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**Litchke, L.,** Willemin, T., Willemin, A., Ekins, C., & Owens, D. (January 2021, in press). Efficacy of therapeutic recreation based drumtastic and kid yoga rocks in early childhood Special education setting. *Therapeutic Recreation Journal*.

Autism Spectrum Disorder (ASD) is a developmental condition which affects millions of people throughout the world. The Centers for Disease Control and Prevention estimates an increase of 15% in the prevalence of ASD in children ages eight years, from 1 in 166 in 2004, to 1 in 59 in 2018 (Baio et al., 2018). Diagnostic criteria for ASD require characteristics in two main categories: (1) social interaction and communication problems, and (2) restricted and repetitive patterns of behavior, interests, or activities (Copeland, 2018). Severity for ASD is divided into three levels: (1) requiring support, (2) requiring substantial support, and (3) requiring very substantial support (APA, 2013). With the increasing number of students diagnosed with ASD, additional research is needed for Certified Therapeutic Recreation Specialists (CTRSs) to design complementary therapies beneficial to students with these unique abilities, especially starting at a young age in early intervention special education programs.

To address incorporating complementary interventions in schools, CTRS practitioners can introduce evidence-based practice (EBP) recreation interventions, such as yoga and drumming, to promote social-emotional health and well-being (Schultz, et al., 2017; Woodruff et al., 2014). For this study, the view of social-emotional skills encompassed behaviors between individuals centering around forming relationships, communication and expression of feelings, attention, mood-regulation, and coping with anxiety and stress (Ho et al., 2011). CTRSs along with other allied health professionals and educators have discovered benefits of these types of social-emotional behaviors for students with ASD utilizing movement-based activities done in a social group setting, such as yoga (Carroll-Wray, 2018; Ferreira-Vorkapic et al., 2015; Koenig et

al., 2012; Litchke, Liu, & Castro, 2018; Sotoodeh, et al., 2017) and drumming (Ekins et al., 2019; Guzic et al., 2011; Ho et al., 2011; Litchke & Finely, 2019; Willemin, et al., 2018), that were added to special education curriculums. This paper presents the social-emotional findings of a comparison study between yoga, drumming, and a control group for 3-4-year old children with ASD attending a pre-school. The following sections highlight past research on yoga and drumming for children with ASD; present an overview of the current 5-week study; and, conclude with implications for TR practice-based interventions in schools.

### **Literature Review**

#### **Yoga**

Yoga combines physical postures (asanas), yogic breathing (pranayama), and chanting to enhance mind, body, and spiritual practice. Yoga done in a group setting provides an environment that creates opportunities for participants to gain social interaction skills, build relationships, and practice communication skills necessary to become a more integrated part of a larger society (Litchke, Liu, & Scroggins, 2018). Earlier research on the social-emotional benefits of yoga for children with ASD has had positive results. Findings by Radhakrishna (2010) showed that children with ASD engaging in group yoga demonstrated improvements in verbal and non-verbal communication, language, and play (interaction with peers, parents, and teacher). In addition, other studies noted that relationships were enhanced during yoga group as children with ASD demonstrated increased eye contact, focus, and joint attention (Ehleringer, 2010; Radhakrishna, 2010; Sequeira & Ahmed, 2012). Specific to yoga studies performed in schools, children with ASD who engaged in yoga class displayed less negative and disruptive behaviors (Gulati et al., 2018; Koenig et al., 2012; Rosenblatt, 2011) and improved behavior at home with family (Radhakrishna & Nagarathna et al., 2010).

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Preliminary research on TR led yoga for school age children with ASD has shown promise in camp settings. One such type of specialized group yoga developed and led by a CTRS is called Kid Yoga Rocks (KYR). KYR program targets social, communication, and behavior skills in a recreational group atmosphere, infusing CTRS leadership instructional strategies to maximize child engagement (Litchke Liu, & Scroggins,, 2018). For example, one type of strategy is meeting the child with ASD with their yoga posture, imitating their movement, then inviting them to join the leader in their asana. This CTRS led KYR program found improvements in mood, initiation of needs, and social skills for children with ASD (Litchke Liu, & Scroggins, 2018). Further, the Scroggins et al. (2015) case study showed CTRS led KYR had positive effects on leadership development and behavior management for a child with Apert and Asperger Syndrome. Overall, yoga benefits children with ASD improving social adaptation, self-confidence, communication, and learning (Artchoudane et al., 2019).

### **Drumming**

In general, drumming involves creating rhythmic beats using one's hands or sticks to strike various percussion type instruments such as drums, bells, cymbals, or nontraditional box, large exercise ball or a bucket (Guzac et al., 2011). More specifically, research on group drumming for children with ASD using percussion instruments showed increased attention to task (Guzac et al., 2011) and decreased stress among the low-income school children (Ho et al., 2011).

One innovative type of drumming that supports educational standards and is being adopted by schools is Drumtastic--drumming is done in a group using drumsticks to hit large exercise balls as music plays (Drums Alive, 2019). Drumtastic combines group drumming with kinesthetic movement to music, dance, and rhythm. The curriculum is interfaced with

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educational concepts and meets national standards for music and physical education (APENS, 2019; NAfME, 2019; NASPE, 2011). Literature on CTRS led Drumtastic group interventions has demonstrated positive results with children with ASD for improving social interaction and relationships, emotional expression, and self-regulatory skills (Litchke & Bracken, 2018; Willemin et al., 2018).

