

# Treating Inhalant Abuse in Adolescence: A Recorded Music Expressive Arts Intervention

Ari M. Oklan and Sheila J. Henderson  
Alliant International University

Inhalant abuse is a significant public health problem that disproportionately affects adolescents. It is therefore critical to advance research on effective interventions to treat this vulnerable population. Because inhalant abuse is well known to compromise neuropsychological functioning, learning, and memory, it creates challenges for language-based psychotherapy. The purpose of this research is to study the effect of a new multimodal therapy—which we refer to as recorded music expressive arts (RMEA)—on symptom reduction and enhanced coping. Through a single case design (16-week ABA design: 3-week baseline, 10-week intervention, and 3-week postintervention), RMEA (involving song-writing, recording, and music production) was evaluated for effectiveness in psychotherapy with a 14-year-old White male, who was experiencing significant neuropsychological sequelae secondary to 3 months of inhalant abuse. It was hypothesized that the RMEA intervention would (a) ameliorate symptoms of depression as measured by the Beck Depression Inventory II and the Symptom Checklist-90-R, (b) reduce psychiatric symptoms as measured by the Symptom Checklist-90-R, and (c) increase the use of adaptive coping strategies as measured by Adolescent Coping Orientation to Problems Experienced. Visual inspection of scale score trends partially supported Hypothesis 1 and more strongly supported Hypothesis 2 and 3. The results suggest that RMEA may be promising in further research with adolescent mental health, especially with those individuals who are in treatment for inhalant abuse—an often difficult-to-treat population refractory to language-based therapeutic approaches.

**Keywords:** music, narrative therapy, counseling, inhalant abuse, substance abuse, single case design

Inhalant abuse is a significant public health problem that disproportionately affects adolescents (Garland, Howard, Vaughn, & Perron, 2011; Howard, Bowen, Garland, Perron, & Vaughn, 2011; Substance Abuse and Mental Health Services Administration, 2009). With an estimated one million adolescents in the United States aged 12 to 17 years (Substance Abuse and Mental Health Services Administration, 2010) and an average of 598,000 new initiates misusing inhalants each year (Substance Abuse and Mental Health Services Administration, 2008), inhalant abuse has emerged as the most widely misused substance among 12- and 13-year-olds, second to only marijuana as the most frequently abused drug among 8th graders (Johnston, O'Malley, Bachman & Schulenberg, 2005; Substance Abuse and Mental Health Services Administration, 2008; Wu, Pilowsky, & Schlenger, 2004). According to *Monitoring the Future*—a national survey on drug use, inhalants appear to be one of the few drugs whose prevalence has remained stable or even increased over the past decade for Americans aged 12 to 17 (Johnston et al., 2005; Johnston, O'Malley, Bachman, & Schulenberg, 2009).

## Inhalants and Adolescents

Inhalants, or volatile substances, are a heterogeneous group of breathable chemical vapors such as organic solvents, nitrates, aerosols, and gases (e.g., fuels) that all produce psychoactive effects and potentially irreparable neurological damage when misused. Because most volatile substances are lipophilic, meaning they are absorbed by lipid-rich tissue, most notably the brain's white matter, they have rapid access to the brain and are particularly damaging to the central nervous system (Bowen, 2011).

The appeal of inhalants to adolescents is likely due to a number of factors—they are widely available, easily accessible, legal to possess, and are low cost components of commonly used consumer products, such as household cleaners, aerosols, and dry erase markers. These substances also have a great abuse potential in impulsive adolescents because they have an immediate euphoric effect (Howard et al., 2011). Compared with other drugs of abuse, however, inhalants have a documented higher risk of permanent neurological damage (Lubman, Yücel, & Lawrence, 2008). The extreme neurotoxicity of volatile substances highlights that with just one misuse, inhalants can cause death or permanent neurological damage with lasting neuropsychological sequelae, from which individuals often do not recover (Dingwall & Cairney, 2011).

Misuse of inhalants in early adolescence is especially deleterious because the brain is undergoing a critical stage of maturation through a process of synaptic pruning and myelination of neurons. Consequently, misuse of inhalants in adolescence may disrupt these normal developmental processes leading to potentially permanent cognitive and neuropsychological impairments. Inhalant

Ari M. Oklan and Sheila J. Henderson, Clinical Psychology PhD Program, Alliant International University.

