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ADVANCES IN PEDIATRIC RESEARCH

Art and autism: Caregiver input

Shireen Kanakri [1*], Kathy Hathorn [2]

1 College of Architecture and Planning, Ball State University, USA **2** American Art Resources, Houston, TX, USA

Abstract

Evidence is needed for how to design spaces that enhance the well-being of children with autism spectrum disorders. Prior research suggests art selection within challenging environments has a positive impact on the well-being of those using the space. Additionally, art images in classroom spaces are hypothesized to have an impact on children's behaviors. More studies are needed to inform the decisions about what art is appropriate in regards to children with autism. The present study surveyed teachers that work with children with autism spectrum disorders as well as children with high functioning autism to gain information about what types of artwork they felt would be appropriate for their classrooms. The study was a cross sectional design in nature, and aimed to gain both quantitative and qualitative results through online surveys sent to 5 different school sites. The sites each specialized in working with children with autism spectrum disorders.

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*Email: smkanakri@bsu.edu

Introduction

Literature on designing specialized schools for children with autism is limited [1]. Although design cannot offset the need for well-trained, experienced teachers, using an evidence-based design can support the education and treatment of this population. Schools for children with autism spectrum disorders (ASD) often require additional diagnostic, medical, therapeutic, and social support services that far exceed traditional public schools [1]. Children with autism respond best to education that is continuous and consistent. Much of the coordination and responsibilities for this falls on the teachers. How can evidence-based artwork and design support this educational process?

Design and Autism

Despite limited information about designing environments for children with autism, some guidelines have been provided. Myler and colleagues present practical guidelines in five areas: color, controlling stimulation, air quality, acoustics, and materials [1]. They suggest colors should be selected from a muted, subdued palette of pastels, including neutrals and browns, with plain, unpatterned finishes. The environment should be comfortable and non-threatening, using low ceiling heights, small spatial volumes, and transitional zones between outside and inside.

Overall, Myler et al. emphasize design elements providing a safe, clean environment that limits overstimulation. In agreement with Myler et al. and Paron-Wildes suggests in Interior Design for Autism from Childhood to Adolescence that interior spaces designed for children with Autism should provide adequate but indirect lighting, use neutral colors, display realistic pictures or calming scenes, and provide sensory boards [1,2].

Architects use common patterns of cognition to guide and manipulate user behavior in a space [3]. Looking at meaning or the cognitive value given to an experience, information about how a user typically interprets the architectural environment can be obtained and used in designing space. That is, giving certain meanings through form can influence user behavior. In a study by Noiprawa and Sahachaisaeree, video recordings and surveys

were used to analyze the physical environments and student behaviors of children with autism [4]. The study found that visual stimuli, although sometimes used effectively for restoration, can also reduce children's concentration if it is unwanted or exaggerated. The authors suggest one focal point within the interior to help draw attention of the children and increase effectiveness of treatment, without adding distraction [4].

Positive impact of art

According to Dr. Roger Ulrich, a leading researcher in the field of evidence-based design, supportive environments are those that foster control (including privacy), promote social support, and provide access to realistic and other positive distractions [5,6]. Under this framework, a positive distraction can be defined as an environmental-social condition marked by a capacity to improve mood and effectively promote restoration from stress [7]. Visual art is an example of such a distraction that helps in creating the supportive environment. However, it can only do so if it is appropriate for those who are using the environment.

Artwork may provide a means to alter specific undesirable behaviors. Kincaid and Peacock tested the effects of artwork on door-testing behaviors (exit attempts) with elderly residents in a U.S. nursing home [8]. After installing a painted wall mural on an entrance/exit doorway there was a significant reduction in door-testing behaviors. The authors contend that murals can be an effective tool for cueing residents away from agitating or dangerous situations. Decreases in behaviors, such as door-testing behaviors, can also have a positive impact on staff members through a reduction of stress and worry. In addition, staff would be able to spend less time trying to redirect these behaviors, allowing more time for positive interactions with residents [9].