A review of literature on yoga, KYR, Drumtastic and drumming in schools for students with ASD reveals that these interventions were led by occupational therapists, special education teachers, physical education teachers, school counselors, and behavioral specialists, (Carroll-Wray, 2018; Ekins et al., 2019; Ho et al., 2011; Koenig et al., 2012; Locke, & Clark, 2009; Rosenblatt, et al., 2011; Sotoodeh, et al., 2017) with only a few implemented by CTRSs (Litchke & Finley, 2019; Rommel & Anderson, 2013). Thus, due to the limited research by CTRSs on drumming and yoga in schools, it is important to further develop evidence to support our role in special education with these targeted TR interventions.

The purpose of this study was to compare the potential social-emotional effects of CTRS led Drumtastic (DR) and CTRS led Kid Yoga Rocks (KYR) to regular classroom activity/recess/physical education (CR) for 29 students, ages 3-4 with ASD at an early childhood school program located in the southwestern United States. Therefore, the research attempted to answer the following two questions: 1) Would a 5-wk school based CTRS led DR or KYR intervention improve fun and mood experienced by these groups? 2) Would the children in the CTRS led DR or KYR groups undergo more changes in emotional behavior and social personal relationships as compared to those students with ASD who attended only CR?

### **Method**

#### **Design**

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This study used a quasi-experimental research design with pre-posttest measurements of a convenience sample of early childhood school students with ASD. A convenience sample was used to accommodate the school schedule and to keep students in each classroom intact. This study was approved by the Institutional review boards (IRBs) at the primary investigators (PI) university and the school district. After both IRB approvals, the three lead classroom teachers sent the study's informed consent home to explain the study's purpose and obtain parent/guardian permission for participation in the study.

### **Participants**

Inclusion criteria for this study were 3-4-year-old students currently diagnosed with ASD or with symptoms and behaviors consistent with a potential future diagnosis of ASD. In addition, all students were deemed eligible for special education services based on having a secondary diagnosis of speech impairment. Exclusion criteria included only children who were deemed ineligible for attending the early childhood program due to severe contagious illness or aggressive behavior. The three classroom groups were then randomly assigned by classroom to either the: (1) Drumtastic (DR; experimental group;  $n=11$ ), (2) Kid Yoga Rocks (KYR; experimental group;  $n=10$ ), or (3) regular classroom/recess/physical education (CR;  $n = 8$ ). Originally, there were 31 students in the three classrooms recruited for the study. Of the 31 students that met the inclusion criteria, only 29 students met the minimum attendance requirement of seven out of ten sessions (70% compliance rate) and were subsequently included in the data analysis. All 29 children were students enrolled in a half-day pre-kindergarten program using standardized delivery methods to enhance early reading, math, problem-solving, motor skills, communication, and socialization for students with disabilities (TEA; 2019). Demographic characteristics are presented in Table 1.

**Table 1**

*Demographic Characteristics of Groups (N = 29)*

Groups	Age Range	Gender	Condition 1	ASD Level	Condition 2	Condition 3	
DR ( <i>n</i> = 11)	4	3 y/o	9 M	7 ASD	3 Level 3	11 SI	1 ORTHO
	7	4 y/o	2 F	2 OHI	3 Level 2		
				1 NEC	1 Level 1		
				1 IDD			
KYR ( <i>n</i> = 10)	4	3 y/o	10 M	7 ASD	4 Level 3	10 SI	1 VI
	6	4 y/o		1 OHI	3 Level 2		
				2 NEC			
CR ( <i>n</i> = 8)	5	3 y/o	6 M	6 ASD	2 Level 3	8 SI	N/A
	3	4 y/o	2 F	2 NEC	2 Level 2		
					2 Level 1		

*Note.* DR = drumtastic; KYR = kid yoga rocks; CR = classroom recess/physical education; Conditions = education handicapping categories; y/o = year old; M = male; F = female; ASD = autism spectrum disorder; SI = speech impairment; OHI = other health impaired; NEC = noncategorical early childhood; VI = visual impairment; ORTHO = orthopedic impairment; N/A = not applicable.

**Measures and Data Collection**

The fun-o-meter (FOMS) assessed the student’s fun/mood before and after each of the DR or KYR sessions. The FOMS was modified from the works of Read et al. (2002) Fun Toolkit and Ottawa Mood Scales (Cheng, 2018). Both mood and fun were embedded in FOMS to provide participants the opportunity to give meaningful feedback as to level of enjoyment or mood experienced in the activity. The FOMS reliability coefficient alpha at pretest was .79 and posttest .76. The small sample size was insufficient for factor analysis and the FOMS has been piloted for use in previous DR and KYR studies (Litchke, Liu, & Castro, 2018, Litchke, Liu, & Scroggins, 2018; Willemin et al., 2018). FOMS included an eight-point emoji facial depiction: 1 = angry, 2 = sad, 3 = shy, 4 = bored, 5 = content, 6 = proud, 7 = happy, and 8 = excited. The emoji faces were mounted in a row, at a small child’s height, on the entry wall of the classroom.