Correspondence concerning this article should be addressed to Sheila J. Henderson, Continuing Education, Alliant International University, 1 Beach Street, San Francisco, CA 94133. E-mail: [drsheilaj@gmail.com](mailto:drsheilaj@gmail.com)

abuse is also associated with a number of profound, potentially irreversible neuropsychological sequelae, such as suicidal ideation; psychosis; hallucinations; delusions; increased violent and aggressive behavior; impulsivity and fearlessness; elevated risk of mood, anxiety, and personality disorders; as well as dementia and organic brain syndrome (Byrne, Kirby, Zibin, & Ensminger, 1991; Freedenthal, Vaughn, Jenson, & Howard, 2007). Because the risk of devastating neurological sequelae is magnified by the preferred use of inhalants by younger teens whose brains are still developing and thus more vulnerable to the neurotoxic effects of volatile chemicals (Lubman, Yücel, & Hall, 2007; Lubman et al., 2008; Spear, 2000), it is critical to further research effective interventions to treat adolescents suffering from cognitive impairment secondary to inhalant abuse.

Because inhalant abuse is well known to compromise neuropsychological functioning, learning, and memory (National Institute on Drug Abuse, 2012a, 2012b; Takagi, Lubman, & Yücel, 2011; Yücel, Takagi, Walterfang, & Lubman, 2008), it creates unusual challenges for language-based psychotherapy, the primary modality common to most psychological treatments. For this and other reasons, inhalant abusing adolescents have been shown to be refractory to traditional psychotherapy as compared with adolescents abusing other drugs, or with other psychological conditions, making research of new clinical approaches critical (Sakai, Mikulich-Gilbertson, & Crowley, 2006). Therapies that are multimodal and that do not rely solely on language may theoretically be of more benefit.

### Music Therapy and Inhalant Abuse Recovery

Music therapy may be an effective approach for those who have suffered neurological sequelae subsequent to inhalant abuse, as it has been shown to be an effective treatment for other neurological disorders in which learning and memory are impaired, such as dementia, stroke, traumatic brain injury, Parkinson's, and Schizophrenia (Brotons, Koger, & Pickett-Cooper, 1997; Daveson, 2008; Dileo & Bradt, 2005; Lou, 2001; Pacchetti et al., 2000; Straube, Schulz, Geipel, Mentzel, & Miltner, 2008; Talwar et al., 2006; Tamplin, 2006; Thaut, 1999; Tomaino, 2002). Multimodal music approaches, in particular, have been found to be effective for the treatment of a number of neuropsychological disorders. For instance, in a randomized, controlled trial studying the efficacy of a self-directed music treatment, Särkämö et al. (2008) found that listening to music with lyrics led to greater cognitive recovery and enhanced mood, compared with listening to verbal material alone, in early stage poststroke patients.

The superiority of music-based therapy over the language-alone treatment was associated with music's ability to stimulate a wider distribution of bilateral neural networks (Särkämö et al., 2008). For instance, music has been found to decrease stress and improve learning by not only modulating the release of corticosteroids, but by also regulating the production of neurotropic factors in the hypothalamus, and stimulating the production of chemical messengers such as neurotransmitters, hormones, proteins (such as antibodies), and cytokines that are critical in galvanizing biological responses to stress (Angelucci, Ricci, Padua, Sabino, & Tonali, 2007). Cytokines, in fact, are cell-signaling proteins critical to intercellular communication and maintaining immune function and growth (Gangrade, 2012). Furthermore, it has been suggested that

music facilitates neurogenesis, or the regeneration and repair of cerebral neurons, as well as cerebral plasticity (Fukui & Toyoshima, 2008). Music's potential ability to stimulate the hippocampus, thought by some to be the brain's neuronal regeneration center, may be critical in its capacity to facilitate this healing process especially for those recovering from the neurotoxic effects of volatile substances.

Music therapy may also be an effective treatment for inhalant abuse because music simultaneously accesses a wide range of neuronal networks, for instance, activating brain systems associated with emotional processing (limbic system), reward and motivation, learning, memory, and language (Boso, Politi, Barale, & Emanuele, 2006; Limb, 2006). The ability of music to simultaneously activate bihemispheric neural networks in both subcortical and cortical regions (Altenmüller, 2003; Peretz & Zatorre, 2005) highlights music's unique capacity to not only access deep emotional and personal material, but also integrate nonverbal information with higher order cognitive processes, such as learning and language.

