and neuroimaging. These will certainly help towards answering some questions for those dedicated to biochemical theories of schizophrenia.

Family Theory Perspectives

Family theories discount biologically causative explanations of schizophrenia and focus on the aberrant dynamics of the family system. Included in this model are three interpretations of the process by which a particular family member may be assigned the status of an individual with schizophrenia (Bernheim & Lewine, 1979).

In one explanation, the family maintains cohesiveness through defining one member as having schizophrenia, who thus serves as the "common enemy" or "scapegoat" against whom the family must unite in order to conceal overwhelming interpersonal conflict (Bateson, 1972; Bowen, 1960).

Another view implicates ambiguous parental communication. The "double-bind" theory maintains that severe and persistent, contradictory and mixed messages are a reasonable provocation for an individual to appropriately adapt to such a situation through a schizophrenic response (Bateson, 1972). A final stream contends that the label of schizophrenia may be applied to an individual who attempts to disengage from an excessively dominant and pervasive family identity. Here, the family refuses to tolerate or incorporate the development of individual identity, in that the identity of the family is both pre-eminent and preclusive (Bernheim & Lewine, 1979).

Research indicates that the family is no longer held responsible for causing an adult child's illness. Hales and Hales (1995) state that a family is not to be blamed for a diagnosis of schizophrenia for their child. However, not all researchers agree with this position (see Rund, 1990).

High/Low "Expressed Emotion" Theory

A third theory, related to the family theory perspectives, first developed by Brown, Carstairs, and Topping (1958) and espoused by Tarrrier, Vaughn, Lader, and Leff (1979) is strengthened by the research of Miklowitz and Goldstein (1993). Cognizant of the significant influence of the quality of family relationships in schizophrenia, they conceptualized a theory pertinent to causation and prediction, based on the assessment of "expressed emotion" (EE). That is, the differentiation of patients with schizophrenia as either high or low "expressed emotion" (EE) was premised on an index of "expressed emotion" of the patient's relative(s). Measurement of "expressed emotion" was based on "the marked involvement, hostility, and critical comments made by the relative" (Miklowitz & Goldstein, 1993; Rund, 1994; Tarrrier et al., 1979). The researchers found that patients with schizophrenia with high "expressed emotion" (EE) relatives were more aroused in the presence of their relatives than low "expressed emotion" (EE) patients; furthermore, the occurrence of a life event was more arousing to the individual with schizophrenia with high "expressed emotion" (EE) relatives than those with low "expressed emotion" (EE) relatives. In addition, the researchers indicate that these results support the understanding of arousal as explanatory of "the provocation of

schizophrenic relapses by social situations" (p. 315).

The Information Processing Model

A fourth model, the information processing model, includes two related theories, which are dissimilar in perspective. First, the attention model centers on the possibility that there is a primary deficit in attention, with difficulties in concentrating and focusing of attention which may be responsible for schizophrenia (Bernheim & Lewine, 1979; Hemsley, 1993). Numerous methods have been used to measure this deficit, such as reaction time studies, eye tracking, and studies of thinking tests. All of these have produced varied results.

The second theory related to the information processing model is the arousal theory. This theory postulates that if the origin of schizophrenia is an undue responsiveness to external reality, an increase in electrical activity would be physiologically measurable in schizophrenia, as an indication of the body's arousal to an "increased attention to an interaction with the environment" (Bernheim & Lewine, 1979; Corrigan & Green, 1993; Hemsley, 1993; Knight, 1993, p. 170). Two types of responses have been reported in schizophrenia, both over- and under-arousal. These findings suggest that underresponsiveness is the eventual consequence of a process of gradual withdrawal, which was generated by an initially overresponsive state (Bernheim & Lewine, 1979; Tarrrier et al., 1979). Research by Epstein and Coleman (1970) determined that children of individuals with schizophrenia had extreme physiological responses, both in the direction of overresponding and underresponding. "This points to an absence of control of modulation of response,

rather than an absolute under- or overarousal" (p. 196). These findings are in agreement with the work of Corrigan and Green (1993), who ascertained that the information processing capacity of individuals with schizophrenia varied with arousal in such a way that they have more processing capacity at middle levels of arousal and less at extreme levels of arousal" whether over- or under-stimulated". These findings are also in agreement with the well researched "U" hypothesis for a number of other emotions, e.g., anxiety, called the Yerkes-Dodson Law (Lefton, 1979). However, in the case of the individual with schizophrenia, the over- and under-responding is related to human stimuli thus interfering with significant relationships in the life of the individual with schizophrenia.

Diathesis-Stress Model

The Diathesis-Stress model considers both a genetic and epidemiological view of schizophrenia. The hypothesis here is that schizophrenia occurs in those particular individuals who both possess a genetic predisposition to the disorder and are exposed to an adverse environment. That is, the Diathesis-Stress model predicts that the combination of susceptibility and a stressful environment will generate the individual development of schizophrenia (Bernstein & Lewine, 1979; Erlenmeyer-Kimling, 1968; Goldstein, 1987; Gottesman & Shields, 1976; Kohn, 1972; Matthyse, 1976; Murphy, 1968; Rosenthal, 1968).

Interactive Developmental Model

The Interactive Developmental Model is one proposed by Strauss, Hafez, Liberman and Harding (1985) in which they emphasis the course of a disorder rather

than the outcome. It is built on the natural history and the diathesis-stress model but more specifically accounts for change and the active role of the patient. The course of the disorder is explained by two principles: nonlinearity of course and identifiable phases. It stresses the importance of analyzing sequences, patterns, individual-environmental interactions, vulnerability and recovery.

An Integrated Model of Etiology

Brodsky and Brodsky (1981) proposed a theoretical model for integrating the etiology of schizophrenia, the schizophrenia spectrum, and the normal development of an individual. This review integrated the findings from biochemistry, genetics, and psychophysiology, and incorporated the significance of both the psychological deficit so prominent in individuals with schizophrenia (for example, the thought disorder) and the known aversiveness of human stimuli (Brodsky, 1963).

This theory of integration is based on the hypothesis that a physically-rejecting, unempathic, insensitive and noncontingently responding mother is a major environmental stressor in the development of schizophrenia; and that the continued presence of this environmental stressor throughout the developmental period is the quintessential factor in the formulation of a deviant arousal response to people. In other words, the mother becomes an aversive stimulus to the infant and "deviant cognitive development arises out of a malforming transaction between the infant's temperament" and the unresponsive mother. Consequently, after innumerable trials with the mother's inability to provide comfort, the infant develops a conditioned avoidance response, resulting in an increase in arousal as a defense against

overstimulation. This, in turn, prevents the occurrence of the mother as a punisher. The consequent result is a deviant arousal response to people (Brodsky & Gal, 1990). In fact, the anxious/avoidant infant at one year is already showing three of the major characteristics of schizophrenia:

- a) avoidance of human beings,
- b) deviant cognitive development, and
- c) an increased arousal to human beings.

However, regardless of the etiology of schizophrenia, the concern of professionals and others who work with the schizophrenia population, is the rehabilitation of individuals with schizophrenia (see Anthony, 1994, p.425; Backlar, 1994; Liberman et al., 1993; Mueser & Gingerich, 1994). It is apparent that no one particular intervention or treatment will cure or reduce the symptoms and problems of individuals with schizophrenia. Therefore, in order that they might lead more productive and fulfilling lives, rehabilitation is now considered an important factor in providing an improved lifestyle for them.

Psychosocial Rehabilitation

Definition

During the past several decades, psychosocial rehabilitation has achieved prominence as a major service modality to assist people with mental health disabilities (Bachrach, 1992; Cnaan, Blankertz, Messinger, & Gardner, 1990). Since the deinstitutionalization of the mentally ill in the early 1960's, rehabilitation programmes have multiplied and flourished and the demand for more and improved programmes

continues (Spaniol, Zipple, & Cohen, 1991). Interestingly, Anthony, Cohen, and Farkas (1990) insist that in the 1990's psychosocial rehabilitation "will assume its rightful place." However, to better understand what is meant by psychosocial rehabilitation, a concise definition follows:

...psychosocial rehabilitation is a therapeutic approach to the care of mentally ill individuals that encourages each patient to develop his other fullest capacities through learning procedures and environmental supports (Bachrach, 1992, p.1456).

Bachrach (1992) articulates what is considered to be the fundamentals of psychosocial rehabilitation. The emphasis of a psychosocial rehabilitation programme is to meet the needs of the individual in a number of ways; that is, providing a user-friendly environment, exploiting the individual's strengths, restoring hope, providing vocational and avocational opportunities, involving the individual in planning for her/his own care, and providing ongoing care.

Of further interest in regards to defining "psychosocial rehabilitation" is the contest sponsored in April of 1992 by the Psychosocial Rehabilitation Journal. (Now sometimes called "psychiatric rehabilitation" (Anthony & Spaniol, 1994). They asked that "Psychosocial Rehabilitation" be described "clearly, persuasively, succinctly ... in 35 words or less." The winner came up with the following definition:

Psychosocial rehabilitation is a program for persons with long-term mental illnesses to explore and develop social, occupational, leisure, and living skills which will assist them in living as independently as possible in the community. (C. Chambers, Joplin, Mi.)

Reasons for the Movement

After deinstitutionalization, the 1970's and '80's brought in a period of emphasis on the community mental health model. This event encouraged mental health workers to consider the reason why the movement toward psychosocial rehabilitation was initiated (Cohen & Anthony, 1988). Cnaan et al. (1990) cite several reasons for the movement toward psychosocial rehabilitation. First, in the early nineteen eighty's, post-mentally ill clients lobbied for more humane support with less emphasis on a medical model of treatment (Beard, Propst, & Malamud, 1982; Estroff, 1983). Second, clients, as well as professionals in the mental health field realized the potential benefits of psychosocial rehabilitation. Third, the movement in deinstitutionalization proved the importance of psychosocial rehabilitation if mental health clients were to function in the larger community (Spaniol et al., 1991).

A Brief Review of Psychosocial Rehabilitation Programmes

A large number of programmes have been developed which have implemented the principles of psychosocial rehabilitation. In fact, Cnaan et al., (1990) have indicated that by 1985 in the United States, there were eight hundred social agencies promoting psychosocial rehabilitation programmes, while Spaniol et al., (1991) has enumerated thirteen hundred psychosocial programmes.

However, the difficulty is that there are no encompassing definitions, guidelines, or regulations regarding the parameters of psychosocial rehabilitation. Consequently, the imminent task for those who work in this area is the formulation of basic policies and practices for psychosocial rehabilitation (Bachrach, 1992; Cnaan et

al., 1990; Spaniol et al., 1991). Ostensibly, a compendium manual could provide the foundational knowledge from which a clarified and consistent framework for psychosocial rehabilitation could be implemented and evaluated, and which would objectively distinguish its principles and activities from those of other models (Cnaan et al., 1990).

Nevertheless, over the past decades several psychosocial rehabilitation programmes have proven to be effective in promoting the improved social functioning of the mentally ill patient. Programmes which have emphasized social skills training have fostered the greatest improvement for the client and, together with medication, have become the treatment of choice (Glynn & Mueser, 1986; Liberman et al., 1993; Wixted, Morrison, & Bellack, 1988). This experience is attributable to the fact that social skills deficits and the consequent rejection by the community have characteristically been the main reasons for the rehospitalization of individuals with schizophrenia (Lehman, Ward & Linn, 1982; Liberman, 1982).

Definition of Social Skills

Social skills training has been a characteristic feature of psychosocial rehabilitation programmes and as such, has been documented as "an efficacious modality" (Liberman, 1987). Social skills may be operationally defined as:

...refer(ring) to the everyday conversations, encounters, and relationships that people have with each other. They include the ability to give and obtain information and to express and exchange attitudes, opinions, and feelings. A major function of social skills is to subserve interpersonal interactions. Social skills refer to the nature and function of communication between people (Liberman, 1982, p. 63).

Description of Rehabilitation Programmes

A brief description and evaluation of four social skills training programmes which have been employed with individuals with schizophrenia will aid in addressing the appropriateness and effectiveness of particular intervention modalities. First, Goldsmith and McFall (1975) developed a programme that was premised on naturalistic conversation. Role play was used to train clients to engage in conversation with others. A simulation of a realistic scenario was designed to determine the generalization of these skills, wherein a confederate of the researcher came to visit the researcher, presenting himself as the researcher's friend to the client. The client was instructed to engage the "friend"/confederate in conversation, offer coffee, and end the conversation in five minutes. During this time, the confederate stated that she/he had forgotten the client's name, refused the coffee, and then asked where a non-existent bus stop was. This procedure served to provide the client with an opportunity to learn to manage a minimum of stress in a commonly encountered situation.

By allowing the client to interact in a "somewhat normal setting," this programme permits the researcher to observe the client's interactive social skills. However, the focus on interaction with non-significant individuals, rather than on interaction in intimate relationships where most individuals with schizophrenia experience difficulties, is a pronounced deficit of this programme. In this respect, this programme fails to address the ways in which the client may be aided in changing the elevated arousal response that initially prevent an individual with schizophrenia

from interacting with others.

Second, a social learning program based on a token economy was developed by Paul and Lentz (1977) for individuals with chronic schizophrenia. Clients received tokens for interactions, attending meetings, engaging in conversations, appropriate meal behaviour, and for appropriate grooming. Consistent continuity was provided between appropriate behaviours and reinforcement, inappropriate behaviour and punishment (loss of tokens). The tokens were gradually faded, and the behaviours were maintained and generalized. Naturally occurring social reinforcement took the role of the tokens.

Positive findings of this programme included a higher release rate, improvement in ward behaviour, and a dramatic decrease in medication required for 89 per cent of participants. Significantly, participants spent more days in the community than clients who had experienced a regular hospital programme exclusively, thus indicating the highly cost-effective nature of this programme.

A primary strength of this programme was evidenced by the fact that clients learned how to engage in appropriate instrumental behaviours, as well as in basic interactions with both strangers and intimates. Despite these notable achievements, the paucity of client education regarding the signs of relapse presents substantial concern. That is, clients on reduced dosages might be reluctant to increase medication when positive symptoms of schizophrenia reoccur, thereby increasing the likelihood of relapse. Alternatively, the effects of such symptoms might constrain the client's ability to interact with others, particularly in intimate relationships. Again,

the high arousal levels, the essential cause of schizophrenic withdrawal, was neither addressed nor treated by this program.

A third programme designed by Liberman (1987) was premised on the notion that "the patient can move back and forth along a gradient from frank psychotic symptoms and social disability to symptom remission and adequate social functioning." Emphasis here was on the integration of support programmes, that were accessible and contingently responsive to client needs, with treatment and rehabilitation efforts for individuals with chronic schizophrenia. This program was comprised of numerous training modules, including how to interact with others, taking medication, and recognizing signs of relapse. Conjointly, more effective stress management strategies were taught to clients and their family members to effectuate an increasingly supportive environment for the individual with schizophrenia. The module entitled "Symptom Self Management" is of special interest in that its objective is to instruct clients how to identify warning signs of relapse and how to manage these symptoms.

Positive outcomes of this programme included a substantially lower relapse rate, a reduction in neuroleptic drug usage, and an increase in social interaction. In educating both the client and their family members on the recognition of relapse symptoms and attendant coping skills, this program somewhat addresses concerns regarding the diminished capacity of individuals with schizophrenia to interact in both intimate and instrumental situations, by providing the skills necessary to contend with a heterogeneous array of stressors.

An even more structured and detailed rehabilitation programme by Liberman and colleagues is described as the UCLA Social and Independent Living Skills Modules. This programme uses video-assisted modules that teach independent living and social skills, generalizing these skills into the real-life situations. The programme has integrated the client's family as part of the training module; they encourage the use of medication and teach skills to prevent relapse (Liberman et al., 1993).

Lastly, Wixted et al. (1988) devised a social skills programme specifically oriented to clients with schizophrenia who had demonstrated "negative symptoms." [Negative symptoms are described as affective flattening, alogia, avolition, and anhedonia (Awad, 1989; Beiser & Iacono, 1990)]. Whereas social perceptual skills have been most formidable for individuals with schizophrenia, particular attention was directed toward training clients

...to attend to and interpret interpersonal cues that signify the feelings and motives of other people and to be aware of contextual variables that determine the appropriateness of various responses (Wixted et al., 1988, p. 18).

The experience of Wixted et al. (1988) in attempting to teach complex expressive, receptive and interactive elements of social skills to individuals with schizophrenia proved to be both protracted and arduous precisely because of the difficulty in identifying nonverbally displayed emotions manifest in individuals with schizophrenia (Cutting, 1981; Livesay, 1981).

The inability of individuals with schizophrenia to identify complex elements in social interaction, once again identifies the relevance of teaching individuals with

schizophrenia to recognize their own arousal pattern when interacting with others. They might then, as a result, become more cognizant of the nonverbal emotional elements in the social skills of others and be able to respond more appropriately.

Rationale of the Present Study

In view of the present research, it is important to recognize that the move toward rehabilitation for the severely and long-term mentally ill was essential and continues to be important. Despite the efforts to plan for improved community services for the mentally disabled, rehospitalization rates for such individuals range from 35 to 50 percent within the first year of discharge (Friedman, von Mering, & Hinko, 1966; Wolkon, Karman, and Tanka, 1968). Approximately 60 percent of psychiatric beds are occupied by patients who have been hospitalized for more than one year (Paul, 1984). Glynn and Meuser (1986) comment that one of the main reasons for the high recidivism rate of the post-mentally ill is their inability to cope with and blunt the noxious effects of stressors in the community. It is, therefore, pertinent to ask, "What else is needed?" or "What is lacking?" Dawson, Neuchterlein, and Liberman (1980) remind us that stressful life events are ubiquitous, and that some of these events are under the control of individuals. Therefore, it is reasonable that the post-mentally ill should be helped to increase their stress resiliency. Programmes which address the effects of such stressors have not been extensively developed for clients with schizophrenia. It is precisely the social withdrawal of individual with schizophrenia which displays an attempt to cope with information overload and hyperarousal (Wing, 1975). Thus, it is evident that many

psychosocial rehabilitation programmes do not provide training for the changes necessary for individuals to reduce their high arousal levels to others. Even though individuals with schizophrenia have completed such a training programme, they continue to avoid other people. Sadly, one of the results of recurring breakdowns of the individual with schizophrenia, is that there is a residual impairment between the episodes. Therefore, it is imperative that individuals be trained in reducing their high arousal levels to people. It is of note that Wing (1975) suggested that individuals could be taught "relaxation techniques and self-monitoring of arousal and thus learn to abort sensory overload and hyperarousal" (p. 19).

Summary of Brodsky and Gal Study (1990)

Brodsky and Gal (1990) implemented a research project in which they aimed to reduce the high arousal level of individuals with schizophrenia to human stimuli. They conceptualized the interpersonal difficulties of the individual with schizophrenia as a possible fear/avoidance response to humans and human stimuli. The researchers attempted to modify this behaviour by using progressive muscle relaxation and by monitoring the heart rate via biofeedback while the subjects were viewing slides of people interacting with one another. Twenty Introductory Psychology students, who were the controls, and four individuals with chronic/process schizophrenia, who were the subjects, completed Sociability Scale pre- and post-treatment, and watched slides with neutral (geometric) and human stimuli. Brodsky and Gal found that the individuals with schizophrenia scored lower on the Sociability Scale than did the "normals". In fact, the lower the sociability scores, the higher the arousal to human

stimuli. Furthermore, the individuals with schizophrenia had a higher arousal level to both the neutral and human stimuli than did the normals. However, after teaching the subjects to relax while watching the human-stimuli slides and using biofeedback and relaxation, the individuals with schizophrenia learned to reduce their arousal level.

The researchers concluded that the reduction of arousal level to human-stimuli slides would reduce the fear/avoidance response and, possibly, encourage a concomitant increase in responsiveness to people. In addition, a reduction of arousal level to human stimuli for individuals with schizophrenia could promote improved social ties. Specifically, ties with family and friends would improve. Significantly, an increased social network is known to be a key factor in preventing relapse for the individual with schizophrenia (McFarlane, 1991).

The present study was directed towards the effort of teaching individuals with schizophrenia to learn to relax and self-monitor their arousal level. In fact, rehabilitation programmes might benefit by including in their social skills training agendas, a method whereby individuals with schizophrenia could learn to reduce their high arousal levels to human stimuli.

Rationale for the Treatment Plan

High Arousal Levels

A number of theorists have postulated that the high arousal level of the individual with schizophrenia is due to a learned response (for example, Berheim & Lewine, 1979; Lefley, 1992; Rabin, Doneson, & Jentons, 1979). Although many individuals in the general population respond with high arousal to situations that are

threatening (Barlow, 1988), the individual with schizophrenia responds with high arousal to people who are their closest friends and relatives (TARRIER et al., 1979). Accordingly, this might promote relapse. Dawson et al. (1980) and KARRAS (1962) have defined this reaction as "the overstimulating behaviour itself" and "emotional overinvolvement".