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They were bright yellow with the adjective and number below each of the animated facial expressions. The children were asked by their Therapeutic Recreation (TR) student partner to select the facial depiction of mood and or word best describing their feelings pre-post each KYR or DR class. TR student partners recorded the child's responses on the corresponding score sheet next to the date of intervention. If the child did not respond, the TR student partner would score the child based on observations. This process was repeated at the end of each of the 10 DR and KYR sessions.

The positive and negative affect scale-child version (PANAS-C) is a psychometric scale that shows the relationship between positive and negative emotions with personality statistics and characteristics (Laurent et al., 1999). The list of 20-items is divided into two affect scales, measuring positive or negative emotional behaviors. Each segment had 10-terms, rated on a Likert scale of 1 to 5 indicating the extent the child exhibited the traits. The PANAS-C demonstrates good reliability and validity with high internal consistency and construct validity supported through confirmatory factor analysis (Wilson et al., 1998). The PANAS-C has been used successfully in a school-based yoga sample of 4<sup>th</sup> through 6<sup>th</sup> graders (Felver et al., 2015; Wróbel et al., 2019). The PI and two TR graduate students completed each PANAS-C pre-post all 5-wks of DR and KYR. The main classroom teacher completed the PANAS-C for the CR group.

The social personal relationship scale (SPRS) was developed by the PI and piloted in four previous studies (Litchke & Bracken, 2018; Litchke & Finley, 2019; Litchke, Liu, & Castro, 2018; Willemin et al. 2018). It is based on the goals of the Drumtastic curriculum (Drums Alive, 2019). The reliability coefficient alpha for SPRS at pretest and posttest was .97. The small sample size was insufficient for factor analysis. The SPRS includes 20-items measured on a 5-

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point Likert-scale, which describe the child's personal relationship skills (e.g. accepts responsibility for behavior) and each participant's use of social skills with others (e.g. takes turns). The SPRS was completed by the PI and two TR graduate students for the KYR and DR groups and by the classroom teacher for the CR group pre-post the 5-week program duration.

### **Training**

The PI led both the DR and KYR interventions assisted by two TR graduate research assistants and seven TR undergraduate students (all 9 assistants are called TR students). The PI held a three-hour orientation and training of KYR and DR routines, TR intervention strategies, and data collection prior to the start of the study. Part of the PI training included familiarization with behavior techniques and intervention strategies for children with ASD. The two TR graduate students gained experience using the FOMS, SPRS, and PANAS-C for data collection. The seven other TR students only trained and completed the FOMS. The FOMS was completed by TR student child partners after each DR and KYR class. The SPRS and PANAS-C were completed pre- and post- 5-wk period (10 sessions) by the TR graduate research assistants and PI. The classroom teachers only completed pre-post testing using the SPRS and PANAS-C for the CR group. The study commenced at the early childhood school in a spare classroom 2x/wk for one hour over a 5-wk period (10 sessions) during the fall school semester. The DR and KYR groups were held in the same room. The CR group was outdoors or in the gym for physical education.

### **Intervention Protocols**

At the beginning of the study the two intervention protocol groups (KYR & DR) were sub-divided by their classroom teacher in half based on student functional level (e.g. KYR  $n=10$  was divided into two groups of KYR  $n=5$ ). The same process was utilized for the DR group. This

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allowed the students to build a rapport with each TR student partner. The length of the intervention sessions began with 30-minutes for the first six sessions to acclimate the students to the routine and intervention expectations. After the first six sessions, students had successfully adapted to the routine and a decision was made by the classroom teachers and PI to increase sessions 7-10 to one hour and combine the smaller intervention groups (KYR and DR) to become a larger group: Thus, the KYR group was comprised of ten students and DR group had eleven.

### ***Classroom/Recess Control Group (CR)***

The CR group that served as the control for this study were students not in KYR or DR groups. However, all 29 students attended the same early childhood program. Throughout the school day and during 30-minute free play recess and 30-minute physical education, a Certified Pre-K special education teacher and teacher assistants were partnered at a ratio of 1:4 and guided language-rich hands-on learning opportunities (Hartmann, 2015). The CR students attended 30 minutes of free play recess which occurred either indoors or outdoors where students used physical or sedentary equipment (Frank et al., 2018) combined with 30 minutes of physical education focusing on locomotor, balance, gross motor and hand-eye coordination skill development.

### ***Kid Yoga Rocks (KYR)***

In lieu of recess and physical education, the assigned KYR students engaged in the one-hour curriculum based on the research from ASD group yoga studies (Ehleringer, 2010; Koenig et al., 2012; Radhakrishna, 2010; Rosenblatt et al., 2011). KYR also consisted of TR group leadership instructional strategies gained during educational training as a CTRS (NCTRC, 2019). KYR specifically targeted age-appropriate social-emotional skills for students with ASD such as

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correctly expressing feelings, remaining on task, engaging with peers, and maintaining a calm demeanor. A six series format was used to keep the integrity of the protocol intact for consistency over each of the 10-sessions. The KYR yoga routine was done in a circle and included 31 total poses, breathing techniques, and chants. The sections were 5-10 minutes each and included: (1) lavender massage, (2) chanting and breath-work, (3) sun salutations, (4) balance and group circular locomotor poses, (5) flexibility and partner gesture songs with music, and (6) final relaxation with flashlight and closing yoga mantra. Yoga props consisted of yoga mat, pool noodles cut in half, and individual yoga bins containing animal bean bag, pinwheel, feather, miniature flashlight, towel, and a 3-ringed yoga binder consisting of pictures of a child doing each pose with written instructions.

