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Abstract

This article describes a pilot test of a community engaged, culturally relevant, arts-based intervention. The purpose was to increase children's personal protective buffering resources. Protective buffering resources help children cope with stressful stimuli, reduce activation of their systemic stress response, mitigate allostatic load, and promote optimal health. The "Learning a Healthy Rhythm" intervention included a stress management component and an ongoing Afro-Latino percussion program for 18 children ages 9–11. The stress management component included educational content about stress, self-assessment of stress symptoms, and stress management techniques. A mixed-method intervention evaluation design was used. Qualitative data, quantitative data, and biometrics including hair cortisol were collected. Six intervention parameters were evaluated: effectiveness, fidelity, feasibility, acceptability, necessity, and safety. Positive results were obtained for all parameters. Reduction in physiological and subjective measures of stress was evident. This stress management intervention was well-received and supported by participants.

Keywords

anxiety, stress, psychological, community, Hispanic or Latino, pediatrics, community engagement, arts-based, allostatic load, culture, child

Introduction

The experience of stress during childhood has been recognized as a profoundly important influence on lifelong human health (Shern et al., 2014). The ill effects of stress begin in childhood, either through exposure to unmanageable stress, lack of skills and strategies to cope with stress, or both. Thus, childhood represents a window of opportunity to provide interventions to help children develop resources that they can use to manage stress.

Researchers seeking to develop interventions for children that might prevent, or at least lessen, the adverse effects of stress on health and well-being are met with challenges. Populations of children can be difficult to reach, especially in groups, making it difficult to scale the interventions to large audiences and to make them sustainable. Community-based, youth-serving organizations do mount interventions for children often with good outcomes, however these types of programs are not routinely studied, replicated, or disseminated in journals, thus limiting their uptake and widespread evaluation.

The term community-engaged research is an umbrella term for participatory-oriented research methodologies (Ortiz et al., 2020). This article presents an example of a community engaged, culturally relevant, arts-based intervention to help children increase buffering resources to improve their management of stress. Arts-based interventions are arts activities that intentionally nurture emotional, social, and academic development to promote positive change in participants and enhance protective buffering resources (Development Services Group, Inc., 2016; Forrest-Bank et al., 2016; Wright et al., 2014).

Stress in Childhood and Allostatic Load

Stress is an inevitable and necessary part of human life. Positive stress responses are associated with acute, short-lived stressors and result in brief, transient increases in stress hormones (Center on the Developing Child, 2021). Positive stress responses are normal, essential parts of personal growth, and provide opportunities for children to develop healthy coping and problem-solving skills (Garner et al., 2021).

A prolonged activation of the stress response system in the absence of buffering resources is called a toxic stress response (Center on the Developing Child, 2021). Frequent repeated and/or prolonged cycles of activation and deactivation of the body's stress response lead to cumulative, multisystem physiological dysregulation and generation of allostatic load (McEwen, 2017). Allostatic load contributes to increased risk for chronic disease development across the lifespan, including hypertension, dyslipidemia, insulin resistance, and increased inflammatory biomarkers (Berg et al., 2017; Bucci et al., 2016; Rainisch & Upchurch, 2013). Among children, toxic stress responses in combination with genetic predispositions and acquired environmental risks lead to potentially irreversible disruption of brain architecture and other organ systems, and increased susceptibility to stress (Center on the Developing Child, 2021). Structural racism, economic disadvantage, and social marginalization worsen the cumulative negative effects of toxic stress on children's cognition, development, and health (Garner et al., 2021).

The negative effects of toxic stress responses can be mitigated by interventions designed to identify, introduce, cultivate, and/or strengthen intra- and inter-personal protective buffering resources (Center on the Developing Child, 2021; Garner et al., 2021). Use of protective buffering resources to cope with more serious and/or distressing stressors may prevent prolonged activation of the stress response and decrease the long-term adverse effects on health and well-being. Personal protective buffering resources are tools that individuals use to cope with distressing stressors. Buffering resources can be intrapersonal (e.g., strengths, capacities and adaptive skills such as faith and hope, resilience, confidence, self-efficacy, self-control, self-regulation, and flexibility) and interpersonal (e.g., supportive child–adult relationships, social connectedness to one's cultural group) (Center on the Developing Child, 2021). Specific practices to help modulate one's stress response, such as meditation or breathing exercises, are buffering resources that can be learned.