In support of the potential of artwork to alter behavior, Nanda and colleagues found that the installation of still and video artwork depicting nature settings in an emergency room setting produced significant decreases in restless behaviors, decreased the overall noise level, decreased individual staring at other waiting individuals, and decreased the number of queries made at the front desk [10]. In addition, artwork was found to promote positive behaviors, such as increases in social interaction. Boutelle and colleagues found that a combination of music and artwork increased the use of stairwells in public buildings, which suggests the potential of artwork and music to increase such desired healthy behaviors [11].

Theoretical basis

Two theories, an evolutionary theory and an emotional congruence theory, have been proposed to explain the positive impact of appropriate realistic images (Ulrich & Gilpin, 2003). The evolutionary theory posits humans are hardwired to enjoy realistic images congruent with our survival as a species [12]. If vegetation, water, and a high depth of field warning allowing us to be aware of approaching danger were critical to our evolutionary process, perhaps these images still elicit a positive response at a most basic level (Ulrich & Gilpin, 2003). The emotional congruence theory holds that when vulnerable, individuals project their own emotional states onto the objects around them. If an image is open to interpretation (as abstract art often is), interpretation will be congruent with individual emotional states; thus an ambiguous image that might have had a positive connotation for the artist may still have a negative connotation for the person viewing it [12]. Other work by Hathorn and Nanda proposes that individuals may react negatively to artwork they cannot understand, supporting that abstract artwork may not be suitable for all environments [13]. Combining the available theory and evidence, a few guidelines for appropriate healthcare art have been developed. Research in healthcare design suggests art with views or representations of nature containing calm or slowly moving water, verdant foliage, flowers, foreground spatial openness, and park-like or savannah-like properties (scattered trees, grassy undergrowth) provide a focal point that enhances user's experiences in these environments [12].

Other theoretical models have argued that there are cognitive benefits from viewing nature scenes. Kaplan and Kaplan have proposed the attention restoration theory, which argues that viewing natural scenes promotes restoration from attentional fatigue [14]. Features of the natural environment, such as being away, fascination, extent, and compatibility are all proposed to be restorative [10]. Attention restoration theory may provide a

framework to help address attentional fatigue that can occur in educational settings. When selecting art for individuals with autism, the current information was used to help inform decisions.

Impact of art on children

While there a body of evidence for the positive impact of art on adults, there has been less research conducted on the positive impacts of artwork on children and young adults [15]. Research that has been conducted with children and young adults indicates that in order to be effective, artwork needs to be age-appropriate and not include blatant emblems of childhood. In order to address the lack of literature supporting the positive effects of artwork on children, Bishop conducted a qualitative case study with 55 children and young adults aged 9-18, in which perspectives on the role of artwork during hospital stays was assessed via both formal and informal interviews [15]. Results suggested that art was a key environmental attribute, and had a variety of functions in children's overall hospital experience, including: providing a rich source of aesthetic variation, entertainment, distraction, engagement, and identity which supported young people's ability to maintain a positive frame of mind and remain engaged in their experiences.

While there has been less research conducted on the impact of artwork on children, available literature suggests that children, specifically hospitalized children, respond similarly to artwork depicting nature and landscapes as adults [16]. Monti et al. provides multiple studies which suggest that nature-focused artwork serves as a positive distraction, promotes important coping strategies, and promotes cognitive refocusing for both children and adults [16].

Art therapy techniques have recently been utilized to assist children with varying developmental or neurological disorders. Art therapy has been specifically linked to improvements in the behaviors of children diagnosed with autism. In art therapy sessions, the child will typically work on an art project with the assistance of the therapist. The child gains valuable cognitive, emotional and social skills through art therapies [17]. Recently, there have been many strides towards developing more practical guidelines for the use of art therapy specifically on children diagnosed with autism. However, further research needs to be done on the effectiveness of art therapy as an intervention for autism [18]. If creating art can provide benefits for children with autism, research should be conducted to answer the question as to whether or not the art displayed in classrooms or home environments have similar benefits on the children's behavior.