### ***Drumtastic (DR)***

In place of recess and physical education, the assigned DR students participated in Drumtastic an evidence-based program (Drums Alive, 2019). For the DR group, each child had an individual drum set consisting of a large exercise ball placed on a large bucket, one pair of drumsticks, another pair with colored scarves attached, and an additional pair of boom whackers. The DR routine was conducted with drum sets placed in a circle around the room with space for the students to walk around, a stereo system set at an appropriate level for the room, and visual cue cards for social-learning games. Each DR session consisted of six (5-10 min) sequential parts including: (1) stick tricks and character poses, (2) rhythmic sing-along song, (3) choreography series; (4) social games; and (5) relaxation ball poses, and (6) unity cheer. See Table 2 for specific sample CTRS intervention strategies and the KYR and DR protocols.

### **Instructional Group Leadership Strategies**

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CTRS instructional strategies incorporated in KYR and DR sessions were prepared and implemented by PI instructor for both intervention groups. The PI trained the nine TR students in those interventions focusing on the domains of social/communication abilities and emotional/behavioral skills. The KYR and DR curriculums provided modifications and alternative strategies for children with ASD. More specifically, to promote social interaction/communication with others, yoga mats or drum sets were placed in a large circle with instructor and TR students sitting next to and between group participants. Each child was given a TR student partner to engage with throughout the class time. Speech and verbal/nonverbal language were enriched by using familiar songs to maximize singing. Gesture songs were used during yoga partner poses or drumbeats to promote shared social experience. Speech and language polarity (use of opposite terms) was implemented along with voice inflection and tone changes to indicate directionality and transition from one task to another.

To stimulate engagement, the CTRS leader and TR student shared the KYR or DR experience by modeling and actively engaging in the class with their child partner. TR students and leader used physical modeling and mirroring techniques, progressing from visual to verbal to physical hand over hand prompts to foster physical imitation of motions. Directions were provided via auditory, visual, olfactory, and kinesthetic components. KYR and DR equipment and props were also multisensory in nature and are listed in the following protocol section. Repetition and layering of learning were used throughout class to foster memory and advance more complex skill acquisition. Moreover, musical aids, singing, chanting, clapping opportunities were used in both KYR and DR groups to increase recall of movements or poses. However, there was a heavier emphasis on rhythm in DR group based on curriculum derived from Drums Alive (2019).

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Emotional and behavioral skills were supported by providing a consistently scheduled time frame, location and lesson plan format to provide a stable yet flexible program to meet individual/group skill and challenge levels. CTRS leader trained TR students in techniques such as scaffolding, layering of learning, teaching by invitation, social valorization, normalization, challenge by choice, and flow theory (Csikszentmihalyi, 2014). TR 1:1 or 1:2 partner ratio encouraged attentiveness to maximize engagement and minimize off-task behavior. Individual yoga mat/bin or drum set created personal safe space and identity. The yoga mat or drum set remained in the same spot each time unless a child needed more space. Both sets of equipment for KYR and DR could be moved by TR partner to allow for proximity preferences e.g. moving portable yoga mat/bin or drum set farther back from immediate circle if child required additional space.

**Table 2**

*CTRS Instructional Group Leadership Strategies with KYR and DR Protocol Samples*

KYR and DR Series Opening			
Introduction: Fun-o-Meter check in (3 min)	Each child greeted at the door by an assigned TR student partner. TR student partner asked child to identify mood/feeling by pointing, looking, or standing next to large animated emoji faces.  CTRS intervention/purpose: TR partner observed and recorded impression of child’s mood if child was unable to identify preference. This opening created a familiar ritual to mark the beginning of class in a non-threatening manner.		
Section Time Frame	KYR Protocol Instructional Group Leadership Strategies by Sections	Section Time Frame	DR Protocol Instructional Group Leadership Strategies by Section
1: Lavender Massage (5 min)	Children given the option to have lavender lotion dotted on their palm to massage into their hands and smell.  Children encouraged by TR partner to rub lotion on face, ears, head, hair, arms and feet.  CTRS intervention/purpose: Provided choice to massage self; receive massage by TR partner; create a reciprocal shared partner	1: Stix Trix Warm-up (5 min)	Children instructed to enter circle and self-select a pair of boom whacker tubes that created the “G” sound.  CTRS intervention/purpose: The G sound is the most pleasant to the ear and began class in a lower more tolerable volume.  TR leader used 8 count beats with boom whackers in various ways paired with singing familiar

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massage; opportunity for positive touch and sensory integration.

Created calm atmosphere; helped reduces stress/anxiety; and familiarized child to quiet safe yoga space.

gesture songs to promote rhythmic entrainment and joining everyone on the same beat.

Started with basic walking hands up boom whackers to more advanced tossing and catching them.

Promoted eye hand coordination, fine motor skills, and warming up for more complex beats and choreography to follow.

Utilized boom whacker placement and familiar name to gain groups attention by calling out various animal or character names. For example, “rabbit ears” and everyone would place sticks on top of head like ears.

This technique was used to manage attention and mark transition from one task to the next.