### Recorded Music Expressive Arts

Despite the above rationale for incorporating music therapy into clinical psychology work with adolescents, few studies have explored using new music technology as a therapeutic modality. In addition to potential neurological advantages, a technologically current, recorded music-based approach may also be more useful than a solely language-based therapy for purposes of engaging adolescents, who already spend considerable time listening to music and using new, inexpensive technology to listen to, record, and produce music. Adolescent inhalant abusers typically demonstrate low motivation to seek treatment and a high attrition rate (Mason, 1979; National Institute on Drug Abuse, 1992). It has also been posited that an activity-based therapy is needed to maintain this group's interest in treatment (Mason, 1979; Mason & Collison, 1995; National Institute on Drug Abuse, 1992). Therefore, recorded music expressive arts (RMEA) may be particularly relevant and appealing to contemporary adolescents and facilitate active participation in the therapeutic process.

The RMEA intervention is an innovative psychotherapeutic approach, which involves a songwriting and production process that integrates fundamental musical elements such as rhythm, harmony and chord progression, tempo, and beats per minute. RMEA also involves the therapist and client working collaboratively to create a personally meaningful song-narrative as the primary treatment modality. In order for RMEA to be accessible to adolescent clients who may enjoy music but may not have a music production background, the intervention relies heavily on the clinicians' musical ability. It is ideal if the clinician is able to work with the fundamental musical elements mentioned above as well as to utilize music-making technology. Digital hand-held music devices (Nagler, 2011), laptops operating portable applications or "apps" (Magee, 2011), or computer-based software programs with recording capabilities are examples of useful technology to facilitate RMEA.

The RMEA process unfolds as follows: (a) a favorite song of the client is chosen to serve as a creative template for personally meaningful new words and music, (b) the client writes new lyrics and reworks the music of the chosen song with the assistance of

the therapist, using an innovative, portable music recording studio, and (c) the song is collaboratively recorded, mixed, produced, and encoded onto CD—a recording can then be revisited in the future and shared with others. The RMEA design overcomes three pervasive limitations common to most music-based expressive therapies, namely, (a) lack of accessibility, (b) passive participation (as opposed to active participation), and (c) transience of experience. Accessibility is improved in part by the RMEA's incorporation of the client's favorite song.

The present research question is: Can the RMEA intervention be effective in treating depression, psychiatric symptoms, and facilitating coping in an adolescent suffering from the effects of inhalant abuse? To our knowledge, no study has researched the use of music technology in psychotherapy with adolescent inhalant abusers, as is proposed in the RMEA intervention. This single case study was designed to test three primary hypotheses: The RMEA will (a) ameliorate symptoms of depression as measured by the Beck Depression Inventory II (BDI-II) and the Symptom Checklist-90-R (SCL-90-R), (b) reduce psychiatric symptoms as measured by the SCL-90-R, and (c) increase the use of adaptive coping strategies as measured by the Adolescent Coping Orientation to Problems Experienced (A-COPE). Because few studies have explored using new music technology as a therapeutic modality, this study addresses a gap in the literature.

## Method

Heppner, Wampold, and Kivlighan (2008) discussed single case design research as a viable and cost-effective method for evaluating therapy interventions at the preliminary stages of development and noted that single case design is underutilized as a research method in psychology. Single case designs are especially well suited for preliminary examination of counseling interventions where changes in client behavior can be evaluated through qualitative analysis of client session feedback and therapist case notes as well as graphical analysis of assessment scores (Engel & Schutt, 2009). Though generalizability is a drawback to single case designs, meaningful changes in client progress may then justify the resource investment involved in larger follow-up studies and inform choices in determining more complex research designs (Gallo, Comer, & Barlow, 2013).