The reaction of hyperarousal evolves into a fear/avoidance response which compels the individual to attempt to escape from that which is responsible for the hyperarousal (Barlow, 1988). Brodsky and Brodsky (1981) interpret this behaviour as having been learned during the developmental process, by an easily aroused, hypersensitive infant with an unempathic, nonsensitive, noncontingent caregiver. The infant learned that his/her basic needs would not be met and, consequently, learned object attachment prior to learning attachment to people. In that these environmental dynamics continued to reinforce these learned behaviours/beliefs, coupled with the possibility of a genetic and/or biochemical predisposition, the individual developed schizophrenia. While the environment remained unfavourable, the individual with schizophrenia continued to withdraw when overexposed to emotional stimuli and the fear which resulted from such exposure (Mackintosh, 1983). In addition, the avoidance response became an adaptive way of coping with such hyperarousal (Gjerde, 1983). That is, avoidance prevented the occurrence of being overstimulated, and thus, avoidance conditioning occurred (Mackintosh, 1983).

These contingencies lead to the supposition that teaching individuals with schizophrenia to respond with less arousal to human stimuli would decrease their

fear/avoidance response (Dawson et al., 1980). Gjerde (1983) states unequivocally that "the role of arousal must be addressed prior to the postulation of the existence of specific information processing deficits in schizophrenia" (p. 68). Conversely, a decrease in arousal level would increase the individual with schizophrenia's approach response to people (Brodsky and Gal, 1991). Dawson et al. (1980) and Lapidus and Schmolling (1975) have suggested the targeting of the overstimulating or hyperarousal behaviour directly as a method of relapse prevention for individuals with schizophrenia. Brodsky and Gal (1991) have partially validated this hypothesis in their study, described earlier, in which the fear/avoidance behaviour of four individuals with schizophrenia was modified using biofeedback and relaxation training.

Biofeedback

Basmajian (1983) defines biofeedback as:

...the technique of using equipment (usually electronic) to reveal to human beings some of their internal physiological events, normal and abnormal, in the form of visual and auditory signals in order to teach them to manipulate these otherwise involuntary or unfelt events by manipulating the displayed signals (Basmajian, 1983, p. 1).

Through the use of biofeedback, individuals can learn to control some of their internal bodily processes, e.g., heart rate, blood pressure, and muscle relaxation. By obtaining immediate feedback about their bodily states via instrumentation, usually in the form of visual and auditory signals, the particular bodily processes of concern can be brought under conscious control to some degree (Jensen, 1983; Kaplan, 1986). Biofeedback has been used to treat psychosomatic stress-related problems such as migraine and tension headaches, cardiac rates, blood pressure, Raynaud's disease, and

spasmodic torticollis (Basmajian, 1983; Kaplan, 1986). It has also been successfully employed in treating patients with complaints of anxiety and tension (Udell, Saunders, & Wilkinson, 1979).

Biofeedback is best used in tandem with other types of behavioural techniques, such as progressive muscle relaxation (Kaplan, 1986). This dynamic was demonstrated in a study conducted by Hawkins, Doell, Lindseth, Jeffers and Skaggs (1980) which "investigated the efficacy of thermal biofeedback and relaxation as adjunctive treatments to antipsychotic medication for anxiety reduction in forty hospitalized schizophrenics" (Hawkins et al., 1980). In this study, subjects were randomly assigned to four treatment groups: a) biofeedback, b) relaxation, 3) biofeedback and relaxation, and d) minimal treatment control. While results indicated that there were no between-group differences in the significant reduction in anxiety following treatment, a one-year follow-up evidenced the continued substantial reduction in anxiety of individuals with schizophrenia who were in the biofeedback and relaxation treatment group, strongly suggesting the utility of this therapeutic combination. The researchers concluded that:

...these behavioural interventions probably decrease the frequency and/or severity of psychotic behaviour by minimizing responses to stress that would otherwise exacerbate the underlying thought disorder (Hawkins et al., 1980, p. 481).

Gjerde (1983) and Hemsley (1993) suggest that arousal in schizophrenia is determined more by endogenous factors than by external stimuli; specifically, that means that arousal is a background variable and not encouraged by the processing during the experiment itself. Further, disturbed behaviour in individuals with

schizophrenia is often associated with autonomic nervous system disturbances.

Although there is some disagreement among researchers as to whether internality is preferable to externality, i.e., in terms of arousal responses (Futterman & Shapiro, 1986; Zimet, 1979), in the case of individuals with schizophrenia, internality would seem to be the preferable orientation, specifically if the need to reduce their arousal to human stimuli is considered (Zahn, Carpenter, & McGlashan, 1981). The assumption here is that biofeedback sensitizes the individual to bodily responses and to the relation of these responses to behaviours, thereby facilitating more adaptive responses (Corrigan & Green, 1993).

Relaxation Training

Relaxation therapy refers to a systematic training procedure wherein "the client is instructed ... to relax ... muscle groups" sequentially, in order to attain deep relaxation of the skeletal muscles (Basmajian, 1983). Transcripts of relaxation programmes can be readily obtained (e.g., from Psychology texts and audiotapes, e.g., Jacobson, 1974); alternatively, these can be adapted specifically to each individual. Essentially, the individual's attention is initially focused on internal body cues associated with magnitudes of tension, and then focused on the sense of feeling relaxation. When used in conjunction with biofeedback, relaxation encourages the trainee to become increasingly aware of tension and subjective feelings of relaxation which result from successful training in their self-regulation (Basmajian, 1983; Hillenberg & Collins, 1982). Futterman and Shapiro (1986) indicate that "increased anxiety often precipitates psychotic symptoms" (p. 28). They posit that teaching

individuals with schizophrenia to relax and to reduce their anxiety and tension may indirectly decrease the likelihood of relapse. Nigel and Jackson (1979) used EMG biofeedback training in conjunction with standard psychiatric treatment with a group of severely disturbed individuals with schizophrenia. They found that after patients had been trained in this technique, their hospital stays were significantly reduced compared to a similar group that had not received such training. Weiner (1979) used EMG-feedback to teach individuals with schizophrenia to alter their muscle tension. Findings of this study were that the ability to decrease muscle tension increased with the increased use of EMG-feedback. Collectively, these studies demonstrate that using biofeedback and relaxation training as a treatment package is helpful in decreasing the arousal levels of individuals who demonstrate a tendency toward hyperarousal (Weiner, 1979).

Rationale for the Experimental Design

This research employed a multiple-baseline design across subjects (Martin & Pear, 1992) to assess whether the high arousal levels common in individuals with schizophrenia can be controlled by a biofeedback-relaxation treatment package. There were several reasons for using a single-subject design. First, there is a paucity of research on topics related to the problems of individuals with schizophrenia using single-subject designs, and no research using single-subject designs while teaching schizophrenics to reduce their arousal levels. According to Kratochwill, Mott and Dodson (1984) single-subject research designs are "uniquely suited to treatments involving a single client..." and "sometimes to certain rare disorders, such as cases of

... schizophrenia" which might be "unavailable for group investigations" (p. 55).

Second, this design lent itself to assessing the treatment in spite of variability in the arousal level that was specific to each individual (Kazdin, 1982b). For example, individuals with schizophrenia, as a rule, have varied responses to treatment, particularly to prescribed neuroleptics. Therefore, in using the present design, the dosage and variable response to medication experienced by each subject were taken into consideration (Dr. Fran Edye-Mazowita, personal communication, June 10, 1993). Response variations within individual subjects were monitored throughout the span of the project (Bachrach, 1992; Baron, 1990).

Third, single-subject designs have high internal validity for evaluating whether a particular treatment is responsible for changes in the dependent variable (Kazdin, 1982a). Specifically, single-subject designs elucidate the lawful relationships that govern an individual's behaviour (Kratochwill et al., 1984).

The multiple-baseline design across subjects included the following phases:

- a) a baseline phase in which data were collected concurrently on all subjects in order to determine the level of the behaviour prior to intervention (Martin & Pear, 1992);
- b) a treatment phase that demonstrated the experimental effect by showing that behaviour changes occurred whenever treatment was introduced at different points in time (Kazdin, 1982b); and
- c) a follow-up phase that determined whether the changes achieved during the intervention were maintained over time (Martin & Pear, 1992).

Contributions of the Present Study to the Research Literature on Schizophrenia

The proposed study contributed to the research on schizophrenia in the following ways:

- a) A single-subject research design was utilized, thus providing individualized attention to progress.
- b) Three pre- and post-treatment self-report questionnaires, as dependent measures, were administered and provided data on the progress of the subjects.
- c) Subjects were taught how to decrease their high arousal levels to human stimuli via biofeedback, which is considered the major reason for their tendency to withdraw and to be rehospitalized.
- d) Social validity measures were obtained from the subjects and their significant others, thus substantiating the treatment process.
- e) Relaxation and biofeedback training as an adjunctive treatment package to psychosocial rehabilitation was demonstrated as being helpful to individuals with schizophrenia.

Hypotheses

The present project was premised on the hypothesis delineated by Brodsky and Gal (1990) that the interpersonal difficulties of the individual with schizophrenia stem from a fear/avoidance response to humans and human stimuli. To modify this behaviour they used a biofeedback-relaxation treatment to reduce heart rate while the subjects in their study were viewing human-stimuli slides. Their study was limited in

that it consisted of four case histories. The present study employed a single-subject design in order to more clearly evaluate the effectiveness of a relaxation-biofeedback training package for reducing arousal level (as assessed by heart-rate) with individuals diagnosed with schizophrenia. The present study also included more detailed pre- and post- treatments than did Brodsky and Gal in their study, and it also included one-month follow-up data. The Brodsky and Gal study did not include follow-up assessments.

The major hypotheses were:

- 1) That the subjects' arousal level would be higher to human stimuli than to geometric stimuli;
- 2) That relaxation-biofeedback training would decrease the level of arousal to the human stimuli;
- 3) That the decreased arousal response would generalize to social functioning;
- 4) That the decreased arousal response would produce more approach responses to other individuals;
- 5) That the scores on the Social Fear Scale would decrease as a function of the treatment;
- 6) That the scores on the Social Avoidance and Distress Scale would decrease as a function of the treatment;
- 7) That the scores on the Sociability Scale would increase as a function of the treatment;
- 8) That a social validation measure would indicate that low arousal levels

following treatment would generalize to the extent that the subjects would verbally report changes in their interactions with others.

- 9) That significant others would report more varied approach responses by the subjects as a function of treatment.
- 10) That subjects would report that training had been helpful and that they would recommend the treatment to others.

Method

Subjects

Subjects were solicited from the caseload of Mental Health Clinicians in a rural community in Manitoba. In order to qualify for the research, each subject had to have a psychiatric diagnosis consistent with the DSM-III-R for schizophrenia, any type. Individuals with schizophrenia, as noted in the DSM-III-R and the research literature, have difficulties coping when in a social situation. This tendency to withdraw from interpersonal relationships appears to be due in part to their heightened levels of anxiety, social fears, and general stress (Corin & Lauzon, 1992; Mueser & Gingerich, 1994). The goal of the present research was to teach subjects to relax and thus learn to reduce their heart rate in the presence of human stimuli.

Of the six subjects that volunteered for the research, one did not attend because he lived too far away from the research center. The other five lived within walking or driving distance. The subjects' ages ranged from 28 to 50, with an average age of 41. Their education ranged from Grade 8 to Grade 12. All of them were employed at the onset: three of them worked at a sheltered workshop, one just

recently retired from her work, and one worked at home caring for her elderly mother. All of them were on neuroleptic medication; four of them were also on injectable neuroleptics.

Subject 1 had been hospitalized four to five times and had also changed foster placements several times in the last two years. She also had been seeing her family physician three to four times a month and required a lot of care from her foster sponsor. She received Risperidone 1 mg once a day and Lorazepam 1 mg twice a day.

Subject 2 functioned quite well most of the time but during periods of stress, such as when faced with family or personal health issues, she began to hallucinate. Although much of what she said was within social limits, she also became agitated and at such times would speak incessantly. She received injectable Modecate 2.5 mg I.M. once every three weeks, and Levathyroxine 100 mg each morning.

Subject 3 worked as a cashier for a restaurant and a bus depot. Although he did his job well, he nevertheless lacked the social skills necessary in dealing with the public he was serving. He was, however, quite unaware of his dysfunctional interactional patterns. He belonged to a tightly-knit religious group which was a social outlet for him. They provided positive reinforcement for his ability to memorize and recite portions of the Bible in their church meetings. However, the group did not endorse medical intervention and consequently, Subject 3 was unaware of his elevated blood pressure which was, as was later discovered, why he could not reduce his heart rate during the biofeedback-relaxation phase. He received injectable

Modecate 2 cc I.M. once every four weeks, Chlorpromazine 50 mg three times a day and Procyclidine 0.5 mg three times a day.

Subject 4 worked in the kitchen of a restaurant, seemingly enjoyed her work and was usually well-groomed. She usually was quite spontaneous in her interaction with other people. If she was left to herself, she concocted weird stories the content of which could be quite embarrassing for other people. It appeared that the unusual things she talked about made sense to her. Subject 4 was under an Order of Supervision and permission was obtained from the Public Trustee for her to be part of this research project. She received injectable Flupenthixil 275 mg I.M. once every two weeks, Loxapine 100 mg four times a day, Desipramine 75 mg in the morning, and Cogentin 0.2 mg three times a day.

Subject 5 was involved in many different types of jobs at a sheltered workshop. She was the only subject one who smoked. Although on high doses of neuroleptics, she reported hearing voices and these appeared to interfere with her work and with the relaxation part of the research project. She received Piportil 225 mg I.M. once every three weeks and Cogentin 2 mg twice a day.

Setting and Equipment

Sessions were conducted during the regular work day at the Ste. Anne Health Unit in Ste. Anne, Manitoba. The room was spacious and except for the sound of an occasional freight train passing close to the building, was quiet (see Appendix A). It was also out of the way of the general traffic of the Health Unit. The three subjects who worked close by walked to and from their work place to the Health Unit. One

subject had her own car and drove to sessions from eight miles away. She was provided with money to pay for her gas. One subject was chauffeured to and from the Health Unit by her significant other.

For each session, a table about six feet in length held an Amstrad, Personal Portable Computer, Model PPC 640, Serial no. 532-8612142; a Magnavox Professional PC Monitor 80, Serial no. LL 53796 and listed as 641M, E84681, Type 7AV213 0746, NR. TV 00827002536; and a Whittaker Pulse-Watch, Model no. PW-420, Serial no. 1330RCP, which faced the researcher. For obtaining the heart rate of the subject, a cord with a finger sleeve attached to it was inserted into the Pulse-Watch. The subject put his/her index finger into the sleeve and held it there throughout the session. The subject sat facing the researcher. Slides (described later) were projected on to the bare wall behind the researcher from an office desk to the front and left of the researcher. The research assistant operated a Kodak Ektagraphic slide projector, Model E-2; Serial no. 2072317. She was out of the visual range of the subject. She also timed each slide, using a hand-held stop watch, so that each slide appeared on the screen for 15 seconds. The computer programme was designed for automatic recording of heart rate on to individual diskettes for each subject. A subject's heart rate appeared on the monitor in the form of a horizontal bar graph and the bar moved forward and back, five seconds after the actual input from the Pulse-Watch. However, the averaged heart rate, in numerals, for each minute was flashed onto the screen, appearing in the lower left hand corner of the monitor. At the end of each session, the entire process was recorded on the computer diskette and later could

be obtained on a print-out. During relaxation training and biofeedback respectively, the assistant researcher operated the Panasonic Stereo Radio Cassette Recorder, Model No. RX-FS400, MK 093465, using a cassette tape entitled: StressFree* Take Control Over Stress by Dr. Toby Rutner (1987).

Procedure

Initial Contact

The first contact was made with each subject in the Ste. Anne Health Unit office, except for Subject 2 who came to the researcher's home. During the first session a subject completed the Contract, Consent, and Information Form (see Appendix B), the Registration Information for Research Programme (see Appendix C), and three self-report measures: the Social Fear Scale (Appendix D), the Social Avoidance and Distress Scale (Appendix E), and the Sociability Scale (Appendix F). The researcher read the questions on the self-report measures for each subject since the subjects sometimes found it difficult to read these questionnaires. It also appeared to help them to stay on task. Appointments were set up for the first baseline session and each subject indicated who would be his/her significant other. Prior to the first baseline session, the researcher contacted each of the significant others and explained to them their part in the project. They completed the Contract, Consent, and Information Form (see Appendix B), the Confidentiality Form (see Appendix G), and the three self-report measures for their particular subject. The significant others completed and returned the questionnaires within a few days.

Baseline

During baseline sessions, when the subjects arrived they were greeted by the researcher at the front office and escorted to the research room which was toward the back of the building. The assistant researcher greeted them as they entered the research room. They were helped with their jackets and coats and asked to sit on a chair facing the researcher. After the subject appeared to be comfortable, and the finger sleeve had been adjusted to stay on his/her index finger, the Pulse-Watch was turned on. When the pulse had settled and the Pulse-Watch indicated a steady state, the computer programme was begun.

The purpose of the baseline phase was to assess a subject's heart rate response to eight neutral-stimuli slides, consisting of circles, triangles, and rectangles, and to eight human-stimuli slides. The human-stimuli slides portrayed a progressive story of a woman waiting at a fire hydrant for a man who came up to her with a dog on a leash. Each slide remained on the screen for 15 seconds.

The heart rate programme was pre-timed, and each set of slides had to be completed in two minutes. During this time, the subjects were encouraged to focus solely on the slides projected on the wall which served as a screen. The researcher observed the subject, noted the heart rate, and made sure the equipment was working properly. Once the slides were completed, the subject was asked to leave the room for a few minutes while the researcher and research assistant independently recorded the statistics from the monitor. Keeping a record of the heart rate on a session-to-session basis made it possible not to depend on the print-out which could not be obtained on a

daily basis. The number of baseline sessions per subject ranged from six to eleven.

Training

Prior to each training session, the purpose of the training phase was explained to each subject. Each training session consisted of four parts. During Part's 1 and 4, a set of eight human-stimuli slides were flashed on the screen, again for 15 seconds. This time the story line consisted of two men meeting close to a park bench with a woman joining them and putting her arms around both of the men. This type of scenario was thought to be stressful to individuals with schizophrenia because it displayed close bodily contact between members of both genders.

During Part 2 of the training session during which the slide projector was turned off, each subject was encouraged to relax while listening to some music. The first seven minutes of the relaxation tape (Rutner, 1987) consisted of instructions to relax with a background of Psychoactive music which was thought to elicit the relaxing response. The tape prompted a subject to focus on internal body cues associated with the feelings of relaxation. During Part 2 the researcher and research assistant were silent.

After seven minutes of Part 2 the tape was stopped and Part 3 of the training session began. The purpose of Part 3 was to have a subject decrease his/her heart rate as it appeared on the monitor. The monitor was turned toward the subject so that he/she could view the horizontal bar graph indicating the heart rate. Instructions were again repeated to the subject asking him/her to watch the bar graph and to continue relaxing while the music was playing. The subjects were occasionally encouraged to

focus and to observe the bar which indicated the heart rate as it moved back and forth on the screen of the monitor. At times the researcher would provide positive encouragement such as, "That is good, you are relaxing," or "See, you are controlling your own heart." Again, the purpose of Part 3 was to encourage the subjects to associate the music with the relaxing of his/her body, thereby trying to maintain or reduce the heart rate as it appeared on the monitor.

It was assumed that, as the subjects were viewing their own heart rate as it increased or decreased according to their efforts at relaxing, the appearance of the biofeedback bar became a discriminative stimulus for continuing appropriate behaviour: decreased heart rate, or modifying the inappropriate behaviour: increased heart rate. These instances may have become conditioned punishers for those behaviours that were inappropriate and conditioned reinforcers for those behaviour that were appropriate to reducing the heart rate.

When the seven minutes of music in Part 3 were completed, the research assistant turned off the music and the researcher turned the monitor to again have it face herself. Part 4 of the training session then occurred. Once again, the human-stimuli slides from Part 1 were flashed on the screen. It was expected that a subject's heart rate during Part 4 of the session would have decreased from what it had been during Part 1 of that session. When the two minutes were completed, the finger sleeve was removed from the subject's index finger. Then the heart rate noted on the screen was recorded individually by the researcher and research assistant.

During some days, two training sessions were conducted and on those days,

the subject was asked to wait in the corridor for ten minutes in between training sessions. During this time the researcher and research assistant prepared the equipment for another training session. During this time the research assistant reversed the slides once more. Usually during this time the subject took time to go to the bathroom, drink some water, or go out for a smoke. When a training session was completed for the day, the subject was given the appointment time for the next session and then escorted to the front office. The researcher would usually watch the subject until he/she was safely on his/her way back to work or in the car ready to leave.

The number of training sessions for individual subjects ranged from 20 to 26 and, for the most part, sessions were conducted twice per week per subject. The day after the training sessions were completed for all subjects, each subject once again completed the three sets of questionnaires: the Social Fear Scale, the Social Avoidance and Distress Scale and the Sociability Scale. The researcher read the questions for each subject and he/she indicated his/her choices. Each subject was given the StressFree* relaxation tape with a form (see Appendix H) on which to mark a check whenever they listened to the tape. They were requested to listen to the tape once per day. On this form there was a also space for the significant other to verify that the subject had listened to the relaxation tape.