3. Balance and Locomotor (10 min)	TR partners and child held balance poses for count of 5 and then joined group to sing song while moving around yoga mat circle. For example, Airplane pose we sang “fly like airplane, fly like airplane, fly like an airplane in the sky; again, on the other side (repeat song and fly the other direction). Repeated for bird and frog (hopped lily pads; yoga mats were pads); and tree pose and trees in a forest all in a group supporting the person next to them; trees swayed in wind.	3. Choreography Series (10 min)	Complex sequencing of previous boom whacker movements repeated, but used drumsticks and paired motions and beats with familiar child songs.
	CTRS intervention/purpose: Allowed for non-traditional group social movements together with partner inside of large group activity; met the children’s need for creative movement and outlet; promoted locomotor skills and balance.		CTRS intervention/purpose: Motions were repeated throughout song paired with lyrics to promote memory and emotional connectivity to maximize engagement.
			Children asked by TR partner or leader for favorite song and one drum beat or movement to be used later in choreographies to promote self-esteem and self-identity.
			Numerous eye-hand coordinated movements, locomotors patterns, partner engagement, and “free styling” where child could do whatever they felt as a motion.
4. Flexibility Musical Song Series (10 min)	Bean bag animal, towel and cut water noodle used to do various stretches. Music and singing of songs “row the boat” with TR partners.	4. Social Games (10 min)	Games played using drum equipment e.g. bucket or ball to promote following directions, rule compliance, memory; all paired with physical motions and TR partner.
	CTRS intervention/purpose: Promoted interaction, eye contact, and turn taking, moving in conjunction and consideration of another person.		CTRS intervention/purpose: Visual pictures and auditory cues with modeling done in clear space in center of circle. Games promoted play, fun, engagement, imitation, social interaction and cognitive skills.
Fun-o-Meter check out (3 min)	Closure used same format as check in. Children asked by TR partner how much fun they had in KYR or DR class or how they felt after KYR or DR class. CTRS intervention/purpose: Marked familiar closure each time to aide in transition back to classroom.		

Note. KYR = kid yoga rocks group; DR = Drumtastic group; min = minute

**Data Analysis**

Descriptive data analyses were conducted to summarize the characteristics of the sample. An Analysis of Covariance (ANCOVA) was used to compare pre-posttest data for research question one for each intervention. Question two, consisted of a repeated measures analyses of variance (ANOVAs). The repeated measures ANOVA involved testing PANAS-C and SPRS scores at pre-posttest (5-wks). The DR, KYR, CR served as the between-subjects factor, while pre-posttest served as the within-subjects factor. Data for the three groups were found to be normally distributed at pretest and posttest.

**Results**

**Fun-O- Meter (FOMS)**

Changes in FOMS were significant for overall change within both the DR and KYR together as determined by ANCOVA ( $p = .003$ ). However, there was no significant difference between the two intervention groups at posttest on the FOMS. See Table 3 for results for FOMS scores for both the KYR and DR groups.

**Table 3**

*Descriptive Statistics FOMS Within Group Changes*

Variable	Group	Mean	SD	F	df	P
FOMS				.400	1	.535 <sup>b</sup>
FOMS_pre	yoga	5.4911	1.52885			
	drum	5.4737	1.55563			
FOMS_post	yoga	6.1522	1.02481			.003*
	drum	5.9884	1.14963			

*Note.* FOMS = fun-o-meter scale.

b. Computed using alpha = .05.

\* $p < .003$  for overall within groups.

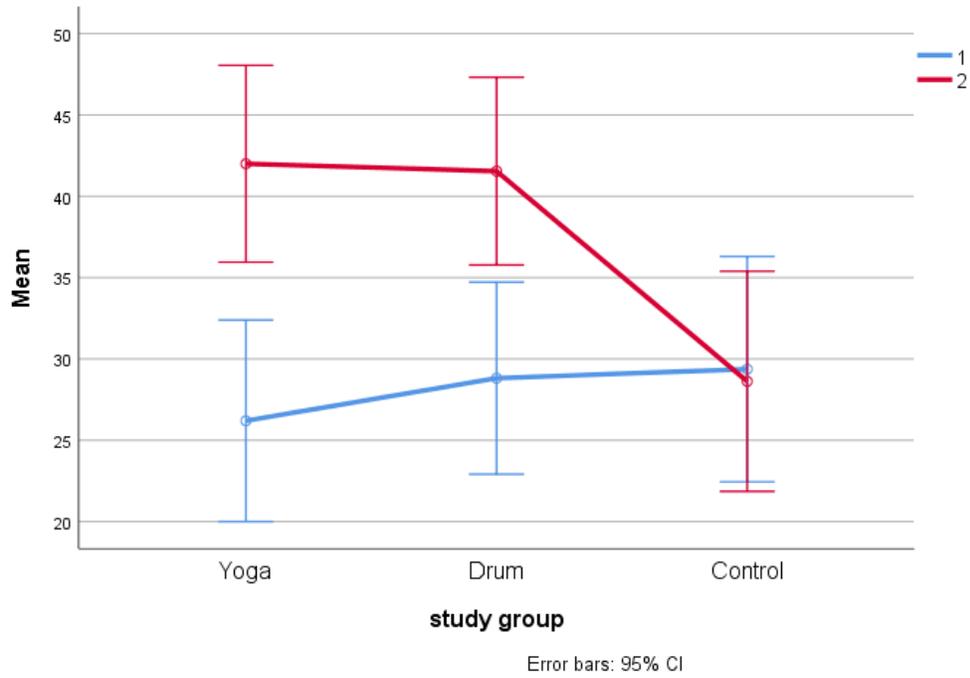
### **Positive and Negative Affect Scale-Children (PANAS-C)**