## Participant

The participant for this study was a 14-year-old White male who had been experiencing significant depression, psychosis, and neuropsychological sequelae, resulting from 3 months of daily inhalant abuse. During the study, the participant (who described his family as middle-class, Christian, and religious) resided at home with his parents and attended church regularly. Having been diagnosed with inhalant-induced mood and psychotic disorders, the participant had been receiving outpatient psychological treatment in an independent practice setting (involving weekly outpatient psychiatric treatment and medication management) for 6 months prior to the study and had ceased inhalant abuse at the outset of treatment. During that time, the participant was concurrently receiving counseling with the principal author. However, outpatient psychotherapy terminated prior to the commencement of the RMEA intervention study. The participant also attended twice

weekly meetings with Narcotics Anonymous, which he continued during this study. With regard to the study and the RMEA intervention, music had been part of the participant's life. He had prior experience playing music and also had taken piano and drum lessons. He was also familiar with writing lyrics, an activity in which he regularly engaged prior to his inhalant abuse.

## Measures

**Beck Depression Inventory II.** The BDI-II is a well-established, 21-item self-report scale, with a Likert-type response format, with high internal consistency ( $\alpha = .92$ ; Beck, Steer, & Brown, 1996) and appropriate for individuals between 13 and 82 years old.

**The Symptom Checklist-90-R.** The SCL-90-R ( $M = 50$ ,  $SD = 10$ ) is a 90-item self-report scale, with a Likert response format, designed to evaluate a broad range of psychological issues, with moderate to high internal consistency ( $.76 < \alpha < .92$ ; Derogatis, 1994, 2000) and appropriate for individuals 13+ years old.

**Adolescent Coping Orientation to Problems Experienced.** The A-COPE is a 54-item self-report scale, with a Likert response format, appropriate for 13+ year old adolescents. The 12 subscales have low to moderate internal consistency ( $.49 < \alpha < .75 = .92$ ; Patterson & McCubbin, 1987).

**RMEA Post Intervention Questionnaire.** The principal author designed the post intervention questionnaire to garner participant feedback regarding his process and experience of the RMEA intervention. It included Likert response items (e.g., "RMEA helped me feel better about myself") as well as open-ended questions (e.g., "If you felt the RMEA intervention benefitted you in any way, please describe how it helped you, and what part of it specifically helped you"). This questionnaire also facilitated an open-ended discussion during the last three closing sessions.

## Procedure

After institutional review board approval, the participant and his parents gave written consent to participate in the study including publication of details of the outcome. The adolescent received 16 weekly sessions, each 75 min in length, which took place over 5 months (3 preintervention, 10 intervention, and 3 postintervention sessions). The participant completed the BDI-II, SCL-90-R, and A-COPE battery before the first preintervention session, and after the 10th intervention session. The participant also completed the RMEA Post Intervention Questionnaire after the 10th session. Additionally, the participant completed the BDI-II weekly, after each preintervention and intervention session.

The preintervention sessions were spent talking with the participant about his circumstances, concerns, and what to expect from the RMEA intervention. During the intervention phase of the treatment, the principal author collaborated with the participant to write lyrics, coproduce, and record a song. The first session focused on picking a favorite song to use as a template. The chosen song was "Not Afraid" by Eminem. The participant was given a notebook to begin writing song lyrics, poetry, or important phrases that could be incorporated into his song. The participant began coproducing by suggesting any genre, instrumentation, or sounds that interested him. The first author collaborated with the partici-

pant to (a) add bass, keyboard, and strings to his song using computer software and a MIDI keyboard; (b) audio record him playing drums, rapping, and singing over his song; (c) produce the song, considering sound effects, song structure, and editing of instrument and vocal performances; and (d) “mix” the song to solidify its sound to a final form. Throughout the intervention phase, the first author also assisted the participant in writing meaningful lyrics. This therapeutic process included discussing and analyzing the lyrics he produced; exploring his use of metaphor, double entendre, and underlying meaning; and contemplating lyric writing as a way to express to others the narrative of his difficult life experiences. At the 10th session, the song was presented to the participant in CD form. The first author and participant listened to the song together and reflected on the finished product and entitled the song, *Pull Through*. In the three closing sessions, we processed the participant’s intervention experience, his view on strengths and weaknesses, and brainstormed possibilities for improvement of the intervention.

## Results

Visual inspection of trends in graphs of the participant’s BDI-II, SCL-90-R, and A-COPE scores partially supported Hypothesis 1, and indicated stronger support for Hypotheses 2 and 3. The participant’s responses on the RMEA Questionnaire supported all three hypotheses.

