

The Effect of Background Music on Task Performance in Psychotic Children

Sharon J. Burluson

David B. Center

Harolyn Reeves

**Timber Ridge Ranch,
Georgia State University, and
DeSoto County, Mississippi Public Schools**

This study attempted to evaluate the effect of background music on the task performance of psychotic children. The subjects were four male psychotic children, ranging in age from 5 to 9 years, who were students in a psychoeducational day treatment center. An ABAB single-subject design was used to evaluate the effect of background music on the dependent variable; the dependent variable was a color coded sorting task. Data were analyzed using graphic analysis, a nonparametric statistic, and a criterion for clinical significance. Results supported a facilitative effect for background music on task performance. Implications of the results are discussed.

Music has been used in efforts to affect a variety of behaviors. Researchers have demonstrated the usefulness of music in interventions to modify inappropriate responses (Greenwald, 1978; Madsen & Wolfe, 1979; McCarty, McElfresh, Rice, & Wilson, 1978; Stevens, 1971; Wilson, 1976), modify activity level (Reardon & Bell, 1970; Stevens, 1971), and improve performance (Fitzpatrick, 1959; Knill, 1983; Madsen & Geringer, 1976; Mowesian & Heyer, 1973; Richman, 1976; Sternlight, Deutsch, & Siegal, 1967). It is also widely recognized that the severely

Sharon J. Burluson, Ed.S., is Coordinator of Clinical Services for Pediatrics at New Medico's Rehabilitation Center at Timber Ridge Ranch in Benton, Arkansas.

David B. Center, Ph.D., is an Associate Professor of Special Education at Georgia State University, Atlanta, Georgia.

Harolyn Reeves, Ed.D., is Supervisor of Special Education for the DeSoto County Public Schools in Hernando, Mississippi.

handicapped are responsive to music even when relatively unresponsive to other types of stimuli (Churchill, Alpern, & DeMeyer, 1971; Des Lauriers & Carlson, 1969; Mahlberg, 1973; Miller & Toca, 1979; Moretti, 1979; Pronovost, Wakstein, & Wakstein, 1966; Rimland, 1964; Velter, 1970; Wing, 1966).

In a review of studies concerning the effect of music on performance, Berland (1970) concluded that music increases concentration in most individuals. Richman (1976), in a study of severely retarded subjects, found improved performance associated with music. Improvement in performance was attributed to the effect of music on focus of attention.

The purpose of the present study was to investigate the effect of background music on the accuracy of a performance task in psychotic children. The hypothesis tested was that music would reduce off-task responses that interfere with task performance, thereby increasing task accuracy in psychotic children.

Method

Subjects

Four males between the ages of 5 and 9 years served as subjects for this study; two subjects were white and two were black. *Vineland Social Maturity Scale* social quotients for the subjects ranged between 23 and 35. All subjects had been screened for visual and hearing problems, with no difficulties noted. All subjects were classified as emotionally handicapped using the Mississippi State Department of Education Exceptional Child Guidelines (Holladay, 1982). Mississippi's definition for emotionally handicapped is the same as the definition for seriously emotionally disturbed contained in P.L. 94-142. All subjects were diagnosed as either autistic or schizophrenic, and subjects exhibited self-stimulation responses that frequently interfered with task performance.

Setting

The study was conducted in a class for emotionally handicapped students in the McDougal Center, a psychoeducational day school located in Tupelo, Mississippi. The classroom teacher was certified at the Master's level in emotionally handicapped under the certification standards for the State of Mississippi.

Measurement

The dependent variable in this study was accuracy on a color coded sorting task using plastic tokens. Permanent product recording (Hersen & Barlow, 1976) was used to collect the data. Interobserver reliability data were collected throughout the study, with reliability computed using the agreements divided by agreements plus disagreements procedure (Hersen & Barlow).

Independent Variable

The independent variable used in the study was background music. For purposes of this study, *background music* was defined as instrumental music without a strong rhythmic beat played at a volume level of 40 decibels. Specifically, George Winston's "December" was the musical selection used throughout the study.

Design and Analysis

An ABAB design was used, with data analysis consisting of graphic analysis (Hersen & Barlow) and nonparametric statistical techniques (Schwarzmueller, 1974). The statistic used was the Walsh Test (Siegel, 1956). In addition, the effect of the independent variable was evaluated using a criterion referenced procedure (Rosenfield & Houtz, 1976) to determine if a clinically significant effect was present. The criterion set was a 40% improvement in performance; this criterion was based on teacher judgment of a useful level of improvement in performance.

Procedures

Baseline one. During this phase, the subjects were provided with the color coded sorting task and given verbal instructions to begin the task. Each subject was provided with a container of assorted chips in four colors. Subjects were provided with a quantity of chips, based on previous experience, well in excess of what they could be expected to sort in a 5-minute session. A possible improvement in performance was taken into account in determining the quantity given to each subject. The actual number of chips provided varied for each subject but ranged between 50 and 100 chips. In addition to the container of

assorted chips, each subject was provided four color coded containers into which the chips were to be sorted by color.

All of the subjects had previous experience with this task. A task on which the subjects were already trained was used to control for learning since the goal of the experiment was not to teach a new task but to assess the effect of the independent variable on the accuracy with which the task was performed. The reasoning was that task accuracy would improve if music reduced off-task responses by improving the focus of attention.

Each subject sat alone at a table and was screened from other subjects by moveable partitions. The teacher monitored the children's activity but provided no assistance, encouragement, or reinforcement. Each task session was 5 minutes in length with two sessions per day, one in the morning and one in the afternoon. During the Baseline One session, no music was played.