Findings for PANAS-C revealed no significant difference between any pairwise combination of the three study groups (DR KYR, & CR) at posttest. There was a significant difference in positive scale behaviors on PANAS-C between the three groups. More specifically, there was a significant positive change for DR and KYR vs. CR ( $p < .001$ ). However, there was no significant difference between DR vs. KYR. Overall, a significant change was revealed within both groups (DR & KYR together) from pre-posttest ( $p < .001$ ). There was also no significant change in negative scale behaviors on PANAS-C pre-posttest between or within each of the three groups. Results for PANAS-C positive scale behaviors and negative scale behaviors for all three groups are presented in Figures 1 and 2.

### **Figure 1**

*PANAS Positive Scale Mean Plots Comparison Between KYR, DR and CR Groups*

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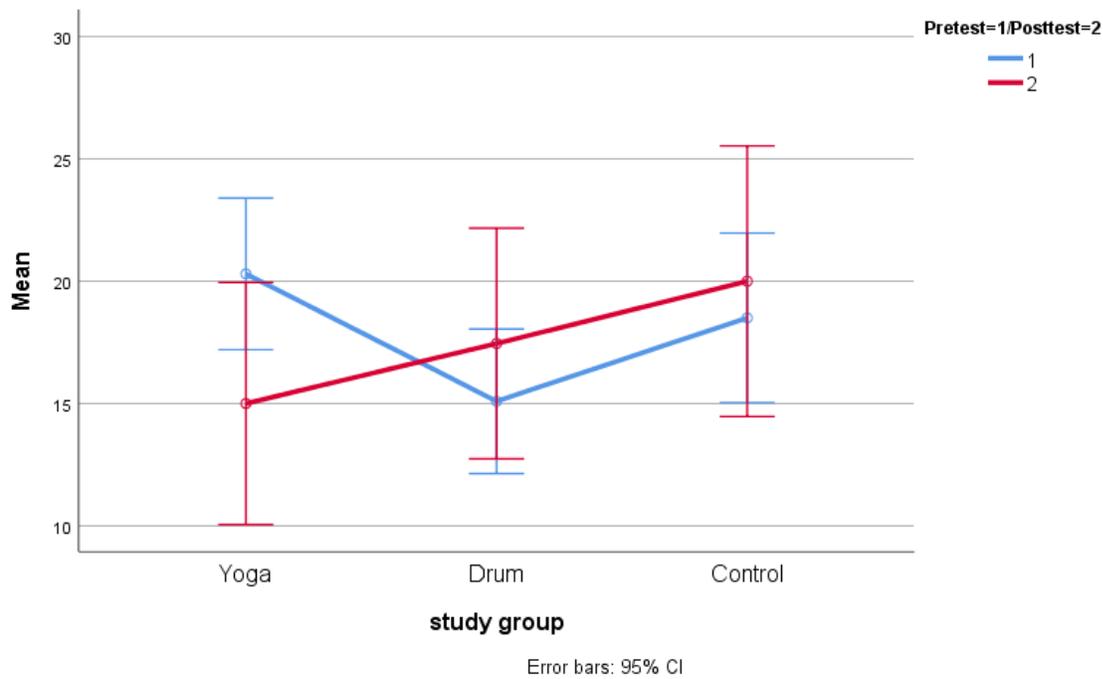


Note. Pre-posttest significant within group changes for both treatment groups (KYR and DR) vs. CR control. Blue (1) = pretest; Red (2) = posttest.

\* $p < .001$ .

**Figure 2**

*PANAS Negative Scale Mean Plots Comparison Between KYR, DR and CR Groups*



*Note.* Pre-posttest within group changes for both treatment groups (KYR and DR) vs. CR control. Blue (1) = pretest; Red (2) = posttest.