The first hypothesis (*The RMEA intervention will ameliorate symptoms of depression as measured by the BDI-II and SCL-90-R*) was only partially supported by the prepost intervention change in SCL-90-R depression subscale scores (see Figure 1, DEP values) and not supported by the change in BDI-II scores (see Figure 2). Clinically significant changes in self-report mental health inventories can be identified when scores change by at least 1 standard deviation of the mean (Becker, 1999). Normal ranges for SCL-90-R scores are between 40 and 60 (Holi, 2003). The participants’ scores on the SCL-90-R depression scale were complex in that the prepost intervention score comparison revealed a

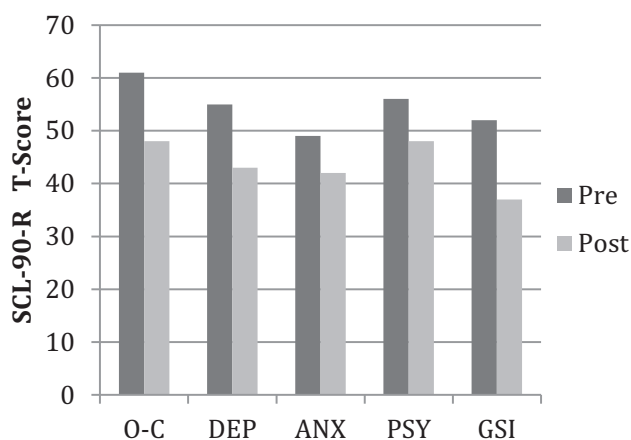


Figure 1. Pre- and postintervention client depression scores as measured by the SCL-90-R. Note: 90-item Likert response format. SCL-90-R = Symptom Checklist-90-R; O-C = obsessive-compulsive; DEP = depression; ANX = anxiety; PSY = psychoticism; GSI = General Severity Index.

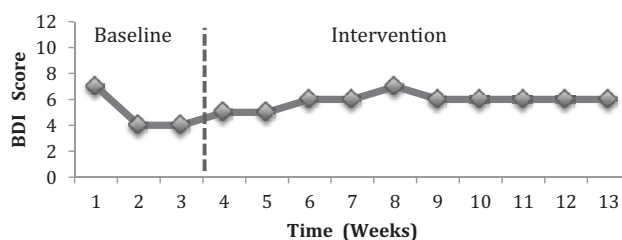


Figure 2. Pre- and postintervention client depression scores as measured by the BDI. Note: 21-item Likert-type response format. BDI score 0 to 13 denotes minimal symptoms. BDI = Beck Depression Inventory.

12-point drop (see Figure 1), exceeding the 10-point spread associated with the SCL-90-R’s standard deviation (Derogatis, 1994, 2000), yet the scores 55 (pre) to 43 (post) were still within the normal range ( $\pm 1$  standard deviation of the scale mean, 50). On the other hand, the participant’s BDI-II pre- and postintervention scores (4 and 7, respectively) revealed no appreciable change and were within the normal range for BDI scores (Smarr & Keefer, 2011; see Figure 2).

The second hypothesis (*The RMEA intervention will reduce psychiatric symptoms as measured by the SCL-90-R*) was supported through a prepost comparison of SCL-90-R T-scores (see Figure 1). The difference in prepost scores revealed reductions in obsessive-compulsive, depressive, and anxiety symptoms, psychotic symptoms, as well as the General Severity Index (GSI) of overall psychiatric symptoms. The changes in the obsessive-compulsive and GSI exceeded normal range of scores 40 to 60 (Holi, 2003), which is within one standard deviation of the mean 50 (Derogatis, 1994, 2000; Holi, 2003).

The third hypothesis (*The RMEA intervention will increase the use of adaptive coping strategies as measured by the A-COPE*) was supported by increases in adaptive coping strategies, including seeking spiritual support, use of positive imagery, and self-reliance, and major decreases in the use of physical diversion and humor as defensive coping strategies. See Figure 3.