Follow-up and Final Contact

Four weeks after the completion of the training phase, each subject returned for a follow-up session. The same slides seen during baseline were viewed once again. Each subject again completed the three questionnaires. The verbal and written

Social Validation questions (see Appendix I) were also completed.

The subjects indicated that they had listened to the relaxation tape during the four weeks between the end of treatment and the follow-up session. The benefits of listening to the tape was discussed. The subjects submitted their forms, marked by them and their significant other. During the next few days, the researcher interviewed each significant other using the Social Validation Scale (see Appendix J). Each significant other also completed and returned the three questionnaires.

Dependent Measures

The following measures were utilized during the research: a) the heart rate response to the human-stimuli slides as an outcome measure of the effects of relaxation and biofeedback training; b) the Social Fear Scale; the Social Distress and Avoidance Scale; the Sociability Scale; and the Social Validation questionnaire. A description of each measure follows.

Heart Rate Response

The heart rate response to the human-stimuli slides has been described at length earlier. Of note is the fact that as each subject began to utilize the biofeedback portion of the training session, he/she began to focus on his/her own ability to relax and decrease his/her heart rate response.

The Social Fear Scale

The Social Fear Scale (Raulin & Wee, 1984; Appendix D) is a 36-item scale which measures the particular type of social fear that is believed to be a common characteristic of schizotypic individuals, defined as those who have a genetic

predisposition to schizophrenia. It was developed to measure interpersonal aversiveness, characteristics such as social inadequacy, and a dearth of interpersonal relationships. Respondents are asked to indicate whether each item is true or false as it applies to them. Items 3, 8, 16, 18, 19, 31, and 32 are considered correct if marked "false" and all the others are considered "correct" if marked "true". Correct answers are assigned 1 point and the scores are summed. The higher the score, the greater the degree of social fear.

The Social Fear Scale has excellent internal consistency, with alphas ranging from .85 to .88. No test-retest correlations have been reported. It has fair concurrent validity, correlating moderately with several other scales measuring schizotypic characteristics, (e.g., perceptual aberration, intense ambivalence, somatic symptoms).

The Social Avoidance and Distress Scale

The Social Avoidance and Distress Scale (Watson & Friend, 1969; Appendix E) is a 28-item measure and was developed to assess two aspects of anxiety: 1) one's experience of distress, discomfort, fear and anxiety, and 2) the deliberate avoidance of social situations. The items are phrased to reflect anxiety and non-anxiety symptoms in an effort to control for response bias. The Social Avoidance and Distress Scale is appropriate for general social situations rather than specific areas of distress such as phobias.

Each item is answered either "true" or "false". Items 2, 5, 8, 10, 11, 13, 14, 16, 18, 20, 21, 23, 24, and 26 are keyed for "true" answers, while the other items

are keyed "false". Answers which match the keyed response are assigned the value of 1, and answers which do not match the key are assigned the value of 0. Total scores are the summation of the item values. Scores range from 0 to 28 with the higher scores indicating more anxiety.

The average item-to-total score correlation is .77 and reliability is .94. Test-retest reliability for a one-month period was .68. The validity of the scale was assessed by testing to see if subjects with high scores demonstrated more discomfort in a social situation than did subjects with lower scores. Differences were found between the groups on this variable and is evidence of known-group validity.

The Sociability Scale

The Sociability Scale (Brodsky and Gal, 1990; Appendix F) is a 33-item scale designed to measure the characteristics of an individual's ability to be social when interacting with other people. The test-retest reliability is .76 over a five month period with a mean of 125 and a standard deviation of 12. Peer attachment and sociability correlated $.45p < .0001$ with Peer Attachment part of the Inventory of Parent-Peer Attachment Scale. Loneliness correlated $-.51 p < .0001$ with sociability on the UCLA Loneliness Scale, that is, a low score on the loneliness was correlated with a high score on sociability. Social intimacy correlated moderately low with sociability, $.17 p < .05$ with the social intimacy scale on Miller's Social Intimacy Scale.

Social Validation Measure

Last of all, a social validation interview was conducted at the completion of

the project, separately, with each subject (see Appendix I) and his/her significant other (Appendix J). Both the researcher and the research assistant were present. Both social validation interviews had four questions that were rated from 1=none; 3=somewhat and 5=a lot, plus four additional questions that were part of the verbal interview.

Interobserver Reliability

Since all the means and standard deviations for each session were obtainable from the computer programme itself at the end of every specified time period, interobserver reliability consisted of the research assistant and the researcher each individually recording the statistics when they came up on the monitor. Separate records were kept which were then compared at the end of the session.

Interrater Reliability

The Social Fear Scale, the Social Avoidance and Distress Scale, and the Sociability Scale completed by the subjects and significant others were scored separately by the researcher and the research assistant. A total of 75 questionnaires were scored.

Procedural Reliability

Procedural reliability assessments were conducted to ensure that experimental procedures as outlined by the researcher were followed as specified. A research assistant served as the observer. She checked the experimental procedures once in each phase for each subject throughout the research (Billingsley, White & Munson, 1980). She had a procedural checklist for each phase and a checklist applicable

specifically to the training sessions (see Appendix K and L). The research assistant also checked the trainer's teaching procedures from a pre-planned list to ensure treatment integrity (see Appendix K and L).

Confidentiality

All of the individuals involved in this research project signed a contract of confidentiality. This included the research assistant, the significant others, the thesis supervisor and the researcher (see Appendix G; Kaplan, 1986).

Results

The main dependent variable was the subjects' heart rate during baseline, treatment, and follow-up phases. Additional dependent measures included subjects' scores on the Social Fear Scale, the Social Avoidance and Distress Scale, and the Sociability Scale collected at pre-treatment, post-treatment, and at follow-up. The final measures obtained included the social validity assessments. On a subject-by-subject basis, the subjects' heart rate data will be presented. The questionnaire data will then be presented on a subject-by-subject basis. Finally, the social validity data will be presented.

Heart Rate Data During Experimental Phases

It was hoped that the data would help to answer three questions: (a) Do persons with schizophrenia show a higher arousal (higher heart rate) when viewing human-stimuli slides as compared to neutral-stimuli slides? (b) Does a combination of relaxation training and biofeedback lead to a decrease in heart rate when persons with

schizophrenia view human-stimuli slides? and (c) Following the treatment phase, does a relaxation homework assignment lead to further decreases in heart rate response to human-stimuli slides at a 1-month follow-up?

Experimental Control of the Treatment Package

Before discussing the results, it is important to add an explanation regarding the use of the bar graph instead of a line graph (see Appendix M). With the data summarized in terms of means across all phases of this study, the delayed-treatment control feature of the multiple-baseline design across subjects is lost. Therefore, in order to demonstrate control of the independent variable (i.e., to demonstrate internal validity of treatment), the information in Appendix M is a tabulation of baseline heart rate for human-stimuli slides for all subjects. Following the introduction of treatment, Phase 4, to Subject 1, baseline continues for Subjects 2, 3, and 4. Following introduction of treatment, Phase 4, for Subject 2, baseline continues for Subject 3 and 4. The same sequence follows for Subject 3. Heart rate data for Phase 4 decreases sequentially for each subject upon introduction of treatment. It is also of note that for Subject 3 there is not a significant decrease in heart rate during Phase 4. This issue will be discussed in greater detail later on.

Subject 1

Session-by-session heart rate data for Subject 1 are presented in Table 1. Mean heart rate across experimental phases for Subject 1 are presented in Figure 1. With respect to the first question listed above, Subject 1 did not respond differentially to the neutral slides versus the human-stimuli slides. As can be seen in Table 1, the

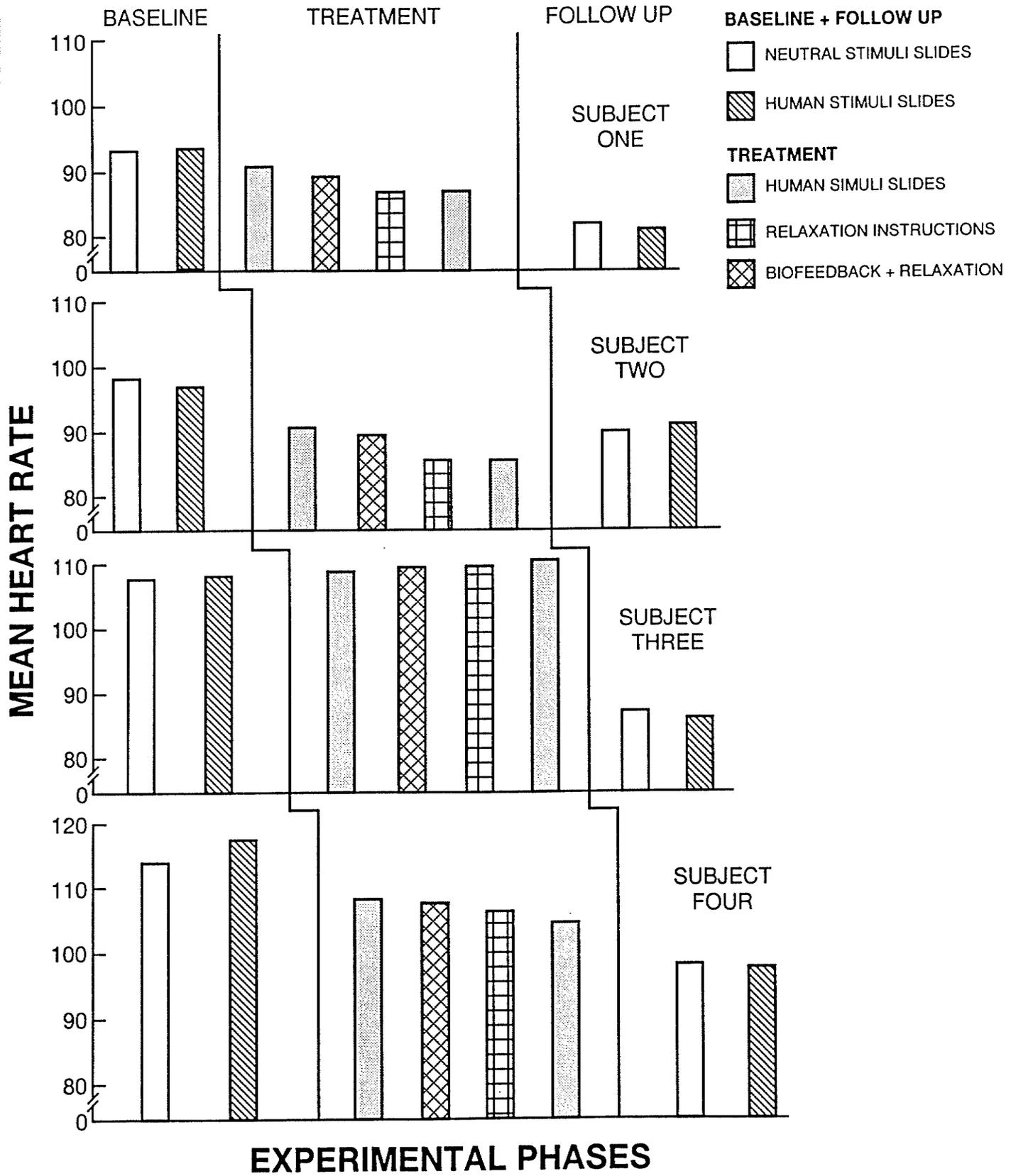
Table 1.--Heart Rate Data for Subject 1

Session	Baseline		Treatment				Follow-Up	
	Neutral	Human	Human	Relaxation	Feedback	Human	Neutral	Human
1	93.5	92.0	91.5	90.0	86.8	88.0	82.0	81.0
2	91.0	90.0	92.0	88.2	84.8	85.5		
3	90.5	90.0	83.5	84.0	84.7	82.5		
4	93.3	95.5	92.0	92.0	88.0	88.5		
5	94.0	95.0	89.5	86.4	85.7	85.0		
6	95.0	97.0	98.5	93.8	93.0	95.0		
7			87.5	82.0	81.7	80.5		
8			80.0	81.0	83.0	83.0		
9			86.0	83.8	82.0	84.0		
10			87.0	89.0	89.0	89.0		
11			94.5	92.0	87.0	87.0		
12			84.5	82.0	82.7	80.5		
13			88.5	85.5	85.7	87.5		
14*			76.0	78.0	80.0	110.5		
15*			112.5	110.0	102.5	107.0		
16			94.0	90.7	91.0	93.0		
17			90.5	90.7	91.0	90.0		
18*			105.0	102.8	100.4	107.0		
19			99.5	108.0	96.0	93.0		
20			98.5	93.8	89.1	88.0		
\bar{X}^*	92.9	93.3	90.4	89.0	87.1	87.0		
\bar{X}	92.9	93.3	91.5	90.2	88.2	90.2		

*The data points for these sessions were not included in the means, as they were not representative of the general trend in treatment.

Figure Caption

Figure 1. Mean heart rate for baseline, treatment, and follow-up phases



mean heart rate across all baseline sessions for the neutral-stimuli slides was 92.9, and for the human-stimuli slides, it was 93.3. During the follow-up phase, mean heart rate data to the neutral slides was 82, and to the human slides was 81.

Concerning the second question listed above, the relaxation and biofeedback training led to a slight decrease in Subject 1's heart rate to human-stimuli slides within sessions. As can be seen in Table 1, the mean heart rate across Part 1 (exposure to human-stimuli slides) of all the treatment sessions was 91.5. The mean heart rate during Part 4 (exposure to human-stimuli slides following relaxation and biofeedback training) across all treatment sessions was 90.2. These results change slightly (in favour of a positive effect from treatment) when data from Sessions 14, 15, and 18 are deleted from the tabulation of the means. Subject 1 showed an excessively high heart rate during Part 4 of Session 14. After the session, she claimed that the slides of a woman without facial features bothered her to the point where she could not concentrate on relaxing during Part 4. During Session 15, she reported that she was still concentrating on the slide of the woman who had no facial features. Similar results occurred during Session 18. When the data from these sessions are excluded, Subject 1 showed a mean decrease in heart rate from 90.4 across Part 1 of the treatment sessions to 87 across Part 4 of the treatment sessions.

Concerning the third question listed above, there was a clear decrease in Subject 1's heart rate to human-stimuli slides at a 1-month follow-up, both in comparison to her heart rate at the end of treatment and her heart rate during the baseline phase. As can be seen in Table 1 and Figure 1, her heart rate to human-

stimuli slides at follow-up was 81 compared to a mean of 90.2 across Part 4 of treatment sessions, and a mean of 93.3 across baseline sessions. As will be discussed later, social validity measures also indicated that the client used the relaxation tape on a daily basis during the month following treatment.

In summary, with Subject 1: (a) there was no difference in heart rate to human-stimuli slides versus neutral slides, either during baseline or during the follow-up phase; (b) there was a small effect of relaxation and biofeedback training for reducing heart rate to human-stimuli slides within treatment session; and (c) there was a large decrease in heart rate to human-stimuli slides (compared to both baseline and to treatment assessments) following one month of homework relaxation exercises.

Causal observations for Subject 1 might provide some insight into the verbal interaction patterns and thought processes of persons with schizophrenia. For example, during baseline Subject 1 claimed that the slide with the fire hydrant appeared to her to have a face. She repeatedly asked why a fire hydrant had to have a face. The circles on the neutral slides reminded her of the song, "Great balls of fire." The squares and rectangles reminded her of the fluorescent light in the ceiling. She insisted that there had to be a connection between the neutral-stimuli slides and square and rectangular objects in the environment. During treatment, while dangling the hand with the finger sleeve from two thick telephone books (thus preventing extraneous noise to move through the finger-sleeve into the heart-rate monitor), Subject 1 indicated that the names of the people in the telephones books came to bother her. When the telephone books were removed, she indicated that now she

could relax.

Subject 2

Session-by-session heart rate for Subject 2 are presented in Table 2. Mean heart rate data across experimental phases for Subject 2 are presented in Figure 1. With respect to the first question listed above, Subject 2 responded with a slightly increased heart rate to neutral versus human-stimuli slides. As can be seen in Table 2, the mean heart rate across all baseline sessions for the neutral-stimuli slides was 98.6, and for the human-stimuli slides, it was 97.5. During the follow-up phase, mean heart rate data to the neutral slides was 90, and to the human-stimuli slides was 91.

Concerning the second question listed above, the relaxation and biofeedback training led to a substantial decrease in Subject 2's heart rate to human-stimuli slides within sessions. As can be seen in Table 2, the mean heart rate across Part 1 (exposure to human-stimuli slides) of all treatment sessions was 90.9. The mean heart rate during Part 4 (exposure to human-stimuli slides following relaxation and biofeedback training) across all treatment sessions was 85.7.

Concerning the third question listed above, there was an increase in Subject 2's heart rate to human-stimuli slides at a 1-month follow-up in comparison to her mean heart rate during Part 4 of treatment sessions. However, there was a decrease in her heart rate from follow-up compared to the baseline phase. As can be seen in Table 2 and Figure 1, her heart rate to human-stimuli slides at follow-up was 91 compared to 85.7 across Part 4 of treatment sessions, and a mean of 97.5 across baseline sessions. As will be discussed later, social validity measures did indicate that

Table 2.--Heart Rate Data for Subject 2

Session	Baseline		Treatment				Follow-Up	
	Neutral	Human	Human	Relaxation	Feedback	Human	Neutral	Human
1	99.0	97.5	97.0	97.8	94.5	94.0	90.0	91.0
2	97.5	96.0	99.0	97.7	93.4	94.5		
3	95.5	96.0	96.0	95.7	92.0	93.5		
4	101.0	99.5	96.0	92.4	93.7	94.5		
5	100.5	98.5	84.5	80.4	80.0	79.5		
6	100.0	97.0	89.0	91.4	85.8	85.0		
7	97.0	98.0	86.5	84.0	80.4	79.0		
8			87.0	86.8	83.5	83.5		
9			90.0	86.7	83.7	83.0		
10			88.0	88.7	83.7	81.5		
11			86.5	86.0	81.0	84.0		
12			87.0	87.0	84.0	85.0		
13			93.0	90.4	85.8	85.0		
14			86.5	85.7	81.8	82.5		
15			88.5	84.0	78.0	79.5		
16			83.0	78.0	77.4	77.5		
17			90.0	87.0	83.8	83.5		
18			91.5	87.0	84.7	84.0		
19			96.5	96.0	92.8	90.5		
20			90.5	92.0	91.7	90.0		
21			96.5	94.0	91.5	91.0		
22			97.0	93.0	86.0	84.5		
\bar{X}	98.6	97.5	90.9	89.2	85.9	85.7		

the client used the relaxation tape on a daily basis (except on the day of her mother's funeral) during the month following treatment.

In summary, with Subject 2: (a) there was only a slight difference in heart rate to human-stimuli slides versus neutral slides, during both baseline and during the follow-up phase; (b) there was a substantial effect of relaxation and biofeedback training for reducing heart rate to human-stimuli slides within treatment sessions; and (c) the heart rate to human-stimuli slides at follow-up was considerably lower than during baseline sessions.

Additional observations for Subject 2 might provide some insight into the variation of Subject 2's heart rate responses to human-stimuli. For example, during baseline she indicated that the squares, circles, and rectangles reminded her of high school geometry courses which she had always enjoyed and she claimed the increased heart rate was due to these pleasant memories. Furthermore, during treatment, Subject 2's mother who had been hospitalized due to a stroke returned home and Subject 2 spent many late nights sitting with her mother. Since she and her mother were close, the whole situation came to be extremely stressful for Subject 2. During several sessions, she was tired, listless and clearly saddened. An additional stressor for Subject 2 was the times of her menses. Her significant other indicated that Subject 2 had a known history of delusional verbal behaviour whenever she menstruated (Gorwood, Leboyer, Jay, Payan & Feingold, 1995). Subject 2, during several of the sessions, indicated that she was not interested in living, but she would not commit suicide and "Therefore," she said, "I could be considered as having a 'su-complex'"

(Neologism, DSM-III-R p. 402), i.e., meaning, "I am only partially suicidal. I think about it but would not do it." Similarly, her explanation of the human-stimuli slides provide some understanding of her thought processes. She concocted a story about one of the men, who although ugly, supported the distraught woman. Consequently, "his eyes become sturdy and they live a clean life."

Subject 3

Session-by-session heart rate data for Subject 3 are presented in Table 3. Mean heart rate data across experimental phases for Subject 3 are presented in Figure 1. With respect to the first question listed above, Subject 3 did not respond differentially to the neutral slides versus the human-stimuli slides. As can be seen in Table 3, the mean heart rate across all baseline sessions for the neutral slides was 107.6, and for the human-stimuli slides, it was 108. During the follow-up phase, mean heart rate data to the neutral slides was 87, and to the human-stimuli slides was 86.

Concerning the second question listed above, the relaxation and biofeedback training led to a slight increase in Subject 3's heart rate response to human-stimuli slides within sessions. As can be seen in Table 3, the mean heart rate across Part 1 (exposure to human-stimuli slides) of all the treatment sessions was 108. The mean heart rate during Part 4 (exposure to human-stimuli slides following relaxation and biofeedback training) across all treatment sessions was 109.9.