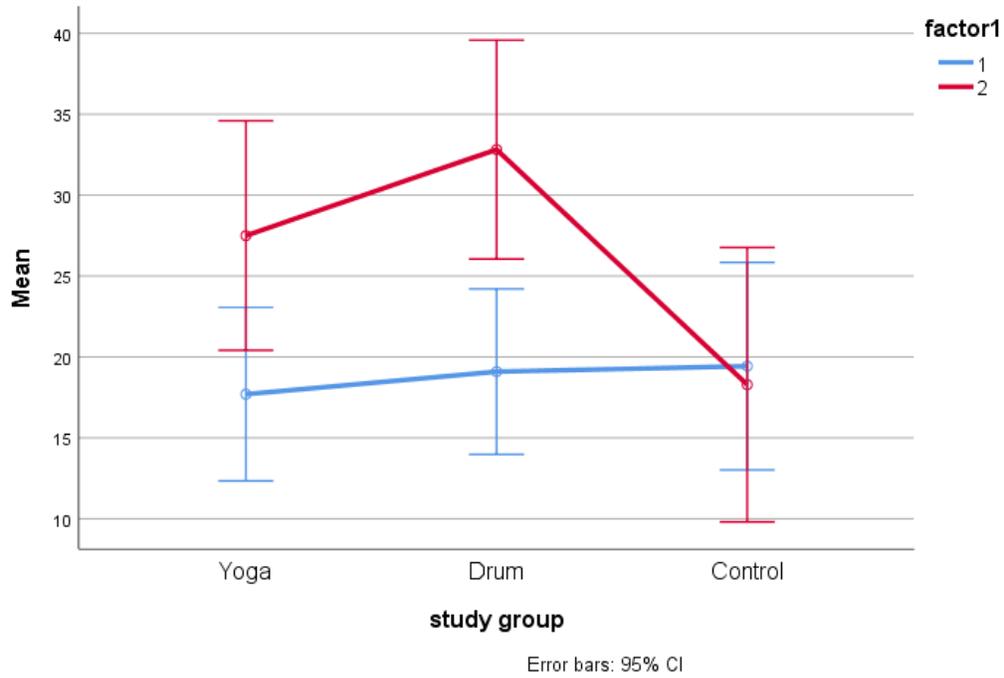
**Social Personal Relationship Scale (SPRS)**

Findings for SPRS revealed there was no significant difference between any pairwise combination of the three study groups (DR KYR, & CR) at posttest. Moreover, there was no significant change on SPRS socialization with others on pre-posttest for all three groups. A near significant difference between groups change was observed (pre-posttest) in personal relationship skills on SPRS; KYR, DR vs. CR ( $p = .065$ ). Using more detailed tests of comparison of means, the Tukey multiple comparison and Dunnett’s T3 showed that the DR group was significantly better ( $p = .023$ ) than KYR and CR. Results for SPRS socialization with others and personal relationship skills on pre-posttest for all three groups are presented in Figures 3 and 4.

**Figure 3**

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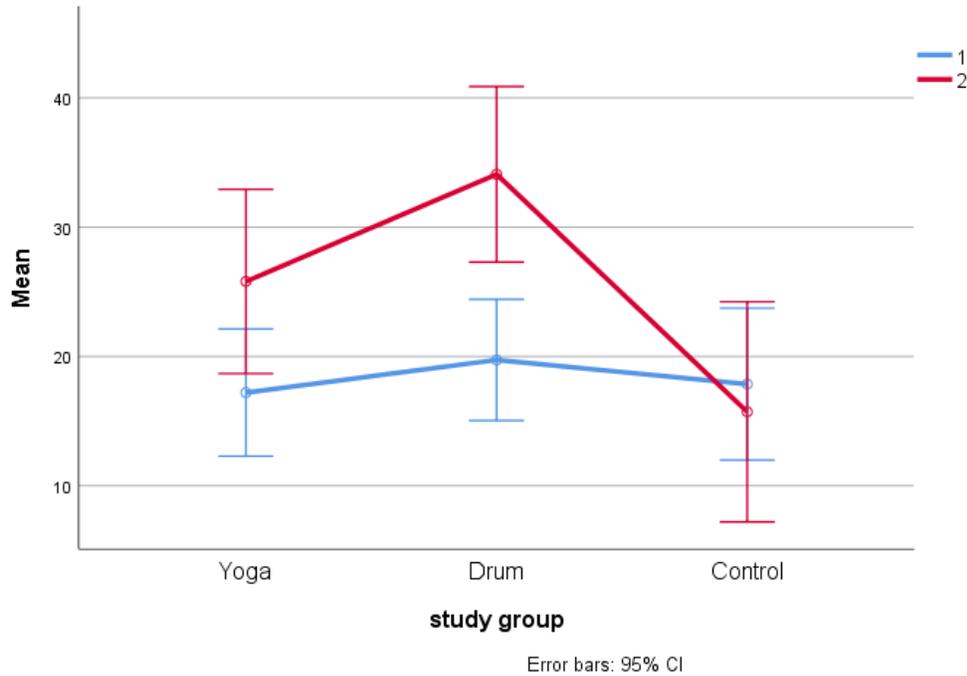
## SPRS Socialization with Others Mean Plots Comparison Between KYR, DR and CR Groups



Note. SPRS socialization with others pairwise comparison between yoga (KYR) group, Drum (DR) group and CR control group. Blue (1) = pretest; Red (2) = posttest.

Figure 4

*SPRS Personal Relationship Skills Mean Plots Comparison Between KYR, DR and CR Groups*



*Figure 4.* SPRS personal relationship skills pairwise comparison between yoga (KYR) group, Drum (DR) group and CR control group. Blue (1) = pretest Red (2) = posttest. \* $p < .05$  DR vs. CR.

**Discussion**

Overall, the results revealed the DR and KYR groups experienced significantly higher positive emotional behaviors and personal relationships than the CR group. In addition, there was a significant change in fun/mood experienced in both the DR and KYR groups (research question one). However, neither KYR or DR proved to be significantly better than the other except for personal relationship building, which proved slightly better in the DR vs KYR and CR groups.

