

The Effects of Therapeutic Recreation Sensory Stimulation Interventions on Autonomic Arousal of Institutionalized Profoundly Mentally Retarded Adults

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INTRODUCTION

Sensory stimulation activities are among the most widely used therapeutic recreation interventions for profoundly mentally retarded individuals. Clients are encouraged to explore objects in their environments through touch, to look at different types of pictures, to experience foods with a variety of tastes, and to listen to a variety of sounds. The developmental basis for these activities is the assumption that when clients respond to stimuli, they increase their degrees of environmental awareness (APA, 1987) and are thereby learning to discriminate between and within their environments (Crawford and Mendell, 1987; Hull, 1952). Such important attributes as interest, preference, choice, desire, and decision making may eventually be built upon this foundation of awareness and discrimination (Utah State Training School, 1985).

One of the major challenges faced by therapeutic recreation personnel who use sensory stimulation interventions is identification of awareness responses of clients to different types of stimulation. Typically, an attempt is made to assess awareness through observations of such behavioural responses as directing the eyes on the task at hand or noting changes in movement of extremities. Such observations, however, do not always signify psychological awareness. Eyes can be directed at a task because a therapist places the task before the client's eyes, and extremities can be moved due to muscle fatigue or due to any other internal desire for stimulation. Thus, a variety of factors may interfere with therapists' attempts to determine the degree to which different sensory stimulation interventions are actually creating desired effects on awareness.

An alternative to behavioural observation can be found in theory of optimal arousal (Berlyne, 1960; Duffy, 1957; Malmö, 1959) that was brought to the recreation and leisure literature by Michael Ellis in his now classic book Why People Play. In that book, Ellis (1973) proposed that play is caused by a constant, physiological need of individuals to maintain an optimal level of interest, alertness, or awareness (arousal). Further, consistent with Berlyne (1960), Ellis proposed that an individual's level of arousal may be modified by increasing or decreasing the level of novelty, complexity, or dissonance in the environment. This theory has served as the basis for several important lines of research in recreation and leisure studies (e.g. Iso-Ahola, 1980; Etzel and Wahlers, 1984; Wahlers and Etzel, 1985).

The arousal model is particularly important in terms of the problem of assessing the reactions of profoundly mentally retarded individuals to therapeutic recreation sensory stimulation interventions. Although quite complex (Barry, 1982; Buck, 1988; Dirken, 1984), arousal is a neurophysiological phenomenon and a variety of instruments have been developed for its measurement. Central nervous system arousal can be measured with an electroencephalograph (EEG), an electromyograph (EMG) can be used to measure somatic arousal, and such devices as electrodermal activity (EDA) recorders, heart rate monitors, and pupil dilation monitors can be used

to measure autonomic arousal. Activation theorists generally consider EDA to be the most appropriate measure of a generalized arousal response (Duffy, 1957, p. 110; Barry, 1982).

The examination and measurement of EDA is not a recent event. That phenomenon has been a subject of investigation since the late 1800s and has been at the centre of research by scholars in many different fields (Bernstein, Riedel, Pava, Schnur, and Lubowsky, 1985; Bull and Gayle, 1975; Newman and Blanton, 1970; Prystav, 1975). In 1963, Sokolov identified a "neuronal model of unitary response", more commonly known as the Orienting Response (OR). The OR is said to be a description of the *entire organism's* response to its environment. Sokolov described the OR as an automatic reflexive by-product of an encounter with stimuli. Barry (1982) proposed a four-system model (called "a fractionation of preliminary processes in OR elicitation") to better understand the OR process. Within this model Barry identifies EDA as the most sensitive OR measure because of its responsiveness to both sympathetic and parasympathetic systems.

Since *awareness* may be equated with *arousal*, a strong theoretical basis from both psychophysiology and leisure theory exists for the use of sensory stimulation interventions by therapeutic recreation personnel. The effects of such interventions on physiological arousal has not previously been assessed. The purpose of this study, therefore, was to examine variations in physiological arousal of profoundly mentally retarded individuals across different sensory stimulation interventions.

METHOD

Three different sensory stimulation interventions (visual, auditory, tactile) were tested for their relative efficacy in eliciting arousal responses. Arousal was determined by continuously measuring and recording each subject's electrodermal activity (EDA) before, during, and after each sensory stimulation intervention. Subjects' EDA was also collected during a rest period.

Eight (four male and four female) profoundly mentally retarded adults residing in a state operated intermediate care facility for the mentally retarded (I.C.F.M.R.) served as subjects. Subjects' chronological ages ranged from 18 years, 7 months to 36 years, 2 months. Subject selection was determined by the following seven criteria: (1) adult (18 years old or older); (2) classified as profoundly mentally retarded; (3) possess a single digit I.Q.; (4) mental capacities under 18 months; (5) be absent of any visual or auditory impairment; (6) not be tactile defensive; and (7) have been exposed to the standardized, sensory stimulation interventions for at least six months, but not longer than one year.

During data collection, each subject received each of the sensory stimulation interventions for a period of six minutes. During this time, EDA was recorded continuously and averaged into two second intervals. A brief description of the interventions is as follows:

Auditory - A series of tones, music, spoken word, animal noises, and common noises.

Visual - A series of different coloured and shaped lights of varying intensity and duration. Also shown were pictures of people, animals, and objects.

Tactile - A series of different textures and pressures presented to different parts of the body, concluding with subject manipulation.

Rest - A control condition absent of stimulation, a period of light rest.

The method of generalized least squares (GLS) regression was used to analyze the data for each subject. Group data were analyzed through analysis of variance (ANOVA) with repeated measures across interventions, divided into consecutive quartiles (interventions divided into fourths). For the group analysis, dependent variables included the level (measured as the mean), frequency (measured as the standard deviation), and the minimum and maximum levels of EDA responses for each subject.

RESULTS

The GLS regression analyses for each subject revealed significant ($p < 0.05$) intervention effects for all but one subject. The minimum and maximum plots provide insight as to the interventions during which each subject was most aroused and least aroused. Subject by subject intervention plots were constructed to facilitate interpretation. Examination of these plots across subjects and by intervention quartile revealed distinct individual differences in responses to the sensory stimulation interventions.

For three of the subjects, results indicated that the interventions were more arousing than the rest condition, but for the remaining five, the rest condition produced higher arousal than the interventions. Results also suggest that gender differences may exist. Three of the four female subjects exhibited nonsignificant responses to all interventions. Also noteworthy, only one of the four ambulatory subjects exhibited nonsignificant responses as compared to two of the four non-ambulatory subjects who exhibited nonsignificant responses. This result may represent developmental differences. No significant group differences were identified through ANOVA for any of the dependent variables. Because the error term in this ANOVA model is the subject by treatment mean square, this result provides further evidence of individual differences in responses to the interventions.

DISCUSSION

The purpose of this study was to examine the effects of sensory stimulation interventions on the arousal (electrodermal activity responses) of institutionalized profoundly mentally retarded adults. Several additional benefits were realized. Results provided insight into the problem of determining which interventions created the greatest arousal for each subject. Further, results provided insight into the segment of each intervention during which each subject was most aroused. Arousal theory could be operationalized in the context of direct care situation in therapeutic recreation. In more general context, results tend to support the importance of individual differences and person by situation research (Ellis and Yessick, 1989) and single subject analysis (Dattilo, 1986). Results also provide additional support for the fundamental concept of individualized treatment in therapeutic recreation.

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