We developed the *Learning a Healthy Rhythm* (LHR) intervention by adding a stress management component to an existing community engaged, culturally relevant, arts-based music program. The purpose of LHR was to strengthen protective buffering resources among children. In this pilot study, we sought to determine if LHR was relevant to, and supported by, the population it was intended to serve. Our goal was to determine if the results supported future investment in development, testing, and evaluation of this, and similar, interventions.

Methods

Design

This pilot study used a mixed methods intervention evaluation design to evaluate six intervention parameters including effectiveness, fidelity, feasibility, acceptability, necessity, and safety (Bekhet & Nakhla, 2019; Zauszniewski et al., 2018). Specific research questions included the following: (a) Is the LHR intervention effective in improving biologic (hair cortisol) and self-reported measures of stress, and a personal buffering

resource (Pressure-Activation Stress (PAS) Scale, Ethnic Identity-Teen Conflict Scale)? (b) How was fidelity to the LHR intervention achieved, and what modifications were required? (c) What aspects of the planned LHR intervention were feasible with the available participant group? (d) How acceptable were the LHR intervention activities to the participants? (e) Were there risk factors in the participant group that supported the necessity of the LHR intervention? (f) Were there any safety concerns that emerged during the LHR intervention?

The study was approved by the university institutional review board. Parental consent and participant assent were obtained. Children received two $10 gift cards to a music store, one card each at the pre- and post-intervention data collection points.

Intervention

LHR was a music education program enhanced with a stress management component. The music program is an ongoing Afro-Latino percussion performance ensemble for children (Haglund et al., 2021). The curriculum was overtly cultural and explored the African diaspora throughout Latino countries and cultures through rhythms, songs, percussion instruments, history, and social contexts of this music. The stress management component included content about the physiology of stress, self-assessment of stress symptoms, and stress management techniques. The drumming portion included techniques to promote mindfulness within the classroom and when practiced at home. Drummers listened to the rhythms played by the leader and repeated it on their drums either together (call and repeat) or individually (pass the rhythm). These techniques required the children to pay attention to the leader and to each other's drumming to get their own rhythm and timing right. Paying attention quieted distractions to help children focus. Rhythmic hand drumming can change brain waves and cortical functioning, which quiet the mind, help to release feelings of tension, and increase feelings of openness, alertness, and relaxation (Ragg et al., 2019). Finally, drumming together promotes connection and cohesion within the group. The protective buffering resources promoted in LHR are listed in Table 1.

Table 1. Personal Buffering Resources.

Domain	Resource	Source/Support in Intervention
Intrapersonal	Confidence (self-worth & self-efficacy)	PYD, PC
	Competence	PYD, PC
	Cultural identity	PC
	Integrity (character)	PC
	Knowledge about stress	SMC
	Self-awareness of stress response	SMC
Interpersonal	Social-connection to cultural group	PC
	Supportive child–adult relationships	PYD, PC, SMC
	Supportive peer relationships	PYD, PC
	Caring (empathy for others)	PYD, PC
	Sense of belonging	PC
Stress management	Square breathing	SMC
Practices	Visualization	SMC
	Mindful percussion techniques	SMC & PC

PC: percussion curriculum; PYD: theory of positive youth development; SMC: stress management component.

The music program was grounded in the theory of positive youth development. The theory of positive youth development emphasizes strengths and developmental potential of young people and focuses on their intrinsic positive attributes (Lerner et al., 2005). Interventions based on this theory cultivate and promote competence, confidence, connection, character, and caring among participants. Positive youth development theory promotes

intentional, positive, and supportive relationships among peers, and between children and adults (Haglund et al., 2021).

