Effect of Long-Term Interactive Music Therapy on Behavior Profile and Musical Skills in Young Adults with Severe Autism

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ABSTRACT

Background: Data on the potential behavioral effects of music therapy in autism are scarce.

Objective: The aim of this study was to investigate whether a musical training program based on interactive music therapy sessions could enhance the behavioral profile and the musical skills of young adults affected by severe autism.

Methodology: Young adults (N = 8) with severe (Childhood Autism Rating Scale > 30) autism took part in a total of 52 weekly active music therapy sessions lasting 60 minutes. Each session consisted of a wide range of different musical activities including singing, piano playing, and drumming. Clinical rating scales included the Clinical Global Impression (CGI) scale and the Brief Psychiatric Rating Scale (BPRS). Musical skills—including singing a short or long melody, playing the C scale on a keyboard, music absorption, rhythm reproduction, and execution of complex rhythmic patterns—were rated on a 5-point Likert-type scale ranging from “completely/entirely absent” to “completely/entirely present.”

Results: At the end of the 52-week training period, significant improvements were found on both the CGI and BPRS scales. Similarly, the patients’ musical skills significantly ameliorated as compared to baseline ratings.

Conclusions: Our pilot data seem to suggest that active music therapy sessions could be of aid in improving autistic symptoms, as well as personal musical skills in young adults with severe autism.

INTRODUCTION

Music therapy is an arts-based tool that is increasingly being applied in the field of a number of psychiatric conditions, including rehabilitation strategies for patients with severe neurodevelopmental disorders.1–4 Accordingly, analyses of published data have provided initial evidence that structured music therapy interventions could exert beneficial short-term effects in individuals with autistic spectrum disorder (ASD).1,2

ASD is a life-long disabling condition characterized by severe impairments in social functioning and reciprocity, deficits in speech and language, and unusual behavioral manifestations such as habitual repetitive movements and great distress from environmental changes.1 Associated comorbidities in some patients may include, but are not limited to, mental retardation, seizure disorders, chronic gastrointestinal disorders, and hyperactivity.

Given the presence of severe deficits in social behavior and social communication, improvement of social functioning in ASD individuals is of paramount importance. In this regard, significant improvements in the fields of communicative behavior and emotional responsiveness by means of music interventions have been repeatedly reported by sev-
eral independent investigators.\textsuperscript{1–3} Music has an intrinsic communication potential that has stimulated clinical research aiming to test its efficacy in ameliorating communicative skills and social interactions,\textsuperscript{5} which are profoundly and characteristically impaired in autism.\textsuperscript{6}

Although initial results have been promising, it should be acknowledged that so far only studies with small sample sizes have been performed, thus limiting the generalizability of such findings in clinical practice.\textsuperscript{1} More importantly, reports published to date in the field have usually exploited brief music therapy interventions—typically daily sessions over 1 week—without focusing on the possible behavioral and social effects of long-term therapeutic programs in ASD.\textsuperscript{1–4} Starting from these premises, in this report we aimed to examine the effects of a long-term active music therapy program on the behavioral profile in a group of young adults with severe autism recruited in a single farm community center. We also wanted to investigate the effects of active music teaching on musical skills—including singing a short or long melody, playing the C scale on a keyboard, music absorption, rhythm reproduction, and execution of complex rhythmic patterns—in our patient cohort.

### MATERIALS AND METHODS

#### Study participants

A total of 8 young adults with ASD (7 males and 1 female; mean age: 30.2 ± 5.5 years; range: 23–38 years) were enrolled in the present study. All patients with ASD were recruited from a single farm community center specifically designed for individuals with autism (Cascina Rossago, Ponte Nizza, Pavia, Italy). The diagnosis of ASD was confirmed in all participants jointly by two independent psychiatrists specializing in ASDs who made the diagnosis according to the guidelines of the Structured Clinical Interview for Axis I DSM-IV Disorders, Patient Version. All patients in the present study scored more than 30 on the Childhood Autism Rating Scale,\textsuperscript{7} the standard threshold used to distinguish autism.\textsuperscript{8} All participants did not have any previous musical training.

