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Brief Report

Measuring Musical Abilities of Autistic Children[1]

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Three normal children with reported musical ability and three autistic children were tested for the ability to imitate individual tones and series of tones delivered by voice, piano, and synthesizer. Accuracy of imitation was judged by two independent observers on the basis of pitch, rhythm, and duration. The autistic children overall performed as well as or better than the age-matched normal children. These results are discussed and their implications for future neurological and clinical research are considered.

INTRODUCTION

There are numerous references to the musical abilities of autistic children in the literature, but for the most part they are merely anecdotal (Cain, 1969; Sherwin, 1953; Viscott, 1970). The most dramatic reference is Rimland's (1964) assertion that musical interests and/or abilities are "almost universal" in autistic children. More recent research by Rimland (1978) has supported this assertion. In his study of "autistic savants" he found that music was the talent most often reported. However, to date there have been no empirical investigations to substantiate the anecdotal reports.

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Empirical indications of musical abilities in autistic children would provide a rationale for further research in this area, with possible clinical and neurological implications.

The purpose of this investigation was to determine objectively if autistic children would differ from normal children in one important aspect of musical ability. In order to do this, three normal children with reported musical ability and three autistic children were tested for the ability to imitate individual tones and series of tones.

METHOD

Subjects

Six children, all male, participated in this study. Their ages and some other important details are summarized in Table I. The autistic children were chosen on the basis (1) of their having been diagnosed as autistic in accordance with the APA Diagnostic and Statistical Manual-II for Psychotic Reaction of Childhood—Autistic Reaction (Spitzer, Endicott, & Robins, 1975), and (2) of anecdotal reports from parents and teachers of the presence of musical abilities. However, none of the autistic children had ever received any formal musical training. All three of these children were observed to exhibit self-stimulation and low levels of appropriate play, social behavior, and affect.

The three normal children were chosen on the basis of reported high musical skill (also summarized in Table I) and to match the ages of the autistic children.

Procedure

Due to the skill levels of the autistic subjects, it was necessary to use a behavioral response of direct imitation of a musical stimulus for assessing ability rather than the more typical paper-and-pencil response sheet. The test that was developed for this study was based largely on the work of Gordon (1965, 1974, 1976). Direct imitation of a musical stimulus was chosen not only for its relevance to the autistic subject population but because it is considered by musicians to be critical and a necessary component of musical ability (Davies, 1978; Gordon, 1976; Hindemith, 1946; Shuter, 1968).

Two tape recorders (Sony tC 158SD) were set up 15 feet apart. The test was played on one and the subject's vocal response was recorded on the

Table I. Some Important Subject Characteristics

	Age	IQ[a] Verbal	Performance	Full	Language[b]	Musical experience
Autistic children						
A1	14-3	52	79	62	2nd to 3rd grade	None
A2	14-11			80	3rd to 4th grade	None
A3	18-0	47	77	61	4th to 5th grade	None
Normal children						
N1	14-6					Built own synthesizer
N2	14-11					4 years of piano lessons
N3	18-0					Plays guitar and sings

[a]WISC-R.
[b]California Achievement Test.