The stress management component of the LHR intervention was supported by the cognitive activation theory of stress (Isaksson et al., 2015; Ursin & Eriksen, 2004). The cognitive activation theory of stress supports the premise that having strong personal buffering resources increases individuals' expectations that they can cope with stressful stimuli, which changes how the stimuli are appraised in the brain, and ultimately the level of physiologic arousal and activation of a systemic stress response.

Setting and Implementation

The music program is a year-long after school program at a preschool through 8th grade charter school in a large Midwestern city. Located on the campus of a multiservice community center, 98% of the children are of Latino heritage and 77% received free or reduced-cost lunch. Participants in LHR were a convenience sample. Children opted to enroll in this program at the beginning of the school year and continued regular participation throughout the year. To recruit children into the music program, the program was advertised by the school's music teacher directly to current music students and to parents through written communication. Interested children also invited their friends to participate.

The music program met twice per week after school for 90 minutes per session. During the study period there were 15 stress management sessions and about 50 drumming sessions. Participants were present for 85%–100% of the sessions. The stress management component was presented by two nurse researchers and drumming sessions were led by professional musicians referred to as teaching artists. The stress management component occurred in the first 10 minutes of one of the two scheduled sessions each week. Sessions began with check-in, which included an assessment of participants' levels of stress on a 1–10 scale and their symptoms of stress. Following check in, the group learned stress management techniques including square breathing and visualization meditation. Afterwards, stress levels were reassessed followed by a short conversation about the relationship between stress and health, symptoms of stress, and stress management. The session continued with group drumming. The drumming portion opened with percussion techniques to promote mindfulness and prepare the children for playing rhythms. The session continued with the program's curriculum.

Data Collection

Surveys collected demographic data, including age, gender, and self-reported ethnicity; and two surveys collected pre-intervention in October 2016 and post-intervention in May 2017 measured levels of perceived stress and ethnic identity (EI). Participants assessed their stress level on a scale of 1–10 and measured their own pulse at the start and end of the stress management component of the sessions. Qualitative data were collected during the intervention through field notes (observations written by researchers after sessions) and recorded group discussions. Group discussions during the stress management component were audio-recorded and transcribed.

Biometric data that are commonly used to measure allostatic load were collected pre- and post-intervention including height, weight, seated blood pressure (BP), waist circumference, and hair cortisol. BP and body mass index (BMI) were categorized according to expert guidelines from the American Academy of Pediatrics (Flynn et al., 2017) and the Centers for Disease Control and Prevention (2020), respectively. By comparing to norms for gender, age, and height, BP was determined to be normal (systolic BP < 90th percentile), elevated (systolic BP ≥ 90th and <95th percentile), or hypertensive (systolic BP ≥ 95th percentile or ≥130/80) (Flynn et al., 2017). BMI percentiles were calculated and categorized using the CDC's online BMI calculator for children and teens (Centers for Disease Control and Prevention, 2020) as underweight (<5th percentile), healthy weight (5th to <85th percentile), overweight (85th to <95th percentile), or obese (≥95th percentile).

Hair cortisol

Cortisol is a glucocorticoid stress hormone that is released by the hypothalamus–pituitary–adrenal axis during the physiological stress response. Measurement of hair cortisol concentration is a reliable, readily accessible, and noninvasive way to estimate chronic stress with established reference ranges for children ages 4–14 (Noppe et al., 2014). The first centimeter segment of hair proximal to the scalp approximates the last month's cortisol production (Wennig, 2000). To obtain samples, a lock of hair was cut as close to the occipital scalp as possible. Hair samples were taped to a piece of paper marking the scalp end and stored at room temperature until the time of analysis. Cortisol was extracted from the first centimeter of hair closest to the scalp (Noppe et al., 2014) and analyzed using commercially available cortisol ELISA kits (Salimetrics LLC). Duplicates showed acceptable inter- and intra-assay coefficients of variance (CV) of 7.6% and 5.4%, respectively. Hair cortisol concentrations have not been found to be significantly affected by hair color, hair washing frequency, or use of hair products, so these factors were not controlled for in the analysis (Groeneveld et al., 2013).