#### Active music therapy sessions

Patients with autism took part in a total of 52 weekly active music therapy sessions each lasting about 1 hour. Sessions were provided within a group setting. All music therapy sessions were delivered for rehabilitation purposes in a well-defined, calm environment. The musical equipment in each session consisted of a piano, electric keyboards, and drums. Musical sessions consisted of live music experiences comprising a diverse range of active musical activities aiming to facilitate social engagement, to improve behavioral problems, and to enhance creative music making. During each session, three different musical activities were consecutively performed (i.e., drumming, piano playing, and singing). Each session was conducted by two music therapists who actively engaged patients in their musical performances.

#### Clinical and musical skills ratings

Clinical and musical ratings were done three times as follows: (1) at baseline (prior to the first music session, T1); (2) at 26 weeks (after the 26th music session, T2); and (3) at the end of the 52-week training period (after the 52nd music session, T3). Clinical ratings included the Clinical Global Impressions—Severity (CGI-S) scale, the Clinical Global Impressions—Improvement (CGI-I) scale, and the Brief Psychiatric Rating Scale (BPRS). The CGI-S scale was used to assess the patient’s symptoms at baseline (T1 rating), and the Clinical Global Impressions—Improvement (CGI-I) scale was used throughout the study (T2 and T3 ratings). Severity was rated on a 7-point scale (1 = normal, 7 = most extremely ill). Improvement was also measured on a 7-point scale (1 = very much improved, 4 = no change, 7 = very much worse).\textsuperscript{9} The Brief Psychiatric Rating Scale (BPRS) consists of a 24-item semistructured interview to assess psychiatric symptoms with symptom severity on a 1–7 Likert scale.\textsuperscript{10} Key symptoms in determining severity of psychiatric conditions were mainly psychomotor agitation, aberrant behavior, and lack of interaction with peers or therapists. The CGI and BPRS scales were rated by the patients’ psychiatrist, who acted as an external rater without direct participation in the music sessions.

In addition to clinical measures, a musical skills questionnaire was completed for each participant. The following six items were considered: (1) singing a short melody; (2) singing a long melody; (3) playing the C scale on the keyboard; (4) music absorption; (5) rhythm reproduction; and (6) execution of complex rhythmic patterns. Each item was rated on a 5-point Likert-type scale from “completely/entirely absent” to “completely/entirely present.” An external rater with specific expertise in the musical field independently scored each participant at baseline, at T2 and T3.

#### Data analysis

Data analysis was performed with the use of statistical software SPSS 11.0 (SPSS Inc., Chicago, IL). Data were expressed as mean and standard deviation (SD), unless otherwise indicated. Changes of scores during music sessions training were tested by means of the Friedman’s test for multiple related variables. The primary analysis for the BPRS scores was repeated-measures analysis of variance on the change from baseline scores (T1) to the T2 and T3 scores. Post-hoc comparisons were done by using the Newman-Keuls multiple comparison test procedure. Significant levels were assumed at a two-tailed \( p < 0.05 \).
RESULTS

The study sample consisted of 7 males and 1 female with a mean age of 30.2 years (SD 5.5 years). Each participant was evaluated a total of three times. No evaluation was missed by the patients, leading to a total study completion rate of 100%.

Outcome measures were changes in the ratings on the BPRS and CGI-I scores as well as in the patients’ musical skills. Repeated measures analyses of variance were used to analyze participants’ clinical and musical scores across the three time periods. This procedure was selected to maximize power and examine trends by reducing within-subject variability.11

With regard to clinical ratings, analyses revealed a significant improvement ($F = 13, dF = 2, 21, p < 0.001$) in patients BPRS ratings from baseline (mean ± SD: 55 ± 3.5) to T2 (mean ± SD: 46 ± 4.4) and T3 (mean ± SD: 45 ± 5.2, Fig. 1). Post-hoc comparisons using the Newman-Keuls test indicated that mean scores of the BPRS scale were significantly different from baseline to T2 ($p < 0.001$) but not from T2 to T3 ($p$ ns). Concerning CGI scores, in this study 2 individuals were rated as having marked severity on the CGI-S (score = 5), 3 had severe impairment (score = 6), and 3 had extreme impairment (score = 7). The percentage of patients with a rating of much improved or minimally improved from T1 to T2 on the CGI-I was 87.5%, whereas 75% of the participants were rated minimally improved from T2 to T3.