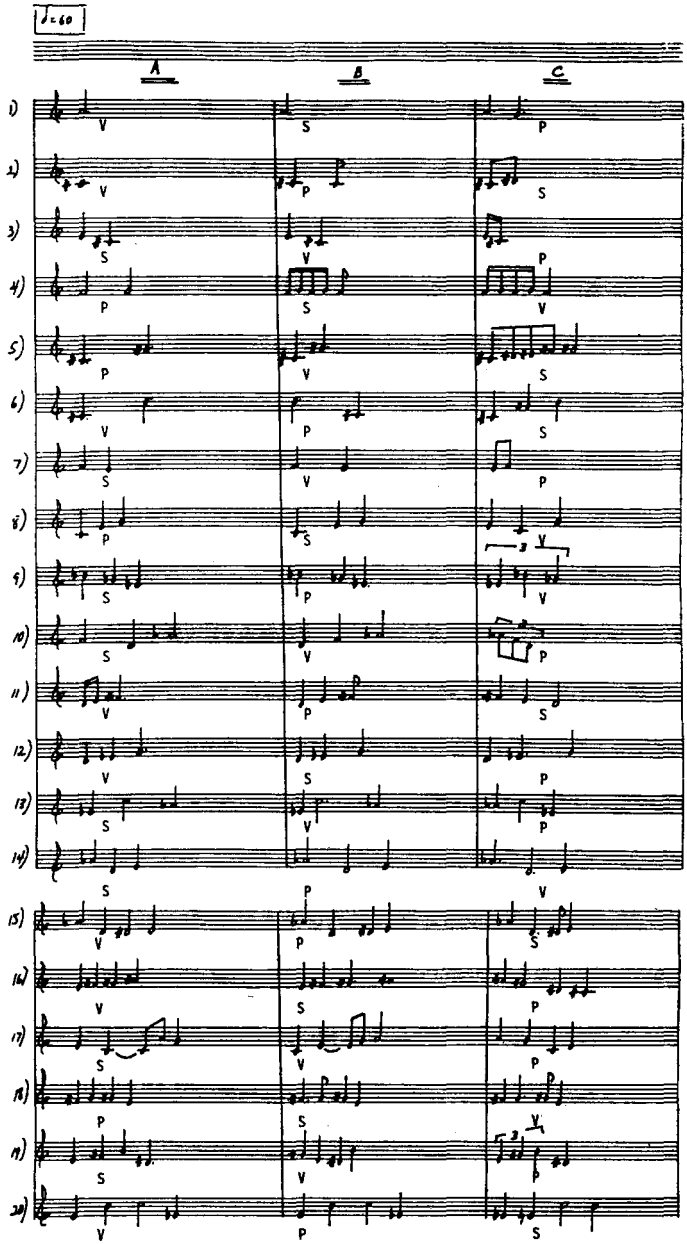
other. The test consisted of 20 levels of increasing complexity, beginning with single pitches and ending with sets of four tones in an atonal configuration. At each level an example and two variations of that example were given, variations being made in any of several areas: timbre (or tone color), duration, pitch order, or changes/additions of pitch. Each of the three examples on a level was given in a different mode: voice, singing the syllable "la"; piano; and synthesizer. The order in which modes were used at each level was random. Table II shows the examples used in this study.

Responses were rated by two independent musicians (a professor of music and a graduate student in music from the University of California, Santa Barbara) for accuracy of imitation of the pitch, rhythm, and duration of the example according to the following scale: 0 = no attempt; 1 = minimal accuracy; 2 = partial accuracy; 3 = nearly complete accuracy; 4 = complete accuracy; 5 = complete accuracy with imitation of timbre. Raters gave each response a score to the nearest ½ point. An agreement was defined as no more than a ½-point difference between ratings given by rater 1 and rater 2. The average agreement across all sessions was 80% (range: 68% to 95%).

RESULTS

The overall results from this investigation are shown in Figure 1. The ordinate shows the ratings, while the abscissa delineates the particular child. Overall, the results of the testing show that the autistic children were

Table II. Test of Musical Abilities[a]



[a]Modes of stimuli: V = voice; P = piano; S = synthesizer.

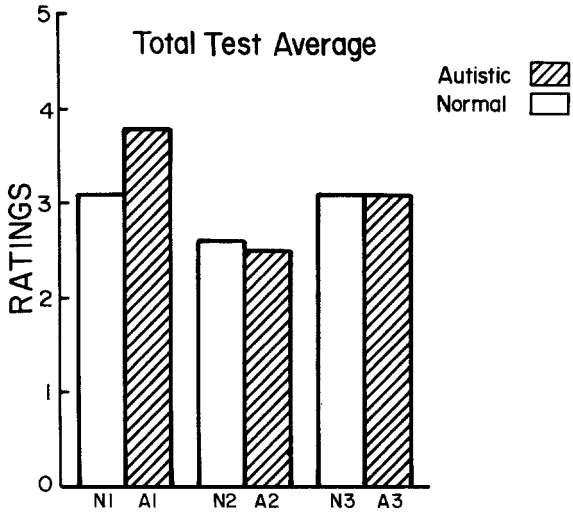


Fig. 1. Comparison of the average ratings given each child for the total test.

functioning as well as or better than their normal counterparts on this skill. The first autistic child (A1) was rated higher overall (3.9) than his age-matched normal control child, who averaged a rating of 3.1. The third autistic child (A3) performed as well as his age-matched counterpart (3.1). Although the second normal child (N2) was rated slightly higher than the second autistic child (A2), the difference was small (difference of .1).