Perceived stress

The 11-item PAS scale was used to measure participants' perceived level of stress. The PAS includes the following two dimensions of stress: (a) pressure—the perception of feeling there are too many demands and not enough time; (b) activation—perceived physiological arousal from stress such as rushing or having difficulty relaxing. Items were scored on a 5-point scale ranging from 0 (never) to 4 (always). Scores were summed and divided by number of items for a total score of 0– 4. Higher scores indicate higher levels of stress. In one study of Swedish youth ages 11–16 years, Cronbach's alpha was 0.86 (Isaksson et al., 2015). In this study, Cronbach's alpha was 0.59.

Ethnic identity (EI)

The Ethnic Identity–Teen Conflict Survey was used to measure changes in participants' identification with, and social connectedness to, their cultural groups. Participants were asked how often they would say each of four statements on a 5-point scale ranging from 1 (never) to 4 (always). Scores were summed and divided by number of items for a total score of 1–4. Higher scores indicate greater ethnic pride and respect. The EI survey was tested with children in grades 6–8 and the internal consistency was 0.73 (Bosworth & Espelage, 2005). For this study, Cronbach's alpha was 0.89.

Data Analysis

Descriptive statistics were used to analyze demographics and baseline measures. Quantitative data were analyzed using R 3.6.1 (R Core Team, 2019). Paired-sample *t*-tests were performed to compare the participants' pre- and post-intervention survey scores, which is an appropriate statistical method for small samples. This method tests mean differences while accounting for sample size by using the student *t* distribution for hypothesis tests, which adjust the degrees of freedom for proper testing in small samples (Cohen, 2013). Effect sizes were measured with Cohen's *d* and were categorized as negligible, small, medium, and large (Cohen, 1992). A positive value for Cohen's *d* means that the score was higher at pre-intervention, while a negative Cohen's *d* means that the post-intervention measurement was the higher score.

Field notes were typed as a word document. Recordings of group discussions were transcribed and transcriptions reviewed for accuracy. Notes and transcriptions were coded. Content analysis was used to organize qualitative data into themes that reflected the intervention parameters and that captured participants' understanding of stress and stress management.

Results

Results are presented for each of the six intervention implementation parameters: effectiveness, fidelity, feasibility, acceptability, necessity, and safety.

Participants

In total, 18 children, including nine boys and nine girls in grades 4–7, participated in this pilot study. The mean age was 10.4 ± 0.85 with a range of 9–12 years. All reported some Latino heritage. All attended the school where the intervention took place.

Effectiveness

Effectiveness is a measure of whether the intervention delivered the desired outcome in the real-world setting (Zauszniewski et al., 2018). Measures of effectiveness included cortisol levels, and scores on the PAS and EI instruments. The range of normative values for hair cortisol concentration for children ages 9–12 years is 0.1–69.5 pg/mg (Noppe et al., 2014). At baseline in our study, the mean hair cortisol concentration was 17.6 ± 23.9 in the low range of normal (Table 2). The mean PAS score of 2.66 ± 0.38 was in the moderate range of the scale and the EI mean score of 4.29 ± 0.69 was in the high range of the scale. While there were no significant changes in the pre- and post-intervention scores, there was a moderate effect size (d = 0.43) for reduction in hair cortisol concentration and a small effect size (d = 0.17) for improvement in PAS scores. The mean self-reported stress level also improved, declining from 5.3 to 3.5 between the session start and the end of session recheck. This data suggests effectiveness of our intervention.

Table 2. Changes in Means from Pre- to Post-Intervention.