Intervention one. In this phase, the independent variable, instrumental music without a strong rhythmic beat played at a volume of 40 dB, was introduced. The speakers for the phonograph were placed behind the subjects so that the partitions would not interfere with audition. The speakers were placed approximately 6 feet behind the subjects and were as equally spaced as possible between subjects. All other conditions were the same as in Baseline One.

Baseline two. This was a return to the same conditions used in Baseline One.

Intervention two. This was a return to the same conditions used in Intervention One.

Results

The graphic analysis is presented in Figure 1. A clear effect for all subjects is evident from the discontinuity between baseline and intervention phases.

The statistical analysis tested for a difference between the mean performance for each subject in the two baseline phases, and in the mean performance level for each subject in the two intervention phases. The Walsh test indicated a change between baseline and intervention phases at the $p < .062$ level (Table 1). While this probability value does not meet the traditional criterion of .05 for significance, it should be noted that this was

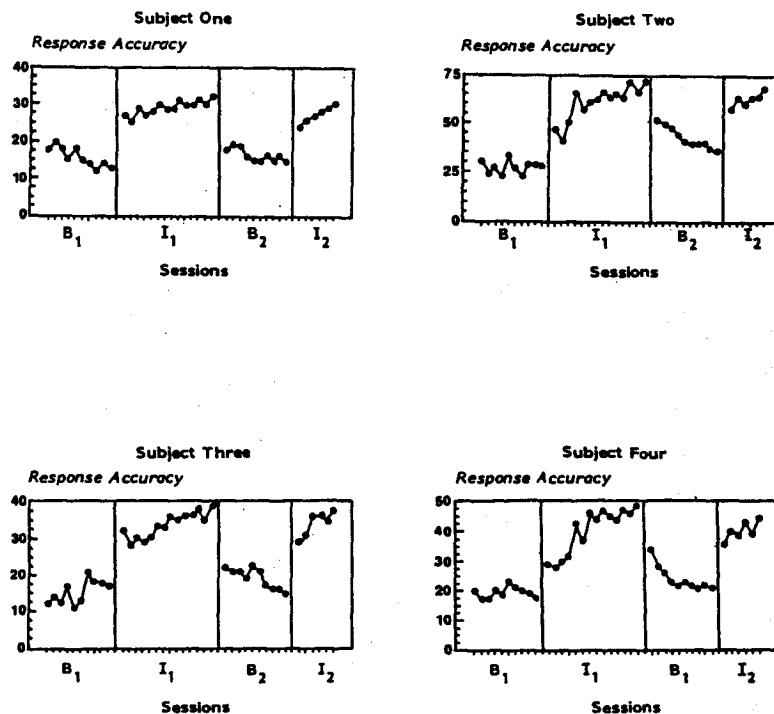


FIGURE 1.

The frequency of correct sorting responses for each subject in each phase.

the lowest probability value that could be obtained with only four subjects.

Finally, the 40% improvement criterion for clinical significance was applied to the data. All subjects met performance criterion; in fact, all subjects obtained 60% or greater improvement.

Discussion

The hypothesis tested in this study was that music would reduce off-task responses that interfere with task performance, thereby increasing task accuracy in psychotic children. The results clearly support this hypothesis as well as earlier research by Ross (1971) and Sternlight et al. (1967), which indicated that music facilitates task performance. Results also support Fitz-

TABLE 1
Walsh Test: Mean Frequency of Correctly Sorted Chips

Subject	Baseline Phases	Intervention Phases	Mean Difference	Sign
1	15.85	28.24	12.39	+
2	35.05	59.52	24.47	+
3	17.10	33.75	16.65	+
4	21.80	40.26	18.46	+

patrick's (1959) conclusion that music facilitates performance on tasks requiring manual dexterity.

This study cannot explain why music had a facilitative effect on the subjects. One possible explanation is that music affected the focus of attention by masking extraneous auditory stimuli (Richman, 1976). In this subject population, extraneous auditory stimuli may serve as distractor stimuli, prompting off-task responses that interfere with task accuracy. If the music masked such stimuli, the ability of these stimuli to prompt off-task responses would be reduced. This explanation would also be consistent with Berland's (1970) conclusion that music increases concentration on a performance task, since concentration could be defined as a relatively low level of off-task responses.

The generalizability of the findings in this study is limited by the small number of subjects. However, since many psychotic children have been shown to be responsive to music (Mahlberg, 1973; Pronovost et al., 1966; Rimland, 1964; Velter, 1970; Wing, 1966), similar results would likely be obtained from other psychotic children. Systematic replication of this study would be required to establish wide generalizability.

In conclusion, the results of this study tentatively support background music as a useful adjunct to instruction for psychotic children. If the effect of music is to reduce off-task responses to extraneous stimuli by masking them, music could prove useful not only for increasing performance accuracy on tasks already taught but also for reducing the time required initially to teach a new task.

Two future lines of investigation are suggested by this study. First, the experimental effect obtained should be investigated under conditions of initial instruction on a new task. Second, a further test of the masking hypothesis could be undertaken by

using nonmusical sound for auditory masking or by using a soundproof room from which extraneous sound can be eliminated. A similar demonstrated effect in this case would support the auditory masking hypothesis. In contrast, failure to achieve similar results would suggest the effect of the music cannot be explained by masking alone. In the latter case, further investigations would be indicated to determine why music positively affects performance in psychotic children.

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