Figure 2 gives a detailed trial-by-trial analysis of the ratings averaged across each mode of presentation. The results show that the autistic children performed as well as or better than the normal children on 62% of the trials. Specifically, Al performed as well as or better than his counterpart on 90% of the trials; A2 performed as well as or better than his counterpart on 55% of the trials; and A3 performed as well as or better than his counterpart on 45% of the trials.

DISCUSSION

The purpose of this investigation was to determine whether there might be any empirical basis to the frequent anecdotal reports of autistic children's musical abilities. The results demonstrated that the autistic children in this study tended to *perform as well as or better* than a group of age-matched normal children who had considerable musical experience.

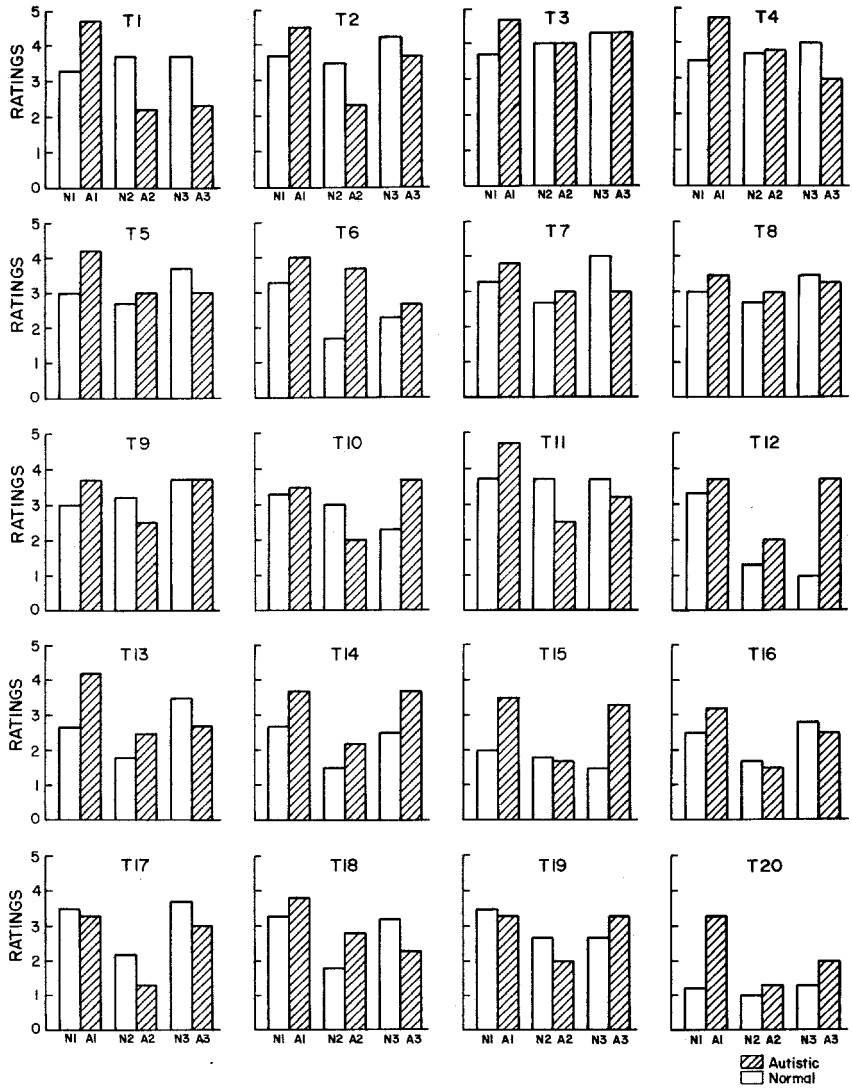


Fig. 2. Trial-by-trial comparisons of the average ratings (across voice, synthesizer, and piano) given each child on the Test of Musical Abilities.

These data suggest several avenues of research that might serve to increase our understanding of this phenomenon and/or of autism. For example, the data from this investigation, together with those of other studies (e.g., Baker, Cantwell, Rutter, & Bartak, 1976; Blackstock, 1978; Bogen, 1969; Kimura, 1973; Springer, 1977; Tanguay, 1976) suggest that hemispheric specializations in autistic children should be examined more extensively.

It is also possible that the musical ability in this study may have reflected a sophisticated form of musical echolalia. In any case, it now seems particularly important to examine the scope, incidence, and profundity of these abilities by obtaining data from more extensive musical testing and from a larger population of autistic children.

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