	Pre-Intervention		Post-Intervention			
Measure	*N*	Mean (*SD*)	*N*	Mean (*SD*)	Test Statistics	Cohen's *d* (95% CI)
PAS[a]	18	2.66 (0.38)	15	2.57 (0.56)	t(14) = 0.66, *p* = .51	0.17 (–0.57, 0.92)
EI[b]	18	4.29 (0.69)	15	4.46 (0.68)	t(14) = –0.85, *p* = .41	–0.22 (–0.97, 0.52)
Hair cortisol[c]	15	17.62 (23.88)	14	7.04 (5.00)	t(13) = 1.63, *p* = .13	0.43 (–0.35, 1.22)

[a]PAS: Pressure Activation Scale, higher score indicates higher level of stress.

[b]EI: Ethnic Identity, higher score indicates higher identification and connection to cultural group.

[c]Higher levels of cortisol production indicate more stress in previous 30 days.

Changes from pre- and post-intervention on the measure of EI were not statistically significant among this small sample with high pretest scores. However, the small effect size (d = –0.22) indicated that participants had increased feelings of positive connection to their cultural group. Participants referenced their identification with their cultural groups on the demographic forms and their engagement with cultural music in the stress management component. On the demographic form, one child wrote that her ethnicity was "loud and proud about being Mexican." Another identified as Boriquen, referring to the name of Puerto Rico before it was changed by the Spaniards. Children who listened to music as a stress management strategy said they listened to Bachata, Merengue, and Reggaeton. When talking about how to practice visualization meditation, children referenced beautiful places like Aguascalientes in Mexico that could be used in a visualization.

Fidelity

Fidelity is a researcher-centric concept that refers to an efficient delivery of the intervention according to an outlined protocol, and includes monitoring of whether all steps of the protocol are carried out (Bekhet & Nakhla, 2019; Zauszniewski et al., 2018). In this project, stress management components were added to a community-created program for youth. There was cooperation between the program's staff, teaching artists, and researchers; however the needs of the program were the priority that led to some modifications to the intervention based on emerging circumstances. For example, stress management components were cancelled in the week prior to a performance. Further, the researchers were invited into the participants' setting, the band room of their school, which meant that the children were comfortable in expecting that their choices and ideas would influence the direction of the discussion and the details of the stress management techniques. For example, one of the guided meditations included imagery of floating off through the earth into space. The children interrupted the presenter with a concern because there is no oxygen in space; therefore, they would not be able to breathe and they could not imagine how they would float off the earth. This required use of different imagery, and the youth suggested a warm beach.

Feasibility

Feasibility refers to participants' perceptions that they can do what they have been asked to do and if what they have been asked is manageable and practical (Bekhet & Nakhla, 2019; Zauszniewski et al., 2018). An essential part of this pilot study intervention was to determine if children have the ability to identify stressors and experiences of stress, and to understand techniques that could be used to manage stress.

Children in this study did demonstrate their understanding of what stress is. To define stress, they provided examples of how stress is experienced, gave examples that conveyed the bothersome aspects of stress (Table 3), and communicated things they did to manage their stress (Table 4). Participants at some points talked over each other in their excitement to share what stressed them out.

Table 3. Children's Descriptions of Stress.

Definitions of stress	I know what it is, but I can't explain it. You are overpowered and you can't focus. Someone pushing your buttons. You want to do something but you forget what you are doing.
Synonyms of stress	Annoying; anxious; obnoxious; uncontrollable
Emotions of stress	Anger; darkness; depression; sadness

Table 4. Categories and Examples of Stressors.

Category	Example
Parents' stress	Parents arguing; parents might get a divorce; parents stressed by their own issues

Punishment	Parents yelling at me; getting grounded; getting scolded by teacher; being reprimanded by teacher in front of the class; getting reprimanded for something that you did not do
School	Having to do homework; not getting homework done; forgetting to do homework; exams
Schedule	Having too much to do; having nothing to do; going to bed late

Participants demonstrated they understood the directions to assess stress level and measured their heart rate by carotid pulse, correctly placing fingers, and counting the pulse. However, some children reported unlikely heart rates indicating that they needed more practice with this skill before their self-reported heart rates could be used as data to measure efficacy of an intervention. The children took turns leading the square breathing and guided imagery meditations, demonstrating that they understood how to do these stress management techniques.