## Discussion

The research question of this study was—*Can the RMEA intervention be effective in treating depression, psychiatric symptoms, and facilitating coping in an adolescent suffering from the effects of inhalant abuse?* In the case of this particular client, who had been suffering with depression, neuropsychological sequelae, and other psychiatric symptoms after 3 months of inhalant abuse, the results of this single case design suggest the potential of further research on the clinical utility of the RMEA intervention in treating the after effects of inhalant abuse. For this client, the gains in psychological functioning appeared to be related to the RMEA intervention’s ability to engage the participant in a process that he found meaningful and maintained his motivation for engaging and persisting in a therapeutic process. The personal impact of the RMEA intervention is perhaps reflected in this client’s lyrics: “Living life on the edge, and death in my lungs/Till I put my story to the beat of the drums,” and “So say what you say like you bein’ recorded/Handcuff your hands to the things that’s important.”

Responses on the RMEA Questionnaire also supported speculation that intervention was effective in engendering a sense of



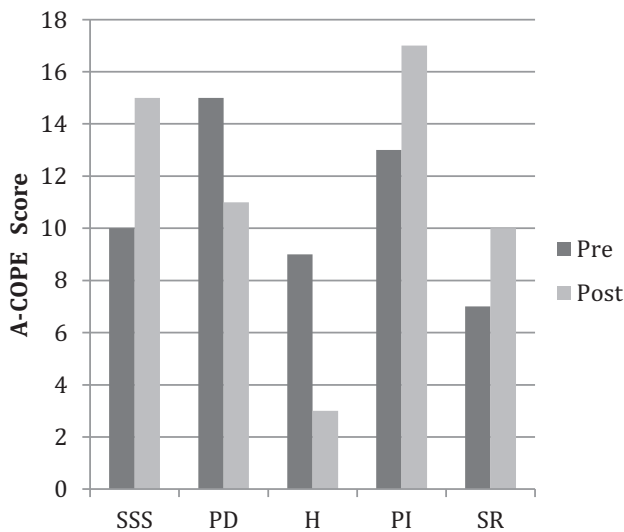


Figure 3. Pre- and postintervention client coping scores as measured by A-COPE. Note: 54-item Likert-type response format. A-COPE = Adolescent Coping Orientation to Problems Experienced; SSS = seeking spiritual support; PD = physical diversion; H = humor; PI = positive imagery; SR = self-reliance.

optimism. For instance, the participant wrote at different times that, “The RMEA gave me something to look forward to,” “It was exciting, fun, and gave me encouragement,” and “I felt like I was going somewhere and got support . . . It felt like, ‘I’m still in the race.’”

One might surmise that the RMEA process may have also been particularly effective in increasing self-esteem, as described by the participant on the RMEA Questionnaire, by facilitating the externalization of problems. This fundamental technique of narrative therapy encourages individuals to objectify or personify problems and talk about them as external things to facilitate the disentanglement of problems from personal narratives (Hull & Mather, 2006). It may be that RMEA’s use of lyric writing and analysis promotes a similar externalization process, in which addiction can be confronted at a safe distance, as an objectified or personified problem, within the context of a familiar song.

Former studies have shown high correlations between the BDI-II and the SCL-90-R subscale measures of depression (Moffett & Radenhausen, 1990; Prinz et al., 2013). In this study, the participant scored within a normal range on both scales, yet there was a discrepancy in the prepost change in scores between the BDI-II and the SCL-90-R Depression subscale. Given the previous literature, this difference in client scores is likely to be idiosyncratic to the study participant in terms of his interpretation of the questions and response formats.

Findings on the A-COPE indicate that the RMEA intervention has potential to enhance adaptive coping behaviors. The increase on the Self Reliance subscale of the ACOPE was corroborated by the participant’s responses on the RMEA Questionnaire. In particular, the RMEA intervention appeared to empower the participant by providing him the opportunity to reauthor his personal narrative from a “permanently damaged loner stoner” to “someone who has struggled, but gotten through it,” and “feel more in

control.” The RMEA seemed to facilitate a sense of competence: “It made me feel like I had something to offer the world given all I’ve been through . . . and it made me feel like the inhalant abuse didn’t kill my thing for music and I could use my experience to help others.” This client elaborated this latter sentiment in his lyric, “For those in pain, I understand,” and in his statement in the chorus, “Even in your darkest night, you can create the light/Till you win the fight, try with all your might/Trust me, I used to be you/Believe me you’ll pull through.”