Similarly, significant increases in music skills emerged both after the 26th week, and at the end of the 52-week music session training as compared to baseline. Table 1 shows that autistic subjects significantly improved in every dimension of musical performance from baseline to T2 and T3. Of interest, post-hoc Newman-Keuls tests showed that all music skills improved from T1 to T2 but none of them improved from T2 to T3, the only exception being the execution of complex rhythmic patterns that did not show any changes from T1 to T2, but ameliorated significantly from T2 to T3.

DISCUSSION

Previous studies have demonstrated that brief music therapy interventions for autistic children may exert beneficial effects on verbal and gestural communicative skills, although it remains unclear whether behavioral outcomes could be affected by music rehabilitation programs.1,2 Because preliminary data on the potential effectiveness of music therapy in ASD were encouraging, it seemed of interest to investigate the effects of a long-term music rehabilitation scheme in a group of young adults affected by severe autism. We thus undertook this 52-week pilot study aiming to investigate prospectively the long-term effects of regular music therapy sessions, with special focuses both on the behavioral profile and musical skills of the investigated individuals.

In this preliminary study we showed that, at the end of a 52-week training period, significant improvements were evident on both the CGI and BPRS scores. Similarly, the patients’ musical skills—including singing a short or long melody, playing the C scale on a keyboard, music absorption, rhythm reproduction, and execution of complex rhythmic patterns—were all significantly improved as compared to baseline ratings. Of interest also is the observation that

<table>
<thead>
<tr>
<th>Musical skills</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singing a short melody</td>
<td>0.6 ± 0.7</td>
<td>2.1 ± 1.1</td>
<td>2.3 ± 1.1</td>
<td>0.008</td>
</tr>
<tr>
<td>Singing a long melody</td>
<td>0.5 ± 0.5</td>
<td>1.8 ± 1.1</td>
<td>2.0 ± 1.1</td>
<td>0.011</td>
</tr>
<tr>
<td>Playing the C scale on a keyboard</td>
<td>1.0 ± 0.7</td>
<td>2.8 ± 0.3</td>
<td>2.98 ± 0.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Music absorption</td>
<td>1.3 ± 1.1</td>
<td>2.6 ± 0.5</td>
<td>2.6 ± 0.5</td>
<td>0.04</td>
</tr>
<tr>
<td>Rhythm reproduction</td>
<td>1.3 ± 1.1</td>
<td>2.5 ± 0.5</td>
<td>2.6 ± 0.5</td>
<td>0.04</td>
</tr>
<tr>
<td>Execution of complex rhythmic patterns</td>
<td>0.0 ± 0.0</td>
<td>0.0 ± 0.0</td>
<td>1.1 ± 0.9</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

$p$ values were calculated by means of repeated measures analyses of variance.
clinical and musical skills scores improved significantly from baseline to the 6-month assessment, whereas no significant improvement was evident from the 6-month point to the end of the study, the only exception being the execution of complex rhythmic patterns. This is an important point to be considered inasmuch as progressive improvement in symptomatology ceased and plateauing of response occurred during the second 6 months. The interpretation of a plateauing response trajectory to music therapy is probably valid because rater bias would likely favor progressive improvement from 6 to 12 months. If improvement does not progress beyond the first 6 months of music therapy sessions, additional interventions may be needed to augment benefits derived from music rehabilitation strategies in severe ASD.

In any case, the beneficial effects of active music on clinical variables measured in our patients with autism during the first 6 months are likely to rely on the high level of absorption and the high degree of personal interaction that active musical engagement may induce. In line with this view, our study suggests a connection between musical skills and clinical ratings.

Relative strengths of this study include the long-term evaluation of both clinical and performance parameters as well as the use of an external rater. On the other hand, extrapolation of this investigation could be prejudiced by two important limitations. First, given the small number of subjects in this pilot study, we cannot exclude that a type II error could exist. Another potential limitation is related to the absence of a parallel control group.

CONCLUSIONS

Notwithstanding its limitations, our current study provides preliminary evidence demonstrating the beneficial action of long-term active music therapy in a group of young adults with severe autism. Because music seemed to be of clinical usefulness for certain core domains of autism, a randomized controlled trial of long-term music therapy in autism is warranted.

REFERENCES


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