Results of the FOMS revealed a significant improvement in fun/mood via social group movement whether it was asanas/pranayama and gesture chanting during yoga, or rhythmic eye-hand/locomotor skills and games associated with drumming. Previous research validated that fun improved after KYR (Litchke, Liu, & Scroggins, 2018) or dyadic Drumtastic sessions for

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students with ASD (Willemin, et al., 2018). Carroll-Wray (2018) also established that students with ASD benefit when teachers created an environment encouraging fun and play through yoga. Ekins et al. (2019) found that children with developmental disorders (including ASD) experienced high enjoyment for learning in a school-based Drumtastic program for two weeks.

Our second research question sought to understand if there would be a change in emotional behaviors, socialization and personal relationships for children with ASD engaged in CTRS led DR or KYR intervention compared with those students with ASD who attended only CR. While the SPRS socialization with others did not significantly improve, personal relationship skills, such as empathy and self-regulation, did for the DR group. Our discoveries are consistent with others such as Overy and Molnar-Szakacs (2009) who found that students with ASD engaging in musical games, began imitating and synchronizing the actions with a social partner and gradually developed an understanding of their partner's intentions and emotions. In previous research on children with ASD engaged in dyadic drumming, personal relationship skills also approached significance (Willemin, et al., 2018).

The positive affect change experienced by the students in the DR group as found on the PANAS-C is similar to studies by Ekins et al. (2019) and Litchke and Bracken (2018) who discovered Drumtastic engagement did have a positive influence on emotional expression and behavior such as self-regulation. In both the DR and KYR groups, music and singing were incorporated into the protocols as part of the instructional strategies added by the CTRS. Researchers, Overy and Molnar-Szakacs (2009) suggested group music-making and singing convey the affective and physical state, and intentions of the partner fostering empathy and positive emotions. Further, Overy (2003) concluded timed rhythmic percussion while singing can increase language and understanding of emotions. This could be particularly important in

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school for students with ASD, given their difficulties in empathizing with and understanding the intentions of others.

The KYR group also experienced a significant change in positive affect behaviors as recorded on the PANAS-C. Other researchers studying the effects of yoga in schools found that teachers promoting independence (right to refuse) and opportunities for self-regulatory behavior can address attention to task and feelings of anxiety and stress that are common for many students with disabilities, especially those with ASD (Caroll-Wrey, 2018; Nanthakumar, 2018). Semple's (2019) review of literature on yoga for ASD found similar aspects of behavioral changes such as reduced aggression, irritability, lethargy, and noncompliance. Further, researchers have noted that implementing yoga in schools can reduce maladaptive classroom behaviors and increase academic engagement (Koenig et al., 2012; Rommel & Anderson, 2013; Rosenblatt et al., 2011).

### **Limitations**

Our study was underpowered ( $N$  was too small) in the group analyses/comparisons (PANAS-C & SPRS). If we had a larger  $N$ , we may have been able to identify statistical significance between the three study groups. Interrater reliability for the TR student trainings was not performed in this study but was based on previous training done in a past study involving the same students. Further, the classroom teachers were not trained on SPRS and PANAS-C but were given an explanation on how to administer the instrument from the PI. In addition, the SPRS was designed based on the Drumtastic curriculum so by default could have favored DR rather than KYR group results. Since the classroom teachers rated the CR students at the beginning and end of five weeks, it is unclear how the rest of their school days affected their ratings. Having a TR student 1:1 partner for our two intervention groups may have made a

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difference in our findings; as the CR groups ratio was 1:4, unless a child required additional support at 1:1.

Moreover, since the smaller DR and KYR familiarization groups were combined back to their original classroom size this may have impacted the outcomes as the CR group in recess and physical education may not have been smaller. Thus, the three groups may have had different experiences impacting group dynamics, opportunities for developing rapport, and engaging in social interactions. However, it is common for teachers to use smaller groups throughout the regular classroom instructional lessons especially in early childhood. Since the PI was the instructor of DR and KYR and completed the measurement instruments this could have created a study bias. Further, not all our students had yet been officially diagnosed with ASD as their main condition for placement in the programs was due to their young age. Therefore, the generalizability of these results should be considered with caution.

### **Implications**

Our results point to the development of social-emotional and positive relational behavior enhancement through engagement in DR and KYR group interventions in a school setting. CTRS led programs such as DR and KYR in the schools could shape relationships with students and teachers, building equity in the classroom and narrowing gaps (Philibert, 2017). While these two specific interventions appeared to be sensitive to diagnostic needs of students with ASD, all students in this study also had SI, some had visual, and/or orthopedic conditions. Thus, these programs may be suitable for use in classrooms for students with a variety of special needs.

The specific KYR and DR protocols are unique in that they were modified and adapted by the lead PI and enhanced with CTRS instructional group strategies to maximize participant experience. As part of the individualized education planning (IEP) team, CTRS can add to

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traditional school instructional strategies professional expertise in recreation group leadership strategies. These innovative EBP- KYR and DR type programs can be offered as part of the related services provided by a CTRS to meet more of the social-emotional needs of students with ASD. Future research is warranted on CTRSs provision of EBP innovative related services as part of the IEPs in school settings for students with ASD as well as other diagnoses.

CTRS led DR and KYR group protocols embedded with TR instructional strategies, showed positive social-emotional benefits for students with ASD in an early childhood school. This study suggested as part of the IEP team, CTRS-led interventions have an impact in special education. CTRS leaders need to continue to seek collaboration with educators to foster connections between academic and social-emotional skills to meet the needs of students with ASD and other diagnosis (Hawkins et al., 2012).

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