We also assessed the children's views of the feasibility of using the stress management techniques outside of the sessions. Several children reported use of mindfulness apps and breathing techniques to manage acute stress. Participants reported a barrier to using percussion-based techniques at home, namely that their parents told them that the drums were too noisy and would ask them to stop drumming.

Acceptability

Acceptability refers to the extent to which participants believe that what they have been asked to do in the intervention is reasonable and appropriate (Bekhet & Nakhla, 2019; Zauszniewski et al., 2018). Acceptability on the part of the parents and children was demonstrated by giving consent and assent to participate in this research study, including providing hair specimens and biometric measurements. To increase acceptability of participation, the researchers presented the study and answered questions at a parent orientation meeting for the drumming program. Teaching artists introduced the researchers and endorsed the study. Parents of 18 of 19 eligible children provided consent for their children to participate in data collection; all 18 children provided assent. One child fully participated in the program but did not participate in data collection. Fourteen families consented to providing a hair sample.

Acceptability was also demonstrated by children's identification of stressors in their lives, their acknowledgement of how stress could affect them negatively, and their ready participation to learn how to manage stress. They reported several things they were already doing to manage stress, including breathing exercises; using calming apps; listening to music; petting a dog; playing sports like basketball, soccer, or catch; hitting a punching bag, pillow, or the wall; sleeping; watching tv; and eating. None of the children stated that the stress management component was boring or irrelevant, and they participated with enthusiasm.

Enrolling a control group of children from the same school who were not in LHR was not accepted by school leadership. Administrative leaders of the music program and school supported the idea of a control group but the researchers' requests to school leadership for access to parents were met with nonresponse. The study proceeded without a control group.

Necessity

The biometrics of children in this study indicated high risk for future compromised health and supported the need for this intervention. In the current study, 5 of 13 children (28%) had BPs categorized as hypertensive at baseline. In a nationally representative sample of children ages 12–17 years, the prevalence of high BP among

the entire sample was 3.2 and among the subgroup of Mexican American children the prevalence was 5% (Jackson et al., 2018). In this pilot study, 8 (44%) children's BMI were categorized as obese, higher than U.S. national population rates of 19% of children ages 2–19 and 25.6% of Hispanic children (Fryar et al., 2021). Abdominal obesity is related to increased stress hormones and is an indication of allostatic load. In this study, the mean waist circumference for children with obesity was 91.4 cm (36 inches), compared to 67.5 cm (16.6 inches) among children with a healthy weight. Eight children (44%) had two or more elevated indicators of allostatic load (BP, BMI, and/or abdominal obesity).

Safety

Safety of the intervention denotes that the intervention does not cause physical or mental distress for participants (Bekhet & Nakhla, 2019). There were no reports by the participants that they perceived any aspect of the intervention as stressful or uncomfortable. Participants cheerfully and actively engaged in the educational and percussion components.

Discussion

The findings of this pilot study provide preliminary support to pursue further development and testing of this stress management intervention administered within a community-engaged arts-based program for youth. We found positive evidence for the six parameters of implementation evaluation: effectiveness, fidelity, feasibility, acceptability, necessity, and safety of this intervention. For effectiveness, while the findings of improvement from pre- to post-intervention were not statistically significant, the small to near-medium effect sizes were in the expected direction. Children in this study did experience stress and could identify everyday stressors. Through participation in this intervention, they learned to identify symptoms of stress, assess their own level of stress, and use techniques to cope with stressors.