Art and autism

Robust evidence supports the benefits of art in healthcare environments, and specifically supports the use of art with realistic nature content to reduce high stress. Environmental Competence/Press Theory suggests that individuals with high internal emotional stimulation will seek less challenging environments. Under this framework, previous findings have suggested that abstract work is often preferred by individuals looking to increase internal emotional stimulation, while representational work would be then suggested to be appropriate for individuals who are seeking a less stimulating environment [19]. Emerging evidence does indicate children with autism benefit from having a restful focal point in their treatment environments [4]. This provides a child with autism enough respite from tasks at hand, but not so much visual stimuli as to distract. Too much stimuli in the classroom can be a significant challenge for a child with autism. For example, for children who rely heavily on visual information, it may cause difficulties in distinguishing what signage and verbal cues are important [20]. When considering the design environment in schools for children with autism, the impacts of types of art images warrants investigation.

Problem statement

According to evidence-based design researchers, there is an integral relationship between the built environment and the users of the space [21]. The careful examination of the dynamic between the built environment with attributes of acoustics, visual character, spatial quality, color, texture and human behavior can lead to more efficient design that helps users interact with their environments without difficulty. The use of such strategies results in designs more conducive to productivity, efficiency, and comfort.

One of the most commonly known characteristics of persons with autism is hypersensitivity to environmental stimulation [22]. Physiological

responses have been observed or discussed by many investigators in response to low and high frequency noise [23]. These responses have measured cardiac rhythm and respiration rate with EKG recordings, pulse counts and impedance pneumography, change of systolic rhythm, blood and endocrine changes, and disturbances to the central nervous systems, as well as subjective responses [24]. The better we understand the child with autism, the better we can develop ways to intervene in an effective manner. Lang contends behaviors associated with autism can be influenced favorably by proactively altering the sensory environment, such as the stimulatory input, resulting from the physical architectural surroundings (color, noise, texture, ventilation, sense of closure, orientation, acoustics etc.), rather than addressing issues after challenging behavior occurs [21]. By altering this sensory input in a manner designed to provide and cover specific autism-related needs, behavior might be improved, or at least a more conducive environment created for more efficient skill development.

While previous studies on children with autism suggest art as an area of consideration, none have focused exclusively on art to improve environments. There is a gap in the body of knowledge about how the positive distractions affect children with autism and the empirical evidence regarding the art applications for children with autism appears to be non-existent. Therefore, a well-controlled investigation of the effects of positive art distractions on children with autism in their classrooms is necessary.

Methods

The present study was conducted as a two phase quantitative and qualitative cross sectional survey design. A questionnaire was given to teachers in the chosen schools, with the objective of obtaining teacher feedback regarding whether they considered potential art pieces as helpful to children with autism and appropriate for hanging in their particular classroom. For the second phase, the surveys were distributed to teachers who then distributed the survey to their students. Artwork needs to be studied in real contexts because it is experienced in environments where complex patterns interact with human perception and behavior.

Site selection

Five sites from 3 different states were chosen for the current study. Sites 1 and 2 were located in Texas. Site 1 was a not-for-profit organization that specialized in working with children and adults with autism. This site offered a day school program, residential services, and an adult day rehabilitation program. The current study focused on the day school program. Site 2 was a school that specialized in working with children, ages 2-9, with communication delays, often comorbid with other diagnoses, such as autism, dyslexia, or expressive language disorders. This site provided children with education, speech language therapy, art therapy, music therapy, and occupational therapy. Sites 3 and 4 were located in Indiana. Site 3 was an autism center that specialized in Applied Behavior Analysis (ABA) therapy, speech therapy, and communication skills. Similarly, Site 4 specialized in working with children with autism by providing ABA therapy services. Site 5 