Concerning the third question listed above, there was a major decrease in Subject 3's heart rate to human-stimuli slides at 1-month follow-up, both in

Table 3.--Heart Rate Data for Subject 3

Session	Baseline		Treatment				Follow-Up	
	Neutral	Human	Human	Relaxation	Feedback	Human	Neutral	Human
1	112.0	110.0	101.5	102.7	104.5	104.0	87.0	86.0
2	109.5	111.0	103.0	102.1	101.4	104.0		
3	109.0	110.0	110.0	109.0	109.8	110.0		
4	107.5	109.0	100.0	99.0	100.4	104.5		
5	114.0	112.0	100.0	101.8	101.7	103.5		
6	103.0	102.5	99.0	99.4	101.0	101.0		
7	103.0	105.0	99.0	99.0	98.5	99.0		
8	107.0	107.5	93.5	92.8	92.5	98.0		
9	103.0	106.0	96.0	94.0	94.7	94.5		
10			109.0	109.0	109.5	110.0		
11			110.5	111.0	111.0	110.5		
12			98.5	100.4	105.0	113.0		
13			111.0	114.0	110.5	111.0		
14			110.5	111.7	111.4	111.0		
15			93.5	99.4	99.0	105.0		
16			95.0	96.0	93.0	94.0		
17			130.0	121.8	122.0	121.0		
18			121.5	121.8	121.5	122.5		
19			109.5	111.0	116.0	109.8		
20			113.0	117.0	114.0	110.5		
21			121.0	121.0	121.7	122.0		
22			121.5	122.0	122.0	123.0		
23			108.5	110.0	110.8	112.0		
24			110.5	118.0	119.7	118.0		
25			122.0	121.4	121.4	122.0		
26			121.5	123.8	122.4	124.0		
\bar{X}	107.6	108.0	108.0	108.8	109.1	109.9		

comparison to his heart rate at the end of treatment and his heart rate during the baseline phase. As can be seen in Table 3 and Figure 1, his heart rate to human-stimuli slides at follow-up was 86 compared to 109.9 across Part 4 of the treatment sessions, and a mean of 108 across baseline sessions. As will be discussed later, social validity measures also indicated that the client used the relaxation tape almost daily during the month following treatment (With some difficulty he learned how to operate a newly-acquired cassette player. Incidentally, he began listening to other audiotapes and found this to be a pleasant pastime).

In summary, with Subject 3: (a) there was no difference in heart rate to human-stimuli slides versus neutral-stimuli slides, either during baseline or during the follow-up phase; (b) the relaxation and biofeedback training caused a slight increase in heart rate to human-stimuli slides within treatment sessions; and (c) there was a major decrease in heart rate to human-stimuli slides (compared to both baseline and to treatment assessments) following one month of homework relaxation exercises.

Additional observations for Subject 3 might provide some insight into the steady increase of his heart rate as treatment progressed. Although Subject 3 made concerted efforts to relax, he could not reduce his heart rate from Part 1 to Part 4. Specific efforts were made to help Subject 3 relax. For example, because he seemed sleepy in the mornings, his appointments were changed to later in the day. However, this did not seem to make it easier for him to relax. Furthermore, because of his religious orientation, he felt obligated to recite favourite Bible verses after the completion of training sessions. He admitted that during Part 4, he began rehearsing

these verses. Consequently, he was instructed to recite these verses prior to treatment and this relieved some of his stress. In spite of these efforts, during one of the later sessions, his heart rate increased so dramatically that it seemed there must be a physiological component operating, and he was referred to his family doctor and a psychiatrist. During the interview with the psychiatrist, the Public Health nurse took Subject 3's pulse and blood pressure. He was told that his heart rate and blood pressure were dangerously elevated. A visit to his family physician after the completion of the training sessions indicated that he suffered from extremely elevated blood pressure and consequently an elevated heart rate. He was prescribed Metoprolol Tartrate 5mg i o.d. This medication may have been a determinant of Subject 3's lowered heart rate at follow-up.

Subject 4

Session-by-session heart rate data for Subject 4 are presented in Table 4. Mean heart rate data across experimental phases for Subject 4 are presented in Figure 1. With respect to the first question listed above, Subject 4 responded with a mean increase in heart rate to human-stimuli slides as compared to the neutral-stimuli slides only during the baseline phase, but this was due to a large difference in heart rate during sessions 1, 4, and 8. During the remaining baseline sessions, there was little or no difference in heart rate to the two conditions. Subject 4 did not respond differentially to the neutral-stimuli and human-stimuli slides during follow-up. As can be seen in Table 4, the mean heart rate across all baseline sessions for the neutral-stimuli slides was 114, and for the human-stimuli slides, it was 117.5. During the

Table 4.--Heart Rate Data for Subject 4

Session	Baseline		Treatment				Follow-Up	
	Neutral	Human	Human	Relaxation	Feedback	Human	Neutral	Human
1	106.0	118.5	109.5	111.0	109.0	110.0	98.0	97.5
2	119.0	119.0	112.0	111.7	109.5	107.7		
3	112.0	109.5	109.5	108.0	104.0	104.0		
4	104.0	119.5	107.5	106.5	107.5	105.5		
5	105.5	106.5	109.5	108.8	101.0	100.0		
6	110.0	119.0	109.5	109.0	107.0	104.0		
7	119.5	118.5	100.0	103.5	100.4	108.5		
8	120.5	125.0	109.0	109.4	109.8	109.0		
9	119.0	119.0	109.0	108.0	108.0	106.5		
10	119.5	119.5	102.0	100.8	106.0	101.0		
11	119.0	119.0	109.0	109.0	110.0	108.0		
12			109.5	100.8	101.4	99.5		
13			107.5	110.5	97.5	99.5		
14			109.5	109.1	111.8	105.0		
15			109.0	111.0	110.0	101.5		
16			109.5	109.4	109.0	109.5		
17			109.0	105.0	100.0	100.0		
18			109.0	108.7	107.8	105.0		
19			109.0	109.0	108.8	109.0		
20			107.5	104.7	106.5	103.0		
\bar{X}	114.0	117.5	108.3	107.7	106.3	104.8		

follow-up phase, mean heart rate data to the neutral-stimuli slides was 98, and to the human-stimuli slides was 97.5.

Concerning the second question listed above, the relaxation and biofeedback training led to a clear decrease in Subject 4's heart rate to human-stimuli slides within sessions. As can be seen in Table 4, the mean heart rate across Part 1 (exposure to human-stimuli slides) of all the treatment sessions was 108.3. The mean heart rate during Part 4 (exposure to human-stimuli slides following relaxation and biofeedback training) across all treatment sessions was 104.8.

Concerning the third question listed above, there was a clear decrease in Subject 4's heart rate to human-stimuli slides at 1-month follow-up, both in comparison to her heart rate at the end of treatment and her heart rate during the baseline phase. As can be seen in Table 4 and Figure 1, her heart rate to human-stimuli slides at follow-up was 97.5 compared to a mean of 104.8 across Part 4 of treatment sessions, and a mean of 117.5 across baseline sessions. As will be discussed later, social validity measures also indicated that the client used the relaxation tape on a daily basis during the month following treatment.

In summary, with Subject 4: (a) eight of the eleven baseline sessions showed little or no difference in heart rate to human-stimuli slides versus neutral-stimuli slides and there was no difference at follow-up; (b) there was a clear effect of relaxation and biofeedback training for reducing heart rate to human-stimuli slides within treatment sessions; and (c) there was a large decrease in heart rate to human-stimuli slides (compared to both baseline and treatment assessments) following one month of

homework relaxation exercises.

Additional observations for Subject 4 might provide some understanding of the difficulties in obtaining a steady heart during some of the sessions. Although it was possible to obtain sufficient treatment sessions to keep Subject 4 in the project, approximately 10 sessions had to be aborted because of the difficulty to obtain a steady heart rate. Sometimes her heart rate would begin with 20 beats per minute, slowly rise, until by Part 4, it would be up to 195-299 beats per minute. (see Appendix N for a detailed explanation of how the Pulse-Watch functions). After consulting with two Public Health nurses who on separate occasions took Subject 4's pulse manually and with a stethoscope, they determined that Subject 4 probably had an arrhythmia problem, with a pulse that varied in strength and intensity. They also suggested that Subject 4 seemed to have deep veins in her finger and consequently, the finger-sleeve was not adequately picking up the pulse due to a lack of tactile sensation in the finger (A. Charles and Y. Cyr, personal communication, November 8 and 15, 1994). These difficulties may explain why it was hard to keep her on task during the biofeedback sessions.

Subject 4 also hallucinated actively throughout parts of many sessions; she was frequently seen mumbling to herself. She kept telling the researcher that the slides depicted a story of an Indian with fringes on his coat and that she wanted to learn his language. She would also say things like "chicken dumplings will keep the heart rate down," and that the triangles on the neutral-stimuli slides indicated that we should all move to El Salvador.

Subject 5

Although no graph has been included for Subject 5, she continued to be part of the research project until it was completed; consequently, certain information needs to be included here. Similar to the difficulty of obtaining accurate heart rate readings with Subject 4, Subject 5's peripheral heart rate was even more difficult to obtain. On two separate occasions the Public Health nurse spent parts of two sessions monitoring Subject 5's heart rate, counting it from the wrist and also using the stethoscope on her chest (see Appendix O). The heart rate on the wrist had a similar pattern to what was being recorded by the heart rate monitor, a pattern similar to the following sequence: beat, beat, beatbeatbeat, beat, beat, beatbeat,beatbeat, beat, beat, etc. The heart rate monitor averages the heart rate over every five seconds and thus recorded a heart rate for Subject 5 that would move from 20 to 240 beats per minute. This type of response from the cardiovascular system "occurs when the cardiac systole is not strong enough to produce a palpable arterial pulse" (Swearingen, 1984). It is considered a "pulse deficit, or inequality between apical and radial rates" (Perry & Potter, 1986). Brunner (1986) explained this phenomenon in even greater detail noting that peripheral pulse volume may be assessed using a scale from zero to +4 with 0 being an absent pulse; +1 a weak pulse, indicating a marked impairment; +2 a difficult to palpate pulse, with moderate impairment; and +3 an easily palpable, not easily obliterated with pressure, a slight impairment; and +4 a strong and bounding, normal pulsation (p. 353). The Public Health Nurse suggested that Subject 5's problem was probably due to a slight cardiac impairment. For both Subject 4 and

Subject 5 EKG's were obtained from their family physician and they were normal. (See Appendix N for a detailed explanation of how the heart rate monitor translates the heart rate into computer data and Appendix P for the EKG printout for Subject 5). Out of 22 training sessions, only on a few occasions with Subject 5, was it possible to obtain a steady heart rate. Nevertheless, Subject 5 responded to the relaxation part of the treatment and seemed to enjoy being part of the project. She also completed the three questionnaires and was part of the social validation interviews. Both of these dependent measures indicated some positive results for Subject 5. However, further information on Subject 5 will be presented in Appendix Q.

Pre- and Post-Questionnaire Data

Subject 1

The higher the score on the Social Fear Scale, the greater is the degree of social fear. As can be seen in Table 5 and Figure 2, Subject 1's self-rated score decreased from 9 at baseline to 5 following treatment and to 2 at follow-up. This represents a decrease of 77.7% from pre-baseline to follow-up. Her significant other indicated that Subject 1's score had decreased slightly from pre-baseline to follow-up, but her overall ratings were considerably higher than those of Subject 1.

On the Social Avoidance and Distress Scale, the higher scores indicate great anxiety in social situations. As can be seen in Table 5 and Figure 3, Subject 1 showed a slight decrease from a score of 16 at pre-baseline to 15 at termination of treatment and to 13 at follow-up. This represents a decrease of 18.7% from pretreatment to follow-up. Her significant other reported a large decrease on this

Table 5.--Scores by Subjects and their Significant Others on the Social Fear, Social Avoidance and Distress, and Sociability Scales

	Social Fear Scale ^a			Social Avoidance & Distress Scale ^b			Sociability Scale ^c		
	Pre-	Post-	Followup	Pre-	Post-	Followup	Pre-	Post-	Followup
Subject 1	9	5	2	16	15	13	119	111	134
Significant Other	18	-	16	21	-	4	113	-	124
Subject 2	18	19	22	8	10	6	96	98	100
Significant Other	6	-	7	11	-	8	111	-	109
Subject 3	12	12	5	7	5	4	123	116	115
Significant Other	12	-	12	12	-	11	116	-	114
Subject 4	8	4	6	7	6	7	116	116	143
Significant Other	7	-	1	10	-	6	109	-	118

^a Range from 1-36

^b Range from 1-28

^c Range from 1-37

Figure Caption

Figure 2. Scores on the Social Fear Scale

Social Fear Scale

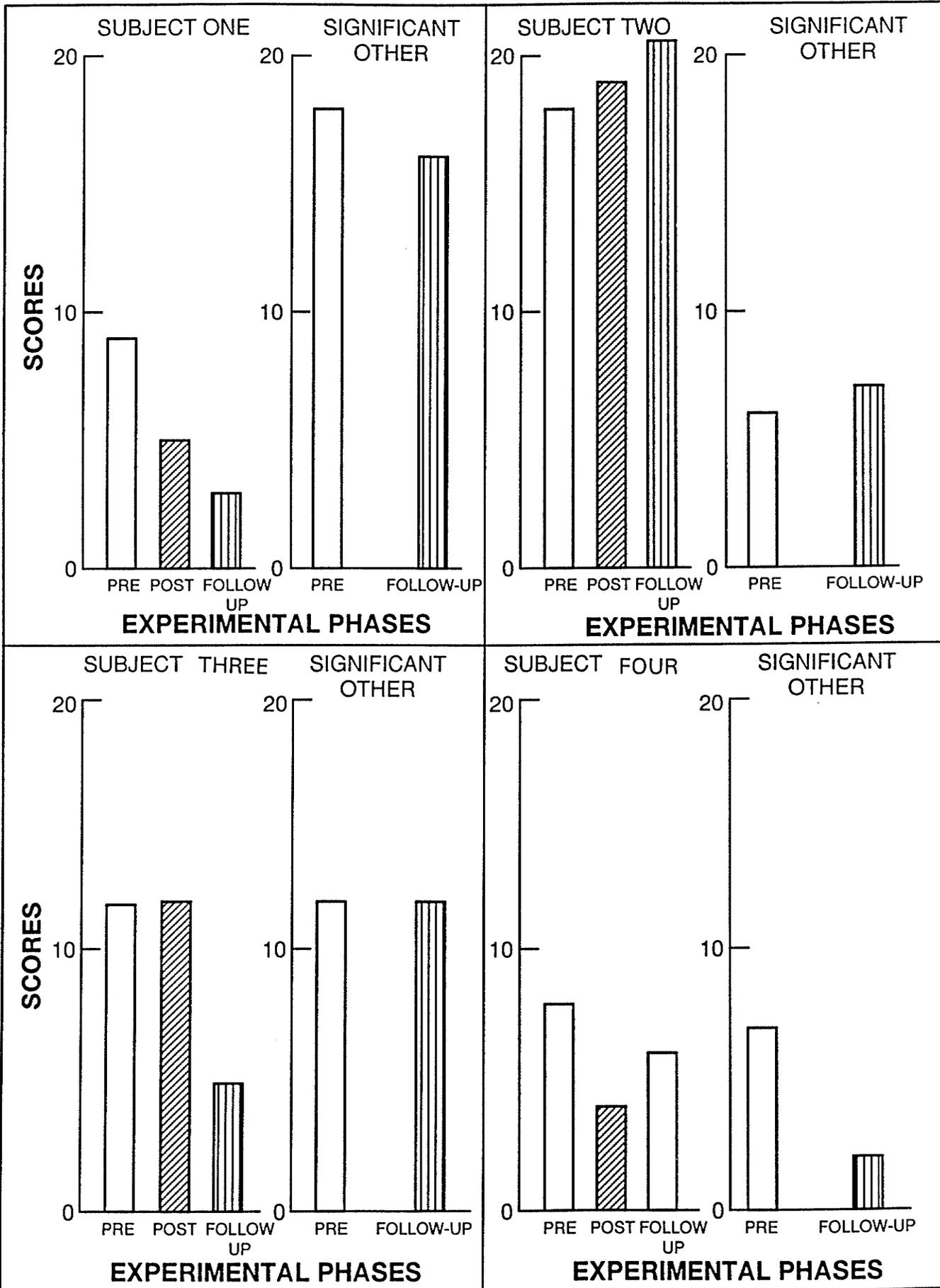
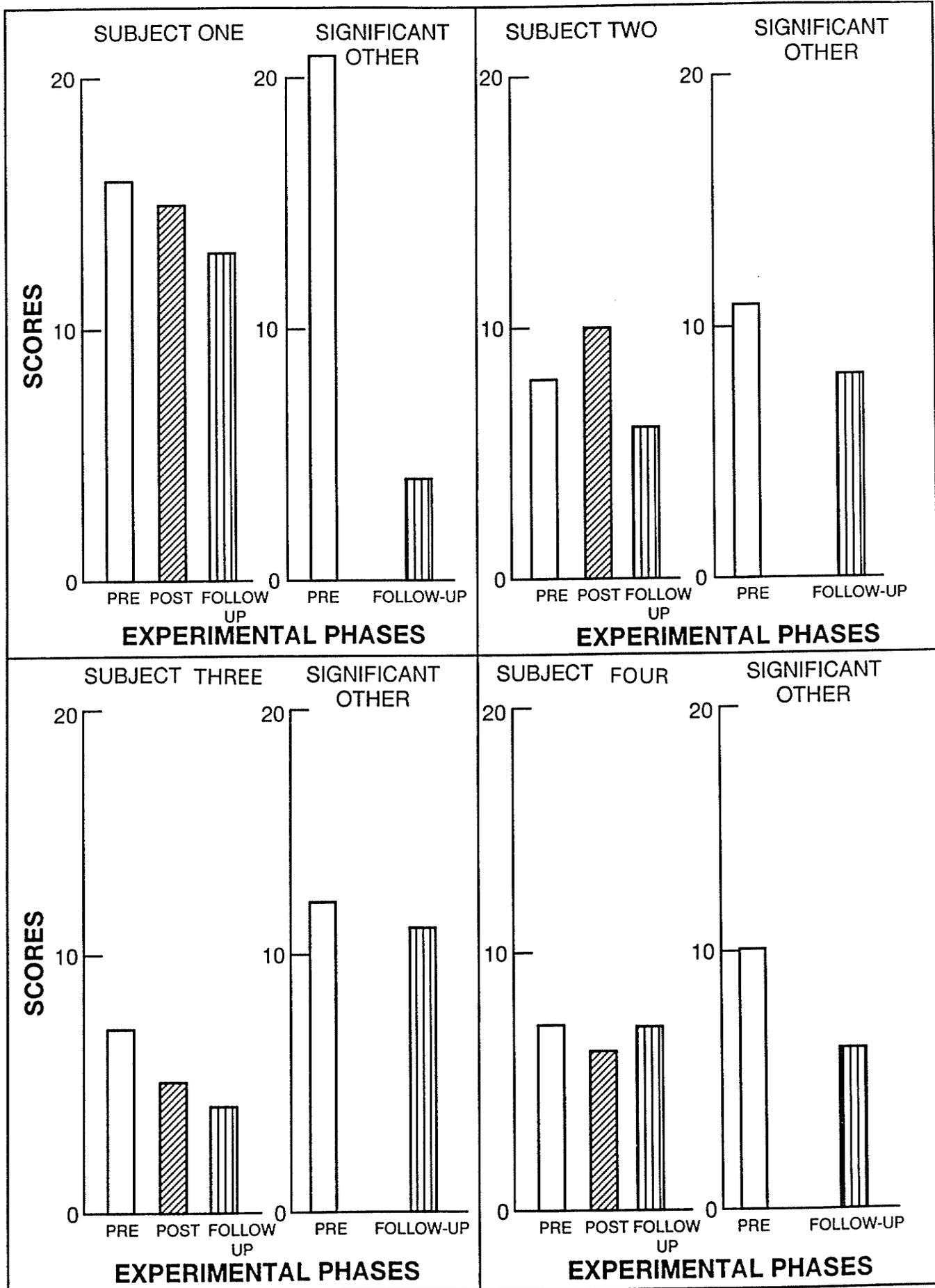


Figure Caption

Figure 3. Scores on the Social Avoidance and Distress Scale

Social Avoidance and Distress Scale



measure with a pre-baseline score of 21 and a follow-up score at 4.

On the Sociability Scale, a higher score indicates a greater tendency for an individual to be sociable when interacting with others. As can be seen in Table 5 and Figure 4, Subject 1 decreased by 8 points from pre-baseline to post-treatment, but increased by 15 points from pre-baseline to follow-up. This represents a total increase of 12.7% from prebaseline to follow-up. Her significant other also reported an increase of 11 points on this measure from pre-baseline to follow-up.