The potential of RMEA intervention in therapy is that it provides a structure for an adolescent to author a coherent narrative. In this way, an adolescent can integrate both negative and positive experiences, as well as integrate the premorbid healthy but lost self-concept of the past with a postmorbid and damaged sense of self in the present (Laudet, 2007). For instance, in response to the item on the RMEA Questionnaire (“If you felt the RMEA intervention benefitted you in any way, please describe how it helped you, and what part of it specifically helped you.”), the participant described a process of regaining a lost sense of self, stating that, “RMEA showed me that my inhalant abuse didn’t kill my thing for music. The whole thing helped me remember my roots, my ability to indulge in music and write lyrics, which I wasn’t sure I could do anymore.” Interestingly, the participant’s song also provided a coherent account of the therapeutic process. In his verses, the client was able to express and interpret his difficult experiences, sometimes in metaphor, then plainly express to others what he has been through, and finally acknowledge the death experience or loss of self precipitated by inhalant abuse, the struggle and suffering it caused, and his transformation through the process.

In comparison with talk therapy, the participant noted that the RMEA helped him feel like he could actively process emotions through experience, rather than just talk about them (“Talk therapy is talking about emotions; RMEA is working with them”). The participant also expressed how important it was to have a finished product that he could share with his community. He reported that this allowed him to “tell everyone what happened to me in a way that I felt proud of . . . and to come out of all that mess with something I made, a finished product, and I actually played the music and recorded the lyrics, it really paid off and made me feel confident and reaccepted.”

Särkämö et al. (2008) reported findings that listening to music with lyrics led to greater cognitive recovery and enhanced mood, compared with listening to verbal material alone, in early stage poststroke patients. In this test of the RMEA, one might speculate the results may be reflecting music’s ability to activate diverse brain systems, including neural networks associated with emotional processing (limbic system), reward and motivation, learning, memory, and language (as articulated by Boso et al., 2006, and Limb, 2006). If the RMEA was able to facilitate integrated emotional and cognitive processing, RMEA may have tapped into unprocessed feelings available for verbal expression for this adolescent.

To conclude, Heppner et al. (2008) have discussed the importance of single case design in research and its low representation in published literature. Our study of the effect of a new multimodal therapy—RMEA—on symptom reduction and enhanced coping supports the view that a single case design can be a powerful way to evaluate the potential effectiveness of innovative treatments in a cost-effective manner in the earliest stages of development.

However, the results of this study must be understood in the context of the limitations of a single case design. Because single case studies are exploratory, results should be interpreted cautiously. Mono-method bias was also a major limitation of this study, as cognitive impairment and challenges likely impacted the participant's ability to self-report accurately. A review of clinical case notes from the multiple mental health professionals working with this participant concurrently revealed significant discrepancies in how the participant might have discussed depressive, suicidal, and psychotic symptoms verbally during sessions versus what he reported on the SCL-90 and the BDI-II. Because the mental health professionals did not administer the SCL-90 and the BDI-II during outpatient treatment, there was no way to relate their case notes to the measures used in the study. Additionally, because the participant was initially seen in therapy by the principal investigator before engaging in this study, it is possible that the participant may have developed an allegiance to the principal investigator, or that social desirability, or experimenter expectancies, impacted findings. Moreover, results may not be generalizable given that the participant had lyric writing and music experience prior to abusing inhalants and engaging in this study, which may be somewhat atypical for the population of inhalant-abusing adolescents. Also an additional limitation of the study is that the assessments chosen to measure the client's progress were not designed to evaluate changes in cognitive impairment. Because inhalant abuse has a negative cognitive impact, future researchers might consider adding a cognitive assessment to the set of dependent variables. Lastly, the preintervention assessments were administered prior to the preintervention sessions, rather than at the start of the intervention sessions. This may also have affected the SCL-90 scores in some unknown manner.

In summary, numerous clinical uses of music are stimulating a growing body of research. However, the neurological impact of music as it relates to clinical interventions is a less researched topic that warrants more and continued investigation. Because listening to music is often valued activity among adolescents, the RMEA appeared appropriated for this population and was evaluated on a preliminary basis within a single case design. It is hoped that this article will catalyze interest in RMEA research, as a technique in counseling for adolescents, especially those recovering from substance abuse.

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