Our intervention was added to an after-school program. After-school programs can provide safe places in combination with academic support, recreation, health promotion, and/or social and emotional learning and skills training (Forrest-Bank et al., 2016). Researchers have demonstrated feasibility of delivering arts-based interventions in after-school programs to nurture emotional, social, and academic development (Forrest-Bank et al., 2016). Elevated BP and BMI among the children in this study supported the necessity for our intervention to help them with stress management. Our findings are consistent with a recent study of 307 multiethnic children aged 7–12 years (39% European American, 35% African American, and 26% Hispanic American) where 31% had high allostatic load (determined using anthropometric measurements and biomarkers), and Hispanic American children had the highest allostatic load scores (Cedillo et al., 2019). These studies point to the need for interventions to help children manage stress, minimize toxic stress responses, and avoid risks associated with allostatic load.

Our pilot study revealed a small effect size for reduction in perceived effects of stress, which in the PAS measure combines feeling pressured and activation of physiological arousal. We found that children understood what stress is, could identify adverse effects of stress, employ strategies to manage stress, and were interested in learning more about stress management. There is evidence from other researchers that arts-based mindfulness interventions among children do improve stress management, decrease depressive symptoms, improve emotional regulation, and lessen impulsiveness (Coholic et al., 2020), and some evidence that brief intervention can be effective in reducing child stress (Mason et al., 2019).

Identification with one's culture, social connectedness to one's cultural group, and engagement with cultural practices and tradition are aspects of cultural continuity that have been identified as positive buffering resources (Center on the Developing Child, 2021). For example, in a Canadian study of Indigenous adults, experiences of racism in childhood explained 21% of the variance in allostatic load among adults with low

cultural continuity. Conversely, among Indigenous adults who had high cultural continuity, there was no association between experiences of racism in childhood and allostatic load (Currie et al., 2019). Our LHR intervention was overtly cultural. We reported a small effect size for increased ethnic pride and respect for other cultures. Participation helped youth to strengthen their personal identities and have pride in who they are.

Community engaged research studies are strength-based and aligned with the communities' priorities, resulting in relevant, contextually appropriate interventions (Carney et al., 2011). Moving research into the community makes it easier for underrepresented groups to participate and for researchers to include hard to reach groups in their work (Jacquez et al., 2013). Adding academic partners to community initiatives can increase access to knowledge, funding, and new audiences for dissemination of their programs' results. To successfully integrate research and community programs, cooperation is necessary. Researchers should not expect that they can unilaterally direct actions or schedules or maintain control regarding how interventions are delivered. The challenges of research with community partners are balanced with the mutual and direct benefits of these partnerships for the community and academic partners. In such partnerships, conventional methods of research that require strict control may not work and other methods need to be considered, such as qualitative or arts-based methods. Involving community members in study design, implementation, data analysis, and dissemination of results will improve and enhance the rigor, specificity, and relevance of research results (Patient-Centered Outcomes Research Institute, 2018).

This study had several limitations. There was no control group. Parents of children not in LHR did not have a relationship with the LHR program team, which may have contributed to the lack of success with obtaining a control group. Aspects of the study design including the small number of participants, the integration of the stress management component into the music program (which did not allow for separate evaluation of effectiveness of each component), and the limited time spent on the stress management component limit the generalizability and potential validity of our findings. Additionally, the reliability of the PAS was low; this may be because our participants were younger those in the prior studies. During the time frame of this study, the children attended almost a year of school and experienced concurrent growth and maturity, which may have contributed to their ability to better cope with stressors. Future research with a nonintervention comparison group will help to understand the effect of the components of this intervention on the biometric markers and the reported stress outcomes.

In conclusion, we pilot tested a culturally relevant, arts-based stress management intervention to increase intra- and inter-personal protective buffering resources in children. We had promising effect sizes for reduction in both cortisol and PAS scores, suggesting this could be an effective approach to mitigate the effects of toxic stress and allostatic load in children. The intervention was well received and supported by children and families in this community. Culturally relevant, arts-based interventions can strengthen buffering resources for young people by facilitating self-discovery, promoting self-esteem and positive cultural identity, nurturing supportive relationships among peers and caring adults, and helping youth to feel hopeful and competent to express themselves, engage with their communities, and promote social change (Ersing, 2009; Wright et al., 2014). Employing these approaches in future work will optimize health for youth now and protect their health into their futures.

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