Subject 2

Subject 2 showed an increase in her score on the Social Fear Scale from 18 at pre-baseline to 19 at post-treatment to 22 by follow-up. This was an increase of 11.1% from pre-baseline to follow-up (see Table 5 and Figure 2). Her significant other also increased the Social Fear Scale rating of Subject 2 from 6 at pre-baseline to 7 at follow-up.

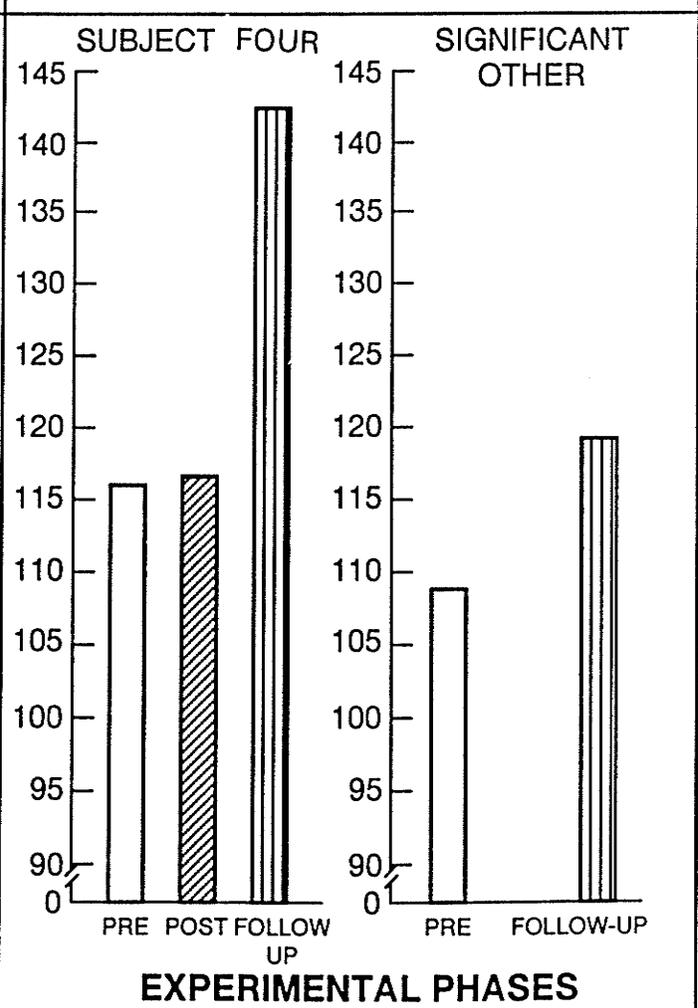
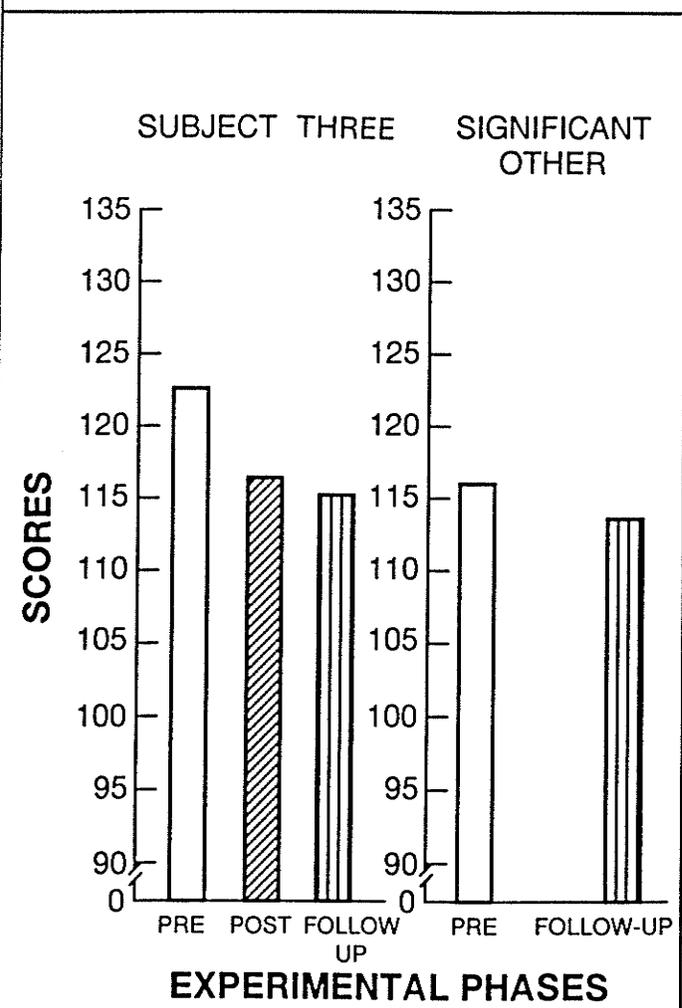
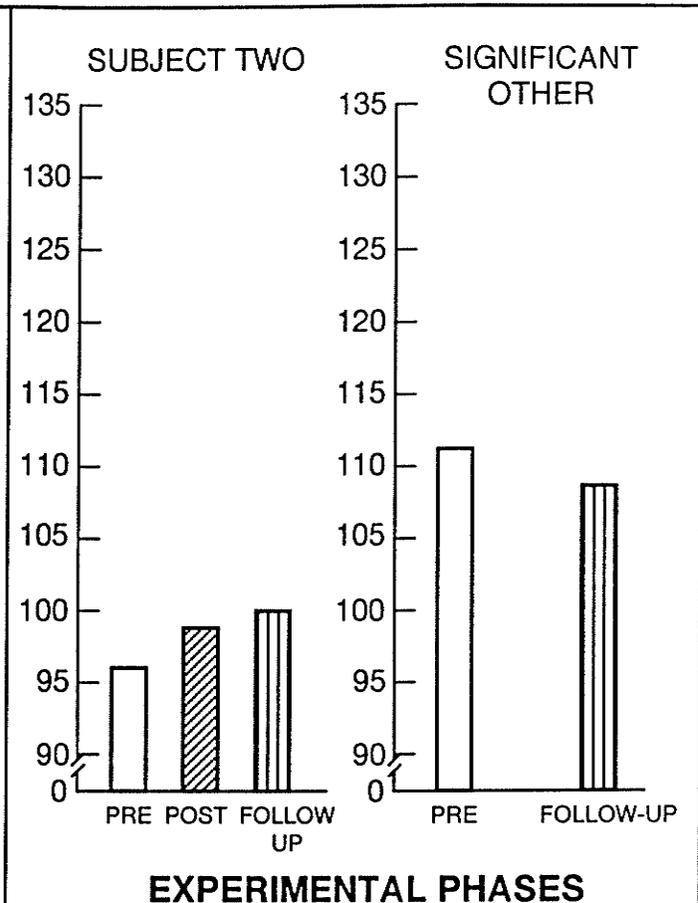
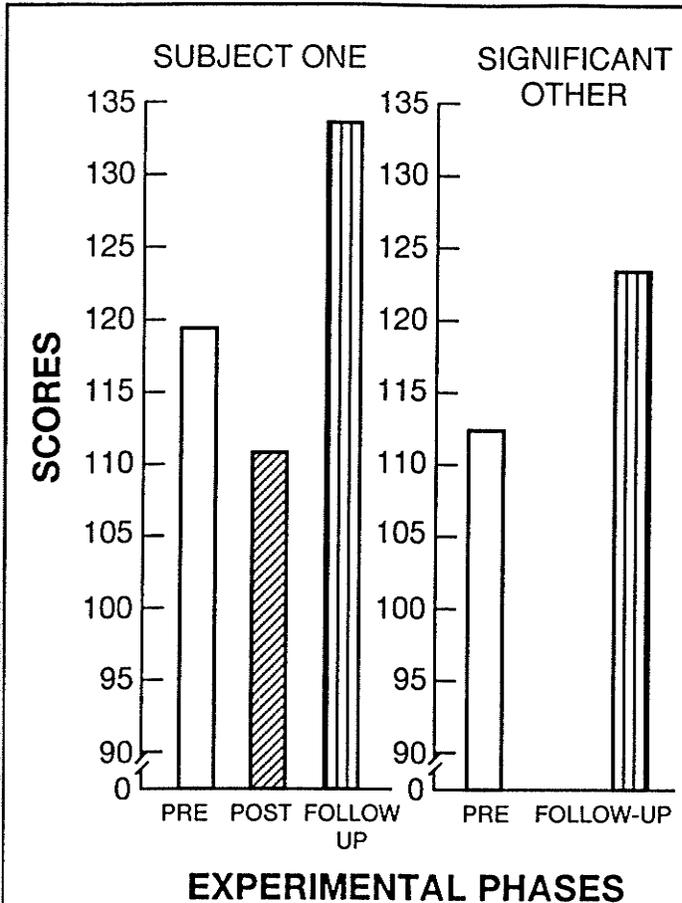
On the Social Avoidance and Distress Scale, Subject 2 had an increase of 2 points from pre-baseline to post-treatment, but showed a decrease at follow-up of 2 points from pre-baseline (see Table 5 and Figure 2). This represented a decrease of 25% from pre-baseline to follow-up. Her significant other indicated a decrease on this scale of 3 points from a score of 11 at pre-baseline to 8 at follow-up.

On the Sociability Scale Subject 2 had an increase of 2 points from pre-baseline to post-treatment, but showed an increase of 4 points from pre-baseline to follow-up (see Table 5 and Figure 4). This was an increase of 4% from pre-baseline to follow-up. Her significant other indicated a decrease of 2 points from pre-baseline to follow-up.

Figure Caption

Figure 4. Scores on the Sociality Scale

Sociability Scale



Subject 3

On the Social Fear, Scale Subject 3 maintained the same score of 12 points from pre-baseline to post-treatment but had a decrease from pre-baseline to follow-up to a score of 5 points (see Table 5 and Figure 2). This was a decrease of 58.3% from pre-baseline to follow-up. His significant other indicated no change in scores on this scale from pre-baseline to follow-up.

On the Social Avoidance and Distress Scale, Subject 3 had a decrease of 2 points from pre-baseline to post-treatment and a decrease of 3 points from pre-baseline to follow-up (see Table 5 and Figure 3). This represented a total decrease of 42.7% from pre-baseline to follow-up. His significant other indicated a decrease of 1 point on this scale from pre-baseline to follow-up.

On the Sociability Scale Subject 3 had a decrease of 7 points from pre-baseline to post-treatment and a decrease of 8 points from pre-baseline to follow-up (see Table 5 and Figure 4). This represented a total decrease of 6.5% from pre-baseline to follow-up. His significant other indicated a decrease of 2 points on this scale from pre-baseline to follow-up.

Subject 4

Subject 4's score on the Social Fear Scale decreased from 8 points at pre-baseline to 4 points at post-treatment. However, her score increase to 6 at follow-up (see Table 5 and Figure 2). This represented an overall decrease of 25% from pre-baseline to follow-up. Her significant other indicated that she decreased from 7 points at pre-baseline to 1 point at follow-up.

On the Social Avoidance and Distress Scale, Subject 4 had a decrease of 1 point from pre-baseline to post-treatment; but at follow-up she had the same score as at pre-baseline (see Table 5 and Figure 3). Her significant other indicated a decrease of 4 points from pre-baseline to follow-up.

On the Sociability Scale (see Table 5 and Figure 4) Subject 4 showed no change in score from pre-baseline to post-treatment, but at follow-up she had an increase of 27 points (see Table 5 and Figure 4). Her total increase was 23% from pre-baseline to follow-up. Her significant other indicated an increase of 9 points from pre-baseline to follow-up.

In summary, Subjects 1, 3, and 4 and the significant others of Subject 1 and 4 reported decreased scores on the Social Fear Scale, whereas Subject 2 and her significant other reported an increase on their scores.

Subjects 1, 2, and 3 and their significant others reported decreased scores on the Social Avoidance and Distress Scale. Subject 4's scores did not change, but her significant other indicated a large decrease in Subject 4's social avoidance and distress behaviour.

Subjects 1, 2, and 4 and the significant others of Subject 1 and 4 reported an increase in the scores on the Sociability Scale. The significant other of Subject 2 indicated a decrease in Subject 2's sociability. Subject 3 reported a decrease in his sociability score which was corroborated by his significant other.

Social Validation Measure

A Social Validation interview (see Appendix I and J) was conducted at the

completion of the project, separately with each subject and his/her significant other.

Subject 1

Subject 1 indicated that the relaxation training and listening to the audiotape at home had been helpful. She rated the question, "Has the treatment helped you?" with a score of 5 on a 5-point scale. She stated that it was especially helpful during times when her mind went "wild." She also claimed that she had come to feel more confident about herself; she was now aware that she could do something about her anxiety and the resulting increased heart rate. Although she admitted that her most negative experience consisted of having to watch some of the slides, the slides were relevant to her experiences. In fact, they reminded her of past negative experiences. She offered no specific examples, however. She claimed that she had received adequate information about the research project and that the number of training sessions had been sufficient.

When Subject 1's significant other was asked "Has the treatment been of help to your client?", she responded with a rating of 5 on a 5-point scale. She also was satisfied with the information provided regarding the research. She was very positive about the treatment in general, stating that Subject 1 seemed to enjoy coming to the sessions, seemed to be more content about her situation and certainly seemed less obsessed about "every little thing" than she used to be. She also indicated that it had been worth the time that she had devoted to bringing Subject 1 to the sessions and completing the questionnaires. She was particularly pleased about the relaxation tape to which Subject 1 listened every day, and which had helped to calm her down. If

there were any negative experiences concerning the project, the significant other indicated it might have been to get Subject 1 up and moving in the morning, especially if the appointment had been scheduled prior to lunch.

Subject 2

Subject 2 indicated that the treatment had helped her "somewhat." Learning to relax was what she considered as being the most helpful for her because she was "emotionally highly triggered." She also indicated that there were some long-term benefits. The one she mentioned was that she had had the courage to introduce her nephew to some people while at a dinner. She also indicated that the slides were "somewhat" relevant to her experiences. She claimed that she had not needed any additional information regarding the research project and indicated that the number of training sessions had been adequate.

Subject 2's significant other indicated during the first interview that she was pleased that someone was doing a "one-on-one" research project with individuals with schizophrenia. Too often, she said, these people were lumped in groups for statistical analyses and specific problems were not really addressed. During the follow-up interview, she explained at length that Subject 2 had mental and emotional problems that "piggy-backed" on her physical problems. Prior to this interview, the mother of Subject 2 had passed away. The significant other commented that it was therefore difficult to answer the question, "Has the treatment been of help to your client?" because Subject 2 had had two psychotic breakdowns since the death of her mother.

She had also been menstruating irregularly during this time. Nevertheless, she indicated that Subject 2 definitely had a positive attitude about her experience in being part of the research project. The significant other who has a Masters Degree in Psychology, indicated that she would have appreciated knowing more about the research.

Subject 3

Subject 3 indicated that the treatment had been helpful. He indicated that he was "happy" that his heart rate came down during the follow-up session. He also enjoyed the "machinery" and was amazed that it "could read his heart rate so that he could watch it." Based on that observation, it is of note that he wished he could have received more information about the research project. (The project was explained in great detail on several occasions to each subject). He indicated that the number of training sessions was adequate. His response to the relevance of the human-stimuli slides to his own experiences was a rating of 4 on a 5-point scale. He also indicated that he felt he had made some permanent changes at work. He found it "easier to meet people." At home he had learned with the help of someone else to operate a tape cassette. He was immensely pleased about this achievement and actually smiled when he said this (which was quite rare for him).

Subject 3's significant other indicated that the treatment was somewhat helpful for Subject 3. She indicated that Subject 3 enjoyed coming for the sessions and had indicated to others in the family how pleased he was to own a tape deck and to learn how to operate it. He did listen to the relaxation tape at home. She felt the time and

effort she had expended for her part in the project was well worth it for the sake of Subject 3. She also indicated that she had sufficient information as to the project itself.

Subject 4

When asked "Has the treatment helped you?" Subject 4 responded with a rating of 5 on a 5-point scale. She claimed that one long term result was that she was beginning to talk more at staff meetings. She indicated that the slides were "somewhat" relevant but immediately began recounting the story about the Indian and his friend and how she would never forget them. She wanted them to teach her the Indian language. It was difficult to get her to focus on the questionnaire and the interview. But she did indicate that she would have "liked a lot more" training sessions because "I enjoyed them."

Subject 4's significant other responded to the question "Has the treatment been of help to your client?" with a rating of 4 on a 5-point scale. Her significant other at work indicated that Subject 4 now approached other workers and joked and was more assertive with with them. Her significant other indicated that Subject 4 enjoyed coming for the sessions and when she was told it was time to go "would smile." She also indicated that she would have liked to have known "a lot more" about the research project and also would have liked to have seen " a lot more" training sessions.

None of the significant others responded to the question: "Were the human-stimuli slides relevant to your client's experiences?" This was due to the fact that

none of the significant others saw any of the slides.

In summary, for all the subjects and their significant other, the project was reported to be a positive experience. The subjects all appeared to have made some significant changes in their social interaction with others. The significant others indicated that these changes were the types of things they had hoped to see in their friend/relative/employee.

Overall Summary of the Results

Concerning the heart rate data, three findings occurred: (a) In most observation sessions with 4 out of 4 persons with schizophrenia, a subject's heart rate when viewing neutral-stimuli slides was very similar to that subject's heart rate when viewing human-stimuli slides; (b) With 3 out of 4 subjects, a combination of relaxation and biofeedback training led to a within-session decrease in heart rate (of approximately three beats per minute with those subjects) when viewing human-stimuli slides; and (c) With 4 out of 4 subjects, listening to a relaxation tape on a daily basis for one month (following approximately twelve weeks of twice-weekly sessions involving relaxation and biofeedback training) led to a further decrease in heart rate (for an average decrease of 13.2 beats per minute compared to baseline and an average decrease of 10.3 beats per minute compared to post-treatment). The pre- and post-questionnaire data indicated that, for 3 of 4 subjects, there was a decrease in social fears and avoidance and distress behaviour, and an increase in social interaction with others. In general, these questionnaire results were corroborated by significant others. Social validation data at the completion of the follow-up indicated that the

project ratings by both subject and significant others ranged from "somewhat helpful" to "very helpful". Overall, in terms of five dependent measure (heart rate data, three questionnaires, and social validations questions), 1 of 4 subjects made considerable improvements from pre-baseline to follow-up on all measures, and three subjects made considerable improvements in four out of five measures.

Interobserver Reliability

The means and standard deviations were obtained from the heart rate programme after each session. The researcher and research assistant each individually recorded the statistics. Interobserver reliability was 100% in all cases. The minimum percentage for an acceptable reliability score is 85% (Gottman & Shields, 1976; Jacobson & Anderson, 1980).

Interrater Reliability

There was a total of 75 questionnaires to be scored separately by the researcher and research assistant. Five subjects each completed three questions at pre-baseline, post-treatment and at follow-up adding up to 45 questionnaires. Five significant others completed three questionnaires each at pre-baseline and at follow-up adding up to 30 questionnaires. Interrater reliability on the questionnaire data between the researcher and research assistant was computed by dividing the total number of instances in which both raters agreed on a given answer by the total number of disagreements (when only one rater coded a response in a given scale) plus the total number of agreements, and multiplying the dividend by one 100% (Jacobson, 1977). This is a stringent criterion for agreement between scorers because it ties agreement

to the specific scores; sometimes it is referred to as a point-by-point ratio (Gottman, 1980; Kazdin, 1982c; Wampold & Holloway, 1983). The mean interrater reliability for the scores on the Social Fear Scale, the Social Avoidance and Distress Scale, and the Sociability Scale for Subjects 1-4 was 86 with a range of 78 to 93.

Procedural Reliability

Procedural reliability was conducted to ensure that the experimental procedures were followed as outlined. A research assistant checked the procedures once during each phase for each subject throughout the research (Billingsley, White & Munson, 1980) (see Appendix K and L). The procedural reliability for all phases for all subjects was 100%. A comment made by the assistant researcher was that the researcher could have spent a bit more time chatting with the subjects.

Discussion

The results of this study indicate that approximately 12 weeks of twice-weekly sessions of biofeedback-relaxation training, followed by one month of daily use of a relaxation tape can produce a substantial decrease in heart rate response in persons with schizophrenia to human-stimuli slides, a decrease in self-report of fear and anxiety concerning social interactions, an increase in self-report of social interactions, and corroboration of the self-report measures by significant others. More specifically, vignettes in the human-stimuli slides were intended to elicit high heart rate levels. Corrigan and Green (1993) and others (Corrigan, Stolley, & Davies-Farmer, 1989; Epstein & Coleman, 1970; Helmsley, 1993) found that persons with schizophrenia

responded best to social interaction video-vignettes when the arousal level was moderate, i.e., neither too low or too high. In the present study, heart rate decreased to the same set of human-stimuli slides after relaxation and biofeedback training.

Of specific relevance to the research is that the subjects were not "easy" cases. All of them had in the past been hospitalized. Thus, it is not likely that the results were obtained by "creaming " the easy clients (Rapp & Wintersteen, 1989). The present research also confirms the view of Rapp and Wintersteen (1989) and Anthony and Liberman (1986) that long-term psychiatric patients can learn, grow, and change; in fact, they should be assisted to make changes.

The results of the present study will be discussed in the following sequence. First, the newly acquired behaviour of the subjects to reduce their heart rate in the presence of human-stimuli slides will be discussed. Second, the data concerning increased sociability will be considered. Third, the benefits of the research design will be mentioned. Fourth, issues concerning social validation will be discussed. Fifth, practical implications of the study will be summarized. Finally, suggestions for future research will be outlined.

It was hypothesized that the subjects' heart rate to the neutral-stimuli slides would be lower than the heart-rate to the human-stimuli slides. The heart rate recorded for both sets of slides during baseline and follow-up for all subjects, however, indicated only a difference of one to three points. Thus, the heart rate for the neutral-stimuli and the human-stimuli slides co-varied. These results contradict the view espoused by Brodsky and Gal (1990) that the heart rate response to neutral-

stimuli slides would be considerably less than the response to human-stimuli slides. Regarding the relaxation-biofeedback treatment, subjects 1, 2, and 4 began to respond to the instructions on the relaxation tape by demonstrating a decreased heart rate during sessions, which is evidence of being in a more relaxed state. Sometimes the question is raised, "Can individuals with schizophrenia acquire new skills?" The results of the study indicate that individuals with schizophrenia can acquire new skills. Learning to relax in the presence of human-stimuli in the form of slides is assuredly not as stressful as meeting people in real life; it is, however, a graduated step toward the handling of anxious internal bodily cues (Becker, 1985).

Learning to relax was not equally easy for each subject. Subject 1 and 2 would close their eyes during relaxation training while the researcher observed how they followed the instructions offered on the relaxation tape. Their heart rate usually reduced somewhat during this time. Subject 3, however, did not seem to be able to relax. Several specific efforts were made to help him relax. As mentioned earlier, Subject 3 was deeply involved in a church community and this may have contributed to his difficulty in learning to relax in so much that he had been used to a rigid schedule and authoritative demands from those in positions of power.

During the biofeedback component of treatment, the subjects focused their attention on the bar graph which indicated their heart rate as displayed on the monitor. Simultaneously, the music on the relaxation tape continued as the subjects watched the bar graph and worked at relaxing and maintaining and/or reducing their heart rate. The relaxation training was thought to continue its effect during

biofeedback. Thus subjects had to learn to focus on the bar graph displayed on the monitor as well as to relax their bodies. For Subjects 1, 2, and 4 efforts to relax during biofeedback did reduce their heart rate. At times they were prompted to focus and were coached to repeat to themselves the words: "relax, relax." They indicated either verbally or by a smile, a sense of accomplishment when they observed their heart rate decrease during the biofeedback session. This was always followed with positive feedback by the researcher. This approach agrees with the use of prompting, coaching and positive reinforcement as was used liberally by the trainers in the skills training package used by the UCLA Social and Independent Living Skills Modules (Lieberman et al., 1993).

Since the mean heart rate of each minute during biofeedback was flashed on the monitor, the subjects were quickly aware of the results of their efforts. They often discussed this accomplishment with the researcher; and, doing so may have added to their understanding of how they could influence their own heart rate and reduce their anxiety levels.

Subject 3 was certainly an exception, and as explained earlier, did not seem to be able to reduce his heart rate even after 26 sessions of training. Conversely, his heart rate increased over time. At first the experimenter considered the possibility that the relaxation training resulted in a greater intrusion into his thinking of dysfunctional and painful relationships of his past. He consistently denied this as a reason for his increased heart rate. He, however, admitted feeling anxious about his increased heart rate. After a lot of encouragement from other professionals, he

finally saw his family doctor concerning his heart rate and blood pressure. Being resistant to go for medical help is a behaviour typical of persons with schizophrenia (Bachrach, 1983).

Interestingly, Subject 3 enjoyed coming to the sessions and over time became more sociable. This was evidenced by his questions about the research, by his willingness to talk about things other than his Bible verses, by wanting to know the exact time and day for each appointment, and by becoming friendlier, i.e., talking more on the way into and out of the treatment room. His supervisor at work reported that Subject 3 was proud to be part of the project. It seemed to energize him and this was especially noticeable on those days when he came for a training session.

Paradoxically, Subject 3's heart rate response did not co-vary with his increased positive verbal and non-verbal behaviour. Nevertheless, the results supported Jackson's (1990) view that it is important "to adopt a more holistic view of these mental states (referring to the expression and aetiology of schizophrenia), one which permits variability and individual differences" (p. 126). Subject 3 appeared to benefit from his involvement in the project even though the specific research goal of reducing heart rate in the presence of human-stimuli slides during treatment was not accomplished.

Nevertheless, the general goal of the present study of teaching subjects to reduce their heart rate to the human-stimuli slides was accomplished. For Subjects 1, 3 and 4 this was demonstrated most clearly at follow-up. Subject 2's heart rate increased at follow-up compared to her mean heart rate at the termination of the

to the death of her mother, adding severe stress for Subject 2. During stress she also was known to begin menstruating which usually coincided for her with a brief reactive psychosis.

For all subjects the positive social interaction that was modeled by the researcher and research assistant may have been of benefit. These results cannot be quantified but indicate a qualitative aspect of the research project (Anthony, 1993).

The training strategies in the present research consisted of: providing information for the subjects regarding the project, providing relaxation training while listening to music, having the subject learn to decrease his/her heart rate while watching the human-stimuli slides, and encouraging use of a relaxation tape on a daily basis following treatment. An important and basic question of any research treatment package is whether treatment achieves changes and does so reliably (Kazdin, 1982a). The outcome of the present study indicate that the treatment package did achieve the targeted changes. Furthermore, it did so reliably compared to the baseline of heart rate data, in terms of questionnaire data, and in terms of social validation results.

Regarding the questionnaire data, although the majority of the results were in the hypothesized direction, there were inconsistencies. The general increases in scores on the Sociability Scale were comparatively higher than the general decreases in scores on the Social Fear Scale and the Social Avoidance and Distress Scale. One might raise the question as to whether it is easier for individuals with schizophrenia to view themselves as more positive rather than to be aware of the decrease of their negative traits? One might assume that the negative attitudes of people toward others

with disabilities becomes part of the attitude-belief system of individuals that are disabled. Lee and Rodda (1994) write at length about the formation of such negative attitudes in society. They base their assumptions on Fishbein and Ajzen's analyses (1975) of attitude formation which in turn produces beliefs which then influence behaviour. One might then assume that individuals with schizophrenia adopt these negative attitudes towards themselves, and therefore find it difficult to see themselves change because their beliefs about their illnesses are still negative. On the other hand, as the subjects in this project began to see themselves as learning the skill of relaxation and using it to influence their own behaviour, i.e., reduce their heart rate, it may have been easier for them to recognize an improvement in their social skills rather than to recognize the decrease of their negative traits such as anxiety and fear. This hypothesis, of course, requires systematic consumer-driven research (Loomis, 1994).

It is of note that Subject 3, the only male in the study, did not respond with a decreased heart rate during the biofeedback-relaxation treatment sessions. However, one cannot draw major conclusions regarding gender issues from these results when using a single-subject design. Nevertheless, it is important to note that even though the results of the treatment sessions for Subject 3 were dissimilar to the results of the treatment sessions for Subjects 1, 2, and 4, the results of the other data for Subject 3 were similar to Subjects 1, 2, and 4 in regard to the follow-up heart rate data, the questionnaires, and the social validation interview data.

In summary, for all of the subjects there were some positive changes at follow-

up. This may have been due to their daily use of the relaxation tape between treatment and follow-up.

In the present research the single-subject design was specifically well-suited to meet the differing needs of the subjects. In a single-subject design changes for each subject can be introduced when and as they are needed. Anthony and Spaniol (1994) speak about building "a better service system around each individual client, one client at a time." (p. 424). For example, when Subject 1 had a night in which her mind "went wild," the researcher spent a bit more time listening to her and helping her focus during biofeedback. When Subject 3 came to the session quite sleepy, he was prompted to stay awake and his appointments were changed to accommodate his specific needs. Instead of negating Subject 3's need to recite his Bible verse, he was asked to recite them prior to treatment. Thus, a certain amount of support was provided for his religious needs which agrees with Parrish (1988), Corin and Lauzon (1992), and Sullivan (1993) who indicate that for some individuals religion can be a positive influence in promoting mental health and should therefore be supported.

Regarding social validation, three areas should be considered. First, the goals of the project should be important to the subject and the significant other (Bornstein & Rychtarik, 1983; Wolf, 1978). One indication that the goals of the project were important to the subjects and the significant others was that after explaining to them the extensive time commitment, they nevertheless were willing to commit themselves to the project. More generally, however, the significant others expressed a desire that the social skills of their particular client/friend would increase and that their anxieties

and fears would decrease.

A second aspect of social validation should include an assessment of whether the treatment procedures are acceptable to the subjects and significant others (Bornstein & Rychtarik, 1983; Wolfe, 1978). In the present study in order to determine whether or not the treatment procedures were acceptable to the subject and his/her significant other, questions were asked such as "Has the treatment helped you?" "Would you have liked more training sessions?" and "Were the human-stimuli slides relevant to your experiences?" All the subjects indicated that the treatment had been helpful. Three of the subjects were satisfied with the number of treatment sessions; Subject 3 would have liked more sessions. All the subjects stated that the human stimuli-slides were relevant to their experience which would indicate that the procedures were acceptable.

A third aspect of social validation is one in which the consumer indicates post-treatment satisfaction with the results (Bornstein & Rychtarik, 1983; Wolf, 1978). Questions that elicited positive responses included: "Did the treatment help you?" "Was it worth your time and effort?" The subjects indicated that they had learned to relax and were pleased with themselves. The significant others all indicated that their client/friend had changed, had become more sociable and less anxious. They all indicated that the time they had to give to the project had been well worth it for themselves as well as for the sake of the client. Although the subjects were somewhat unsure if they had made permanent changes as a result of being part of the project, their significant others were more positive on this point. All of them indicated that

they had noticed positive changes in their client particularly in terms of sociability. For example, one significant other indicated that her client was initiating conversations whereas before she waited until she was spoken to.

The present research is consistent with the suggestion of Spaniol, Zipple, and Fitzgerald (1984) that it is of prime importance to involve members of the (patients) subjects' families (caretakers) in the caretaking process. The present study directed a measure of its energies towards involving the significant other of the subject in the research process. The significant others signed the initial contract, indicating that they would complete the three questionnaires pre- and post- research. Prior to the start of baseline and after follow-up, individual sessions for the significant other were conducted by the researcher. During the ongoing research the significant others were usually aware of the appointment schedules. During the month following the completion of treatment, the significant other for each subject supervised in a casual way, the subjects' time spent listening to the relaxation tape.

In summary, practical implications of the present study will be listed:

- a) It is possible for individuals with chronic schizophrenia to learn new skills such as decreasing heart rate levels in response to human-stimuli slides;
- b) It is possible for such individuals to decrease, to some degree, their fear, distress, and avoidance behaviour and conversely, to increase their social interaction;
- c) It is important to include the significant other in a research project such as this one:

- i) it provides support for the subject during and after the project,
 - ii) the significant other feels valued, and with the knowledge gained, can make the relationship better,
- d) Biofeedback teaches individuals with schizophrenia that they have a measure of control over their heart rate and arousal level;
- e) Physiological changes occurred in the desired direction even when the subjects were on psychotropic medications and had been so for years;
- f) Support was provided for the subjects by:
- i) using short, timed sessions, keeping the subjects focused on the task of watching the slides and of listening to the relaxation tapes, and by providing reinforcement in the form of praise and mild comments when there were incorrect responses,
- g) It is important to repeat instructions as often as necessary, in a kind, gentle way;
- h) Even though some subjects seemed to have short psychotic breaks, they still could participate in the treatment and benefit from it;
- i) The results of the study indicated that individuals with schizophrenia need approximately 15-20 sessions in order to learn to reduce their heart rate while listening to the relaxation instructions and observing their heart rate on the monitor;
- j) The study demonstrated that using biofeedback to monitor heart rate while teaching relaxation to individuals with schizophrenia is a viable procedure and

is possibly simpler to implement for practitioners and lay people than using EMG biofeedback. Most studies describe the use of EMG biofeedback for teaching relaxation to individuals with schizophrenia (Schwartz & Associates, 1995, pp. 829-832);

- k) Relaxation training using biofeedback via monitoring heart rate is a treatment method that professionals, lay people, consumers, and some people with psychiatric disabilities could teach to others. Possibly those who have taken this type of training could be as effective or maybe in some instances more so than a professional trainer. The effectiveness might be demonstrated in a better understanding of the problem and in providing empathy to the trainee:
 - i) it would be helpful to have the equipment set up and ready to use,
 - ii) it would be helpful to have a less rigid and complicated system than what was used in this project (i.e., maybe just a Pulse Watch Monitor and a relaxation tape).

The present research generated a number of suggestions for future research. First, it would be beneficial when screening subjects for a similar project to also screen for a steady heart rate response on a Pulse-Watch monitor and with a stethoscope. Certainly, some individuals with schizophrenia are likely to be more responsive to this type of training programme than others. If the pulse rate was strong when listening to the heart using the stethoscope but the pulse rate was weak or

uneven when using the heart rate monitor, such an individual would need to be taught relaxation skills using some other measure than the Pulse-Watch heart rate monitor.

Second, future research might concentrate on individuals with schizophrenia who were much younger, perhaps just diagnosed with schizophrenia. Teaching newly-diagnosed individuals with schizophrenia to reduce their heart rate via relaxation and biofeedback may have a major effect on their ability to function more adequately in the work place and in their social milieu.

Third, several of the significant others indicated that they would have liked more information on the training part of the project. Future research might enhance the treatment package by involving several significant others during parts of the training, giving them first-hand involvement with their client/relative (Brook, Fantopoulos & Johnston, 1989; Tighe & Biersdorff, 1993). This might increase the support for the diagnosed individual within his/her working and social milieu.

Fourth, future research might allow each to choose what is neutral for him/her and also what aspects of people's behaviour were threatening. In other words, the types of slides used could be more relevant to each subject's specific arousal pattern.

Fifth, one might also ask each subject during the research process to keep a diary about his/her life events such as a death of a significant other, a job change, illnesses, menstruation, and changes in medication. These events could then be correlated with the recorded heart rate from session-to-session. Not only would a diary provide information of life events that could be correlated with ongoing heart rate during a study but it might also be therapeutic for the subjects. Diaries are known

to not only strengthen the healing process of painful memories (Pennebaker, 1990) but also to increase the understanding of the purpose of life's events (Berman, 1994).

Finally, future research might focus on a component analysis to try to identify the behaviourally active components of the multiple-component procedure used in this study. Martin and Pear (1992) have described three reasons for conducting component analyses of complex multiple-component procedures: (a) a simpler behaviour change package is easier to teach to therapist than a more complex package, which may result in a more accurate application of procedures; (b) patients are more likely to comply with simpler treatment packages than with more complex ones; and (c) the identification of the active treatment components in a package may help to clarify the behavioral principles responsible for the treatment's effectiveness.

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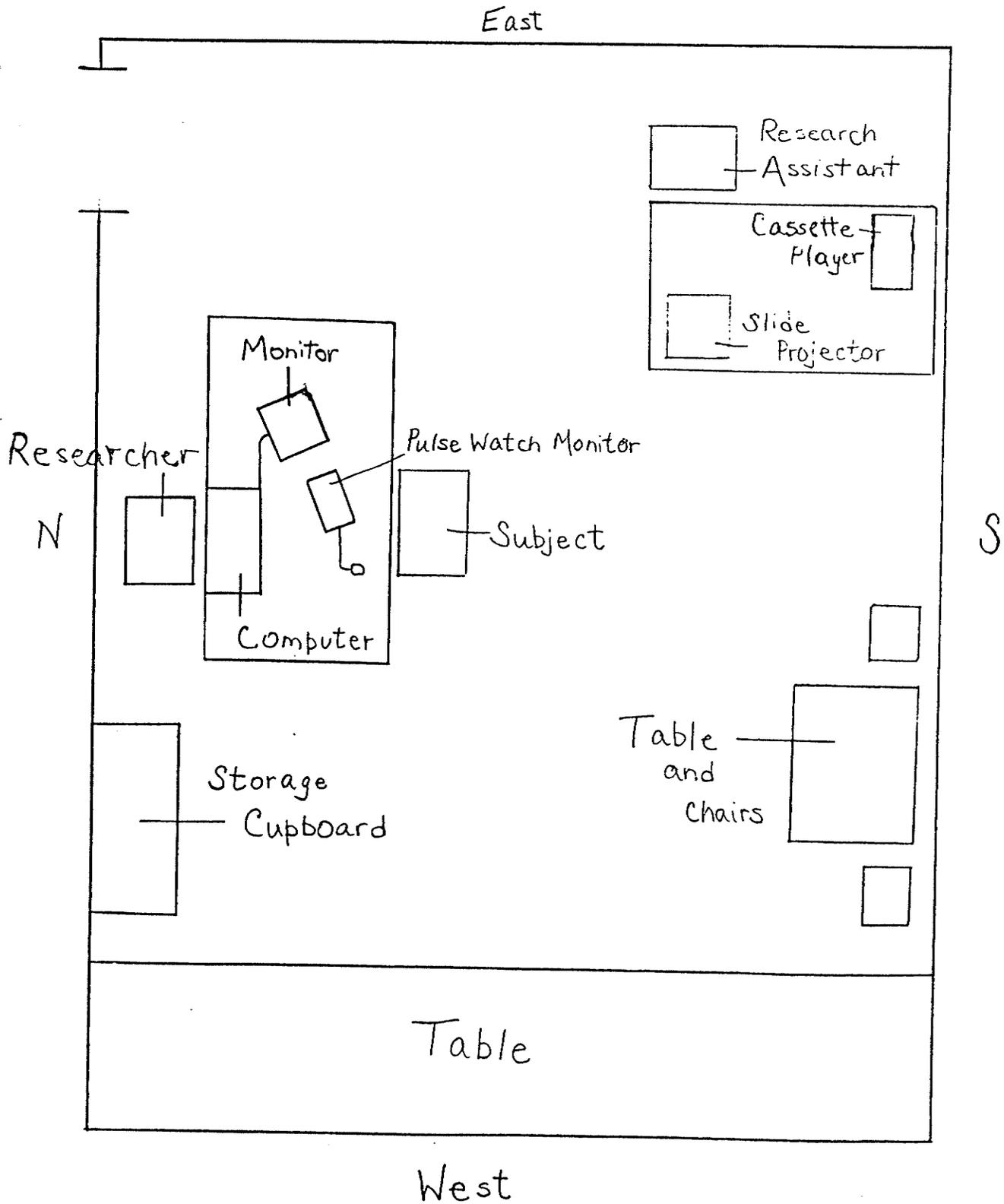
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APPENDIX A

ARRANGEMENT OF EQUIPMENT IN RESEARCH ROOM



APPENDIX B

CONTRACT, CONSENT, AND INFORMATION FORM

I, _____ agree to participate in a research programme evaluating the therapeutic effects of using biofeedback and relaxation to reduce high levels of emotional arousal. I understand that this research is a time limited programme consisting of the following components:

1. completing several pencil and paper questionnaires: pre- and post- research
2. watching slides with neutral and human stimuli while my heart rate is being monitored
3. being taught relaxation exercises in order for me to watch human stimuli slides with decreased arousal levels
4. coming for all the sessions, sometimes twice a day, later on once a week
5. being aware that the total time involvement could be several hours a day for eight to fifteen days over a period of two to three weeks, followed by one or two follow-up sessions two to four weeks later on.

I understand that the information gathered during the programme will be used for analysis and development of a therapeutic treatment package. I have been informed, however, that confidentiality is guaranteed. Information used for research analysis will exclude any details that may reveal my identity. It is further understood that the researcher, Clara Doerksen, is a graduate student in Clinical Psychology in the Psychology Department of the University of Manitoba. She is trained in the conduct of research and therapeutic behavioural procedures under the supervision of her faculty advisor, Dr. M. Brodsky.

I agree that Clara Doerksen, under the supervision of Dr. Brodsky, shall be the sole owner of all rights in regards to the information obtained during the research and that they will receive no financial compensation for the use of this information. I agree that the information may be used for research and teaching purposes. I agree that if the results of this research will be used for other than the above stated reasons, my further consent is required.

I understand that my consent to be part of this research project may be withdrawn at any time. I do, however, agree to participate in the research until its completion barring any unforeseen circumstance. I understand that my participation is vital for the completion of this particular research programme as stated above.

I have read, understand and agree to the conditions for the participation in the research programme as stated above.

Researcher _____ Subject _____

Faculty Advisor _____ Significant Other _____

Date _____

APPENDIX C

REGISTRATION INFORMATION FOR RESEARCH PROGRAMME

All responses are confidential.

NAME _____ BIRTHDATE _____
ADDRESS _____ TELEPHONE (Home) _____
_____ (Work) _____

OCCUPATION _____

MARRIED/SINGLE _____ CHILDREN _____

FAMILY DOCTOR _____

MEDICATION _____

PRESENT HEALTH STATUS _____

NEXT OF KIN AND SIGNIFICANT OTHER _____

EDUCATION _____ RELIGION _____

INCOME _____

COMMUNITY MENTAL HEALTH WORKER _____

APPENDIX D

SOCIAL FEAR SCALE (SFS)

Circle **T** for true or **F** for false.

- T F 1. I like staying in bed so that I won't have to see anyone.
- T F 2. I enjoy being a loner.
- T F 3. I usually prefer being with friends to being by myself.
- T F 4. Upon entering a crowded room, I often feel a strong urge to leave immediately.
- T F 5. Honest people will admit that socializing is a burden.
- T F 6. I find I can't relax unless I am alone.
- T F 7. I feel more comfortable being around animals than being around people.
- T F 8. I think I would enjoy a job that involved working with a lot of different people.
- T F 9. I like to go for days on end without seeing anyone.
- T F 10. I stay away from other people whenever possible.
- T F 11. All my favourite pastimes are things I do by myself.
- T F 12. I often tell people that I am not feeling well just to get out of doing things with them.
- T F 13. The only time I feel really comfortable is when I'm off by myself.
- T F 14. Being around other people makes me nervous.
- T F 15. I would rather eat alone than with other people.
- T F 16. I prefer travelling with friends to travelling alone.
- T F 17. I really prefer going to movies alone.

- T F 18. I almost always enjoy being with people.
- T F 19. It is rare for me to prefer sitting home alone to going out with a group of friends.
- T F 20. I often dream of being out in the wilderness with only animals as friends.
- T F 21. While talking with people I am often overwhelmed with a desire to be alone.
- T F 22. Pets are generally safer to be with than people.
- T F 23. I usually find that being with people is very wearing.
- T F 24. I often feel like leaving parties without saying goodbye.
- T F 25. Even when I am in a good mood, I prefer being alone to being with people.
- T F 26. Often I can't wait until the day is over so I can be by myself.
- T F 27. I wish people would just leave me alone.
- T F 28. I feel most secure when I am by myself.
- T F 29. When seated in a crowded place I have often felt the urge to get up suddenly and leave.
- T F 30. I often need to be totally alone for a couple of days.
- T F 31. I feel most comfortable when I am with people.
- T F 32. I like spending my spare time with other people.
- T F 33. Whenever I make plans to be with people I always regret it later.
- T F 34. The strain of being around people is so unbearable that I have to get away.
- T F 35. I would consider myself a loner.
- T F 36. I wish that I could be alone most of the time.

APPENDIX E

SOCIAL AVOIDANCE AND DISTRESS SCALE (SAD)

For the following statements, please answer each in terms of whether it is true or false for you.

Circle **T** for **true** or **F** for **false**.

- T F 1. I feel relaxed even in unfamiliar social situations.
- T F 2. I try to avoid situations which force me to be very sociable.
- T F 3. It is easy for me to relax when I am with strangers.
- T F 4. I have no particular desire to avoid people.
- T F 5. I often find social occasions upsetting.
- T F 6. I usually feel calm and comfortable at social occasions.
- T F 7. I am usually at ease when talking to someone of the opposite sex.
- T F 8. I try to avoid talking to people unless I know them well.
- T F 9. If the chance comes to meet new people, I often take it.
- T F 10. I often feel nervous or tense in casual get-togethers in which both sexes are present.
- T F 11. I am usually nervous with people unless I know them well.
- T F 12. I usually feel relaxed when I am with a group of people.
- T F 13. I often want to get away from people.
- T F 14. I usually feel uncomfortable when I am in a group of people I don't know.
- T F 15. I usually feel relaxed when I meet someone for the first time.
- T F 16. Being introduced to people makes me tense and nervous.
- T F 17. Even though a room is full of strangers, I may enter it anyway.

- T F 18. I would avoid walking up and joining a large group of people.
- T F 19. When my superiors want to talk with me, I talk willingly.
- T F 20. I often feel on edge when I am with a group of people.
- T F 21. I tend to withdraw from people.
- T F 22. I don't mind talking to people at parties or social gatherings.
- T F 23. I am seldom at ease in a large group of people.
- T F 24. I often think up excuses in order to avoid social engagements.
- T F 25. I sometimes take the responsibility for introducing people to each other.
- T F 26. I try to avoid formal social occasions.
- T F 27. I usually go to whatever social engagement I have.
- T F 28. I find it easy to relax with other people.

APPENDIX F

SOCIABILITY SCALE

Directions: Blacken the letter on the sheet which applies to you. For example: I like food. If this is true about you, then black "A" (Very much like me).
Remember: This is "like me".

A. Very much; B. Mostly; C. Sometimes; D. Mostly not; E. Very much not

1. Things usually bother me.
A. B. C. D. E.
2. I find it very hard to talk in front of a group.
A. B. C. D. E.
3. I wish I were friendlier.
A. B. C. D. E.
4. I'm a lot of fun to be with.
A. B. C. D. E.
5. It takes me a long time to get used to new people.
A. B. C. D. E.
6. I'm popular with people.
A. B. C. D. E.
7. I often get discouraged to talk to people at social functions.
A. B. C. D. E.
8. My parents and I used to have a lot of fun together.
A. B. C. D. E.
9. I like to be alone.
A. B. C. D. E.
10. I like to be called on in a group.
A. B. C. D. E.
11. No one pays much attention to me.
A. B. C. D. E.

A. Very much; B. Mostly; C. Sometimes; D. Mostly not; E. Very much not

12. I'm often shy.
A. B. C. D. E.
13. I always know what to say to people.
A. B. C. D. E.
14. I seldom touch when I am expressing tenderness.
A. B. C. D. E.
15. I often find it difficult to ask a friend or others for a favour.
A. B. C. D. E.
16. I make few or no hand gestures when speaking.
A. B. C. D. E.
17. I'm a little withdrawn.
A. B. C. D. E.
18. At times, I want to be the center of attention.
A. B. C. D. E.
19. At times, I speak of matters of low personal importance (e.g., weather).
A. B. C. D. E.
20. I respond appropriately when someone asks a question.
A. B. C. D. E.
21. At times, I speak at moderately intimate levels (e.g., topics concerning likes and dislikes).
A. B. C. D. E.
22. At times, I touch others when showing emotional support.
A. B. C. D. E.
23. I don't like to argue with others so I give in or find a middle ground.
A. B. C. D. E.
24. I often say "I'm sorry" when inappropriate.
A. B. C. D. E.

A. Very much; B. Mostly; C. Sometimes; D. Mostly not; E. Very much not

25. I am usually able to express love and affection to close friends and family.
A. B. C. D. E.
26. I feel tense in social situations.
A. B. C. D. E.
27. I seldom take the responsibility to introduce strangers to each other.
A. B. C. D. E.
28. At times I am afraid of others.
A. B. C. D. E.
29. I feel awkward around others.
A. B. C. D. E.
30. I avoid others, when I can.
A. B. C. D. E.
31. I don't like others to touch me.
A. B. C. D. E.
32. I like to talk on the telephone.
A. B. C. D. E.
33. I like to meet people for coffee.
A. B. C. D. E.
34. I approach salespeople when I'm unsure what to buy.
A. B. C. D. E.
35. I like to initiate conversations with people I don't know.
A. B. C. D. E.
36. I like being introduced at parties/other social situations.
A. B. C. D. E.
37. I like walking and holding hands.
A. B. C. D. E.

APPENDIX G

PROMISE OF CONFIDENTIALITY

Date _____

I, _____, understand the request for confidentiality and hereby propose to adhere to it in all things pertaining to this Research Project, conducted by Clara Doerksen, under the auspices of Dr. M. Brodsky, Department of Psychology, University of Manitoba.

Signature _____

Witness _____

APPENDIX H RECORD FOR HOMEWORK

Name _____

DATE - 1994	I listened to the tape	Yes, she listened
November 24		
25		
26		
27		
28		
29		
30		
December 1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

I will phone once a week to see how you are getting along. - Clara Doerksen

APPENDIX I

SOCIAL VALIDATION QUESTIONNAIRE

Instructions: Please circle the number for each item that comes closest to describing your opinion.

1. Has the treatment helped you?
1 2 3 4 5
no somewhat a lot

2. As the sessions progressed, would you have like more information about the research?
1 2 3 4 5
no somewhat a lot

3. Would you have liked more training sessions?
1 2 3 4 5
no somewhat a lot

4. Were the human-stimuli slides relevant to your experiences?
1 2 3 4 5
no somewhat a lot

The following questions will be asked during the interview situation.

1. In general, how has the treatment helped you? Was it worth your time and effort?
2. What were some positive experiences?
3. Did you have some negative experiences?
4. Has the treatment helped you to make some permanent changes in relating to people you know well? Can you identify some specific situations?

APPENDIX J

SOCIAL VALIDATION QUESTIONNAIRE FOR THE SIGNIFICANT OTHER

Instructions: Please circle the number for each item that comes closest to describing your opinion.

1. Has the treatment been of help to your client?
1 2 3 4 5
no somewhat a lot

2. As the sessions progressed, would you have liked more information about the research in which your client was involved?
1 2 3 4 5
no somewhat a lot

3. Do you think there should have been more training sessions?
1 2 3 4 5
no somewhat a lot

4. Were the human-stimuli slides relevant to your client's experiences?
1 2 3 4 5
no somewhat a lot

The following questions will be asked during an interview situation.

1. In general, how do you think the treatment has benefited your client? Was it worth your time and effort?
2. What do you consider some positive experiences for your client?
3. Did your client indicate to you that he/she had some negative experiences?
4. Has the treatment helped your client to make some permanent changes in his/her way of relating to others? For example, to you and/or his/her foster sponsors?

APPENDIX K

PROCEDURAL RELIABILITY FOR ALL SESSIONS

DATE _____ NAME _____

TRAINER _____ PHASE _____

OBSERVER _____

Instructions: Check "✓" the appropriate column based on trainer response.

Procedural Elements	Correct	Incorrect	Improvement
1. Trainer greets subject with a smile and chats			
2. Trainer explains procedure, if necessary			
3. Subject sits down, equipment is adjusted			
4. Equipment is switched on; procedure begins			
5. Recording and instructions proceed			
6. Equipment is switched off			
7. Trainer thanks, says "good-bye", small talk			
TOTAL			

P.R.O. - # correct procedures x 100

P.R.O. score - % total # of procedures required

APPENDIX L

PROCEDURAL RELIABILITY FOR TREATMENT SESSION

DATE _____ NAME _____

TRAINER _____ SESSION # _____

OBSERVER _____

Instructions: Check "✓" the appropriate column based on trainer response.

Procedural Elements	Correct	Incorrect	Improvement
1. Trainer and subject prepare for session			
2. Trainer and subject record heart rate			
3. Trainer and subject view neutral stimuli			
4. Trainer and subject record heart rate			
5. Trainer and subject view human stimuli			
6. Trainer and subject record heart rate			
7. Subject engages in relaxation exercise			
8. Trainer and subject record heart rate			
9. Trainer and subject view human stimuli			
10. Trainer and subject record heart rate			
TOTAL			

P.R.O. - # correct procedures x 100

P.R.O. score - % total # of procedures required

APPENDIX M**Use of Multiple Baseline Design Across Subjects****To Demonstrate Internal Validity of Treatment**

Sessions	Subject 1	Subject 2	Subject 3	Subject 4	
1	92.0	97.5	110.0	118.5	Heart Rate During BASELINE sessions
2	90.0	96.0	111.0	119.5	
3	90.0	96.0	110.0	109.5	
4	95.5	99.5	109.0	119.5	
5	95.0	98.5	112.0	106.5	
6	97.0	97.0	102.0	119.0	
7	88.0	98.0	105.0	118.5	
8	85.5	94.0	107.5	125.0	
9	82.5	94.5	106.0	119.0	
10	88.5	93.5	104.0	119.5	
11	85.0	94.5	104.0	119.0	
12		79.5	110.0	110.0	Heart rate during Part 4 of TREATMENT sessions
13			104.5	107.7	
14			103.5	104.0	
15				105.5	
16				100.0	

APPENDIX N

WHITTAKER PULSE WATCH AND INTERFACE PROBLEMS

Introduction

The Whittaker Pulse Watch is an electronic device to monitor heart rate. Throughout 1994 (in particular the latter months), Clara Doerksen, who had been using the unit for research into schizophrenia, made me aware of problems she was experiencing with the unit.

These problems were erratic, sometimes grossly exaggerating readings for heart rates of subjects in her study. Many of the readings were of such magnitude as to render them biologically improbable, if not impossible.

I had tested the unit numerous times throughout this period and found no fault with its operation. However, having travelled to Clara's research facility and witnessed these spurious readings, and in the light of further information from Clara, I believe readings from the unit can be interpreted.

Pulse Watch

The Whittaker Pulse Watch consists of a system unit, finger clamp (which has infra-red transmitter and sensor), a cable to connect the finger clamp (sensor) to the system unit and an interface cable to input the detected pulses into a PC for recording the data. The system unit also has an analogue scale to display the pulse rate (see drawing attached).

Operation of Unit

The PC being used to gather the data is turned on and the relevant heart rate program is run. Once the program is ready for the trial, the finger clamp (with sensor) is placed over one of the subject's fingers. The Pulse Watch unit is turned on and the trial can begin.

A minute infra-red signal from the transmitter in the finger clamp shines on the skin of the subject. This emitted radiation will either be absorbed or reflected. The infra-red receiver in the finger clamp will receive a signal proportional to the amount of reflected energy. The amount of absorption or reflection will be dependent upon the medium it strikes (i.e., the skin of the subject's finger). If the properties of the medium (skin) change (by an influx of blood associated with the beating of the heart), then the amount of reflection and absorption changes. This change in reflected energy gives us a signal at the infra-red receiver proportional to the rate at which the skin's properties change, and thus the heart rate.

This small signal at the infra-red receiver is amplified in the Pulse Watch system unit. It is then conditioned and finally a DC level obtained by filtering. This DC level drives the scale on the system unit giving the heart rate reading on the analogue scale (see drawing attached).

Signal Interfacing

The amplified analogue detected signal of the subject's heart rate is not suitable to be fed directly to the PC recording the data. To make it useful, it is digitized by the interface and can now be read by the PC via the parallel port (see drawing attached).

Data Acquisition

The digitized pulse stream (square wave) can be read through the parallel port. The software "watches" the port in question and "counts" the number of pulses over a 5 second interval. The number of pulses counted over this 5 second interval is then extrapolated to give the number of pulses per minute. This result for pulses per minute is graphically displayed on the screen. Another 5 second interval is initiated, pulses counted and extrapolated as before and the display is updated. This process continues until the trial in question is complete.

Pulse Watch Problems

Device Limitations

The primary limitation of the Pulse Watch unit is that it does require full cooperation by the subject. For example, movement can cause a false heart beat to be detected, slight pressure applied by the finger on the sensor can reduce the number of heart beats detected. Thus, cooperation of the subject is necessary.

Software Limitations

In order to obtain a reasonable representation of heart rate, the sample time of 5 seconds was set up. This sample time provides accurate results. However, in the event of extraneous "extra" beats being detected in the 5 second time sample at the parallel port, these "extra" beats are also used in the calculation and extrapolation of beats per minute, and "unbelievable" heart rate fluctuations can be seen displayed as output (see attached drawing).

Errors in Heart Rate Output

Having visited Clara Doerksen's research facility and ensured that the problem readings were not attributable to any EMI source (electromagnetic interference, i.e., an electric motor nearby, power equipment, etc.), I observed several of Clara's trials with her subjects. One subject, in particular, displayed huge oscillations in her heart rate, which were clearly wrong. On completion of this subject's trial, I tested the unit. It gave an accurate and trouble-free response.

Clara Doerksen spoke to me at a later date concerning the inaccurate readings which continued, particular with a certain subject in her study. She asked the subject to take an E.K.G. which showed no cardiac arrhythmias which could explain the readings. However, Clara did inform me that a nurse who worked at the facility felt that the subject in question exhibited "extra" peripheral pulses associated with the actual pulse rate.

At this point, I explained to Clara how the heart rate software calculated its result. I suggested that the erratic "extra" peripheral beats at the subject's finger could certainly cause major inaccuracies.

Conclusion and Recommendations

I believe that the Whittaker Pulse Watch unit is functioning correctly, within its specifications but also subject to its limitations. The device, as stated before, needs the cooperation of the subject and a signal uncluttered with "extra" peripheral pulses to give accurate results. I believe, also, that the subjects in Clara's study push the unit toward its boundary in terms of performance.

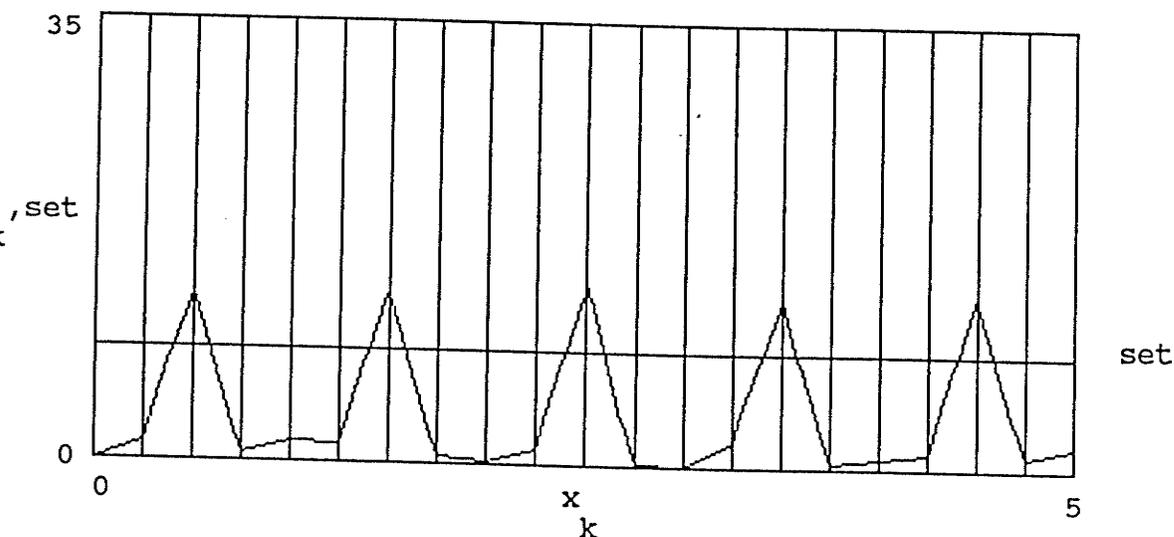
I feel considerations should be given to the acquisition of a newer and more accurate device to monitor pulse rates for Departmental experiments and Research work.

- Prepared by Paul Rowan,
Computer Technician
Department of Psychology,
University of Manitoba

$r_k := y_k + \text{rnd}(2)$ This expression simulates our signal and external noise

SIGNAL PLUS NOISE

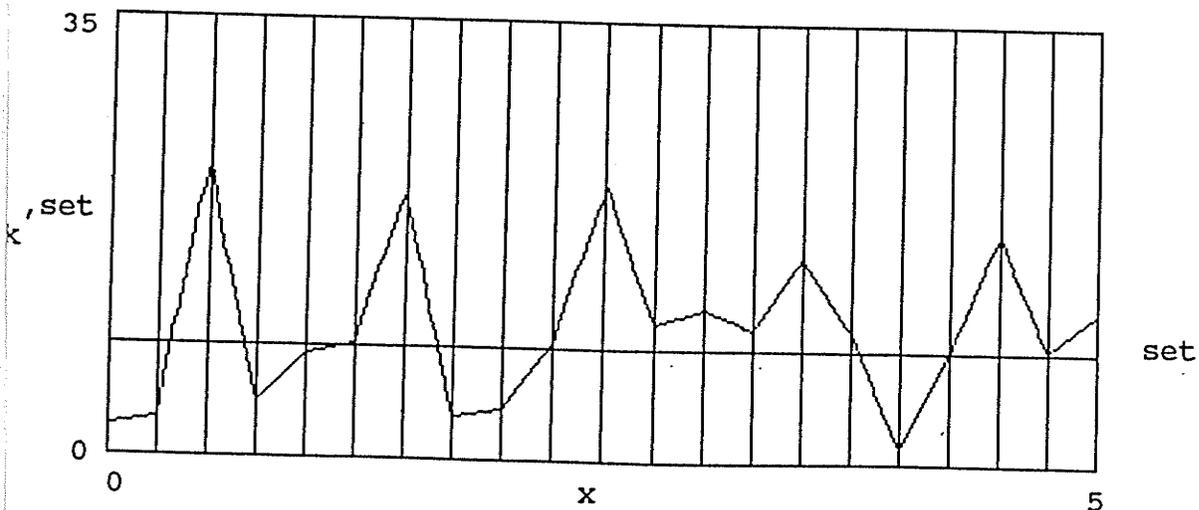
Pulse Count = 5 Beats over 5 second interval



$r_k := y_k + \text{rnd}(2) + \text{rnd}(12)$ This expression simulates the spurious extra pulses exhibited combined with legitimate pulses from the subject.

SIGNAL WITH EXTRA PULSES AND NOISE

Pulse Count = 12 Beats over 5 second interval



MODEL TO SHOW THE EFFECT OF SPURIOUS EXTRA PULSE ON PULSE WATCH SYSTEM

k := 1 ..21

Y :=

k
0
1
12
0
0
1
12
0
0
1
12
0
0
1
12
0
0
1
12
0
0

x :=

k
0
.25
.5
.75
1
1.25
1.5
1.75
2
2.25
2.5
2.75
3
3.25
3.5
3.75
4
4.25
4.5
4.75
5

This table of values will be used to plot a signal as input to the pulse watch.

To this initial pulse train we will introduce first noise, then the extra pulses existing in certain subjects.

The horizontal line (set) will act as a threshold filter (set point). The vertical bars simulate a sampling of the signal.

The pulse count from the graphs below are defined as the intersections of the plotted value and vertical bars which are found above set point line.

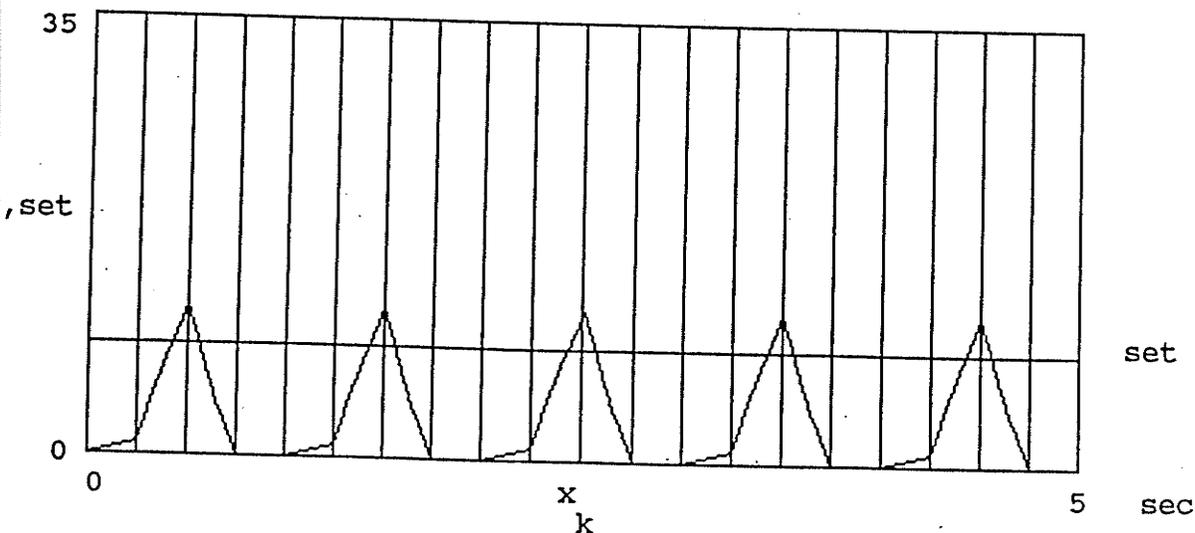
z := 0

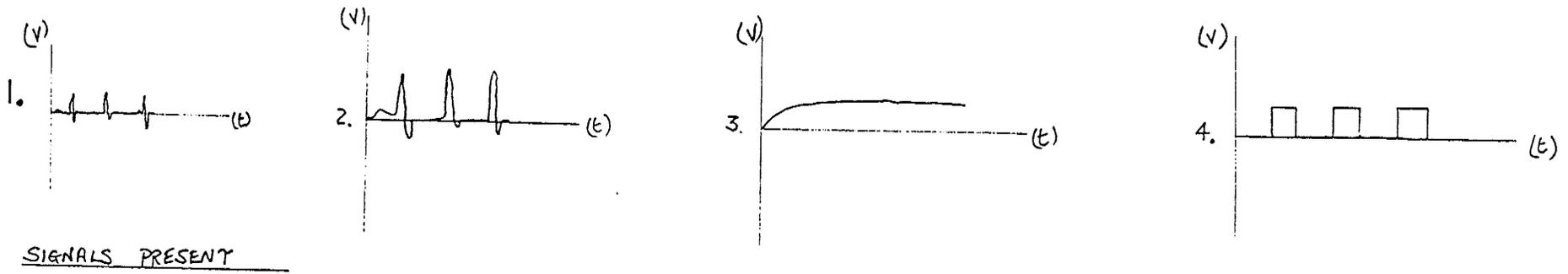
set := 9

This graph is used to simulate a signal for legitimate pulses detected under ideal conditions, that is noise free. This noise free condition implies cooperation of the subject.

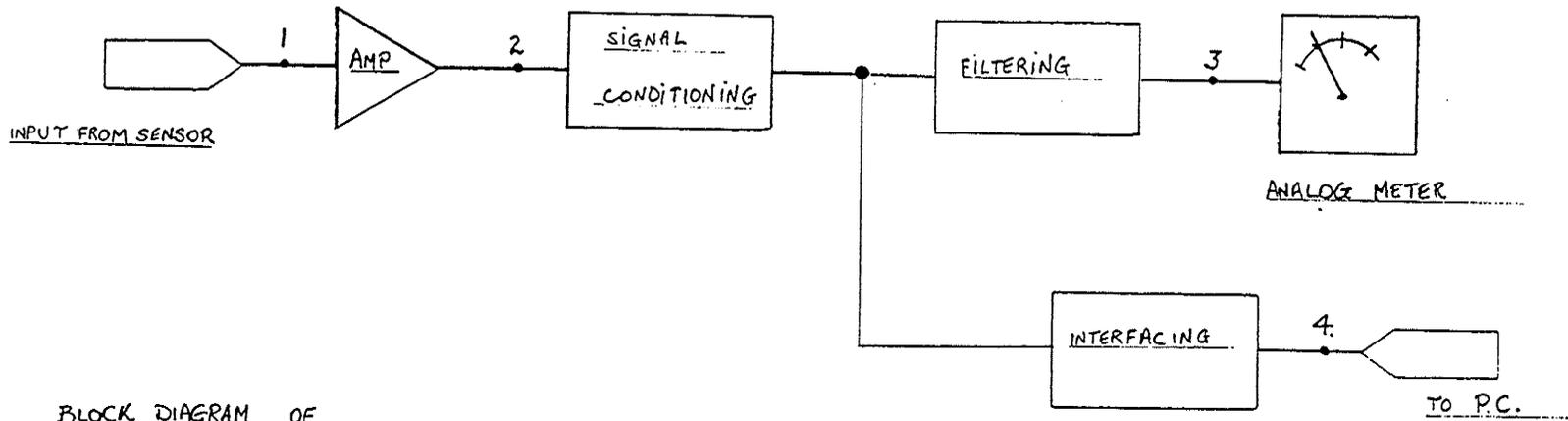
SIGNAL

Pulse Count = 5 Beats over 5 second interval





SIGNALS PRESENT



BLOCK DIAGRAM OF WHITTAKER PULSE WATCH.

BLOCK DIAGRAM OF WHITTAKER PULSE WATCH

Manitoba



Date: 94. 11. 02

Action / Route Slip

To: Clara

From: Yvette Cyr
RN BN

Telephone: _____

- Take Action
- Per Your Request
- Circulate, Initial and Return
- For Approval and Signature
- Make _____ Copies
- May We Discuss
- For Your Information
- Return With Comments or Revisions
- Draft Reply for Signature
- Please File

Comments: See

(R) radial pulse — 89 — rhythm seems to vary in fast then slower

(taken for 1 full minute each time)

80

80

87 — some stronger beats, some weaker

Apex (taken 1 full minute each time) 107 — regular rhythm

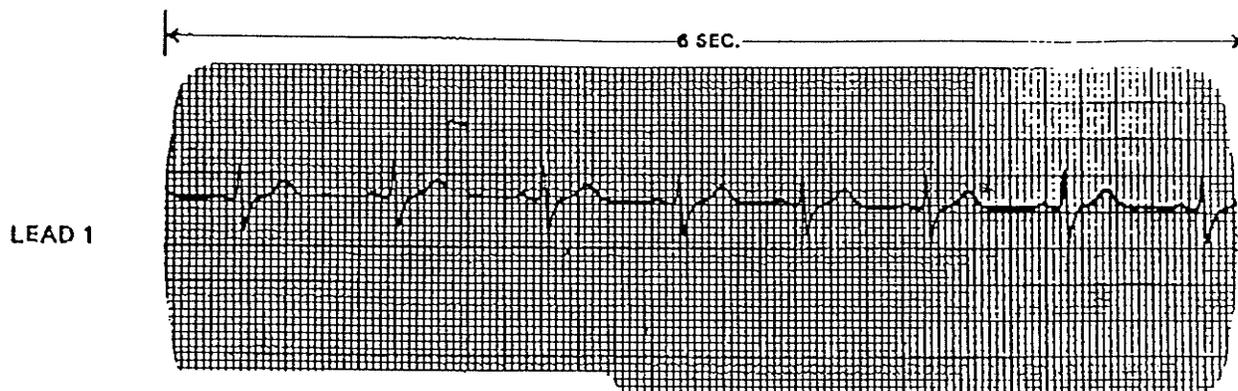
105 — strong beat

MG-1298 PS-1-182 8940100671

NOTES FROM THE NURSE

APPENDIX O

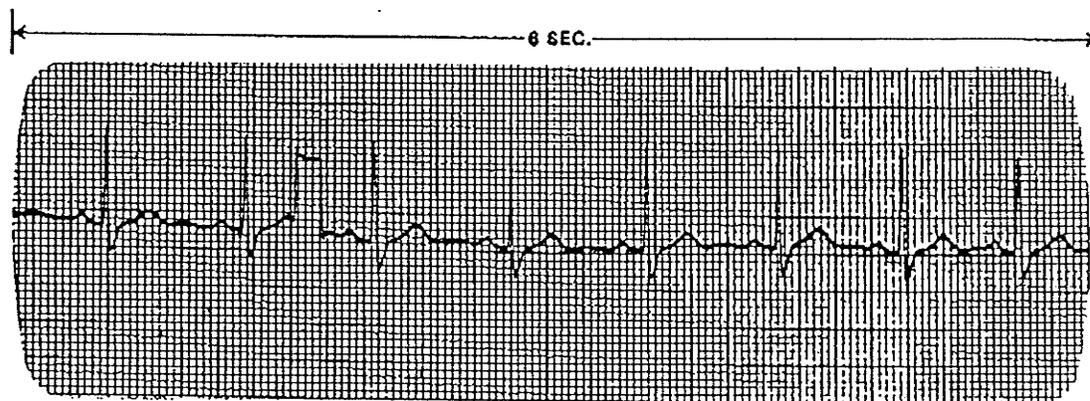
APPENDIX P



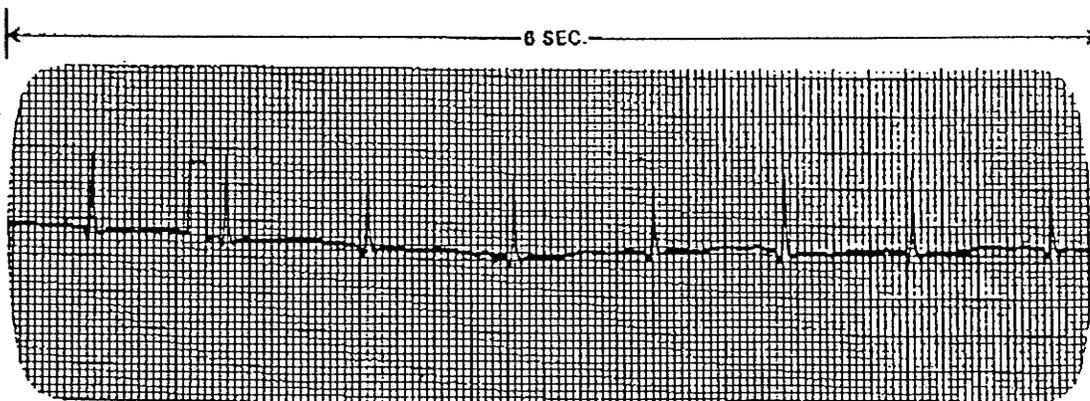
LEAD 1

12726

Traced Oct. 21/94 ordered by DR. G. Gobeil



LEAD 2

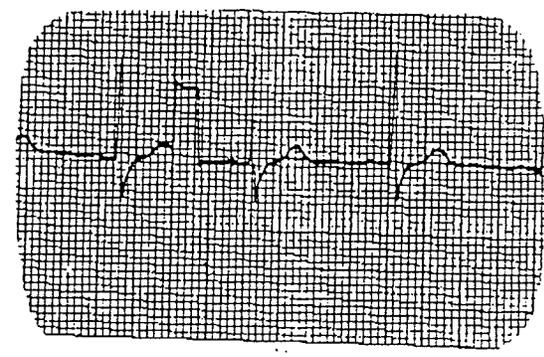
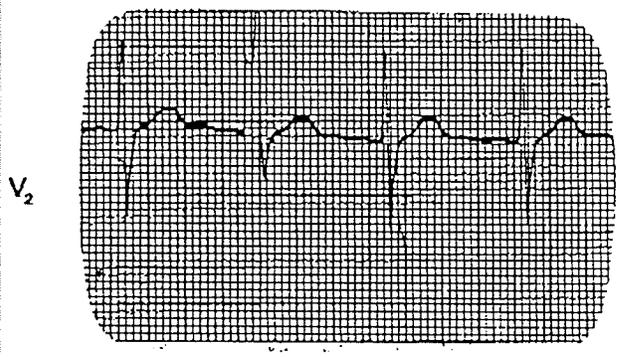
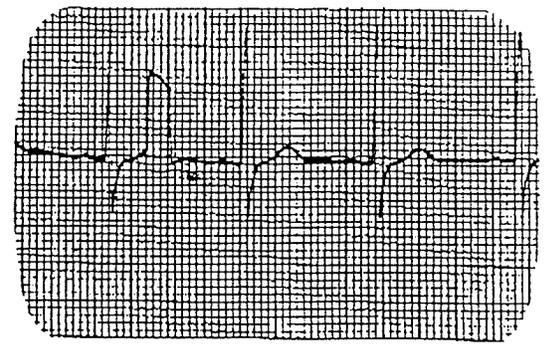
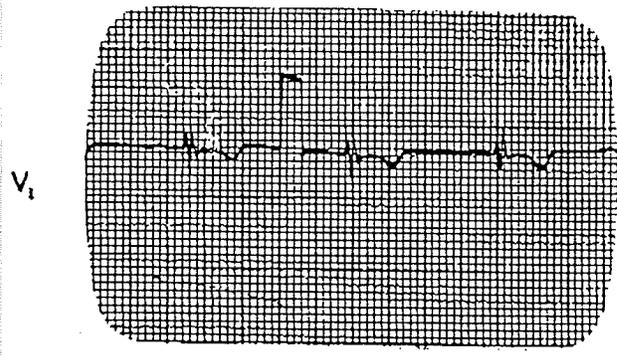


LEAD 3

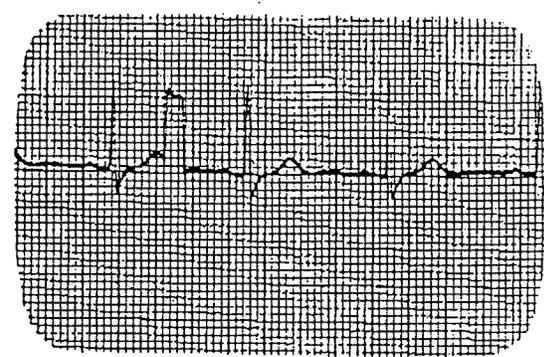
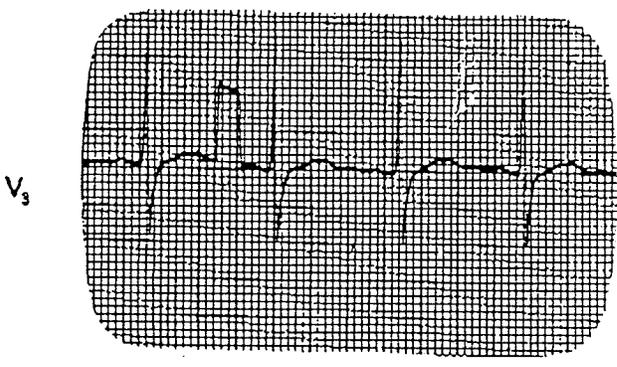
ATRIAL RATE	80	P-R INTERVAL	0.13	PATIENT POSITION	ⓐ
VENTRICULAR RATE	80	QRS INTERVAL	0.108	ELECTRICAL AXIS	70
RHYTHM	Sin	Q-T INTERVAL		S-T SEGMENT	ⓐ
P WAVES	ⓐ	T WAVES	ⓐ		

REMARKS

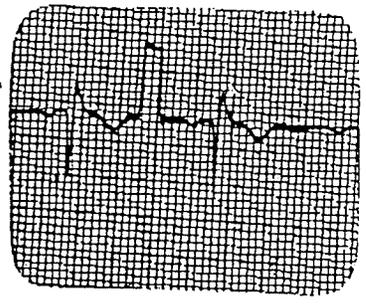
Normal EKG



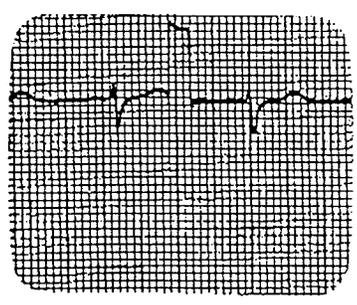
Traced OCT 21/94
DR. Gobeil



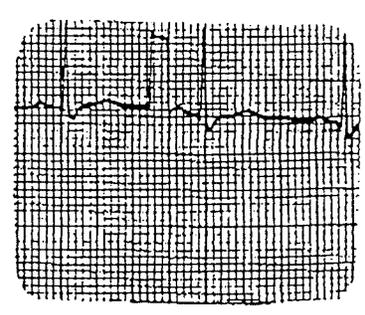
AVR



AVL



AVF



APPENDIX Q

INFORMATION AND RESULTS FOR SUBJECT 5

Subject 5 completed the three questionnaires: the Social Fear Scale, the Social Avoidance and Distress Scale, and the Sociability Scale. On the Social Fear Scale, Subject 5 showed an increase from 2 points at pre-baseline to 7 points post-treatment, and from pre-baseline to follow-up, an increase of 2 additional points from post-treatment. Scores from her significant other indicated an increase of 1 point from pre-baseline to follow-up.

On the Social Avoidance and Distress Scale, Subject 5 showed a decrease from her pre-baseline score of 3 points at post-treatment, but an increase of 1 point at follow-up from the pre-baseline score. She showed a total increase 25% from pre-baseline to follow-up. Her significant other indicated an increase of 10 points from pre-baseline to follow-up.

On the Sociability Scale, Subject 5 showed an increase of 6 points from pre-baseline to post-treatment, and an increase of 22 points from pre-baseline to follow-up. This was a total increase of 20% from pre-baseline to follow-up. Her significant other did not indicate any change.

Subject 5 and her significant other were part of the social validation interview. This subject indicated that the treatment had helped "a lot", especially "to think about something different than the voices." She indicated that a long-term change was that she was getting along better with her roommates. She also felt that it had been worth her time to come for the sessions. This is quite a positive statement considering that the

subject was aware that it had been difficult to obtain valid data during the training sessions. Even at that, she would have liked "a lot more" training sessions. She also indicated that she would have liked more information about the research project. She claimed that there had been no negative experiences for her during the project.

Subject 5's significant other responded to the question, "Has the treatment been of help to your client?" with a 3=somewhat. She also indicated that Subject 5 was "more willing" to do things together with the other roommates; and relationships among all of the roommates in the group home had improved since this subject had been part of the project. The significant other also noted that Subject 5 had sat down to interact socially with an older woman, a behavior in which she would not have engaged prior to her participation in the project. This subject would also come to the significant other and ask her for a hug, which she never did prior to the research. Subject 5's significant other would have liked "some more" information about the research, but felt that the number of sessions had been adequate.

In summary, Subject 5 had made some major changes regarding her social interactions with others. Others saw her as being more open to helping and cooperating with the roommates. Her significant other had not interacted with Subject 5 during the four to five weeks previous to follow-up, and so her scores for Subject 5 had not changed. However, even though the treatment part of the research was not productive for Subject 5, other changes for her were positive.

A different type of heart rate measurement would be needed for Subject 5, who had a weak peripheral pulse. Possibly, had there been a more sophisticated measuring

device for her, she, too, could have benefited from the relaxation and biofeedback treatment package.

	Social Fear Scale			Social Avoidance & Distress Scale			Sociability Scale		
	Pre-	Post-	Followup	Pre-	Post-	Followup	Pre-	Post-	Followup
Subject 5	2	7	5	8	5	6	109	115	131
Significant Other	10	-	11	10	-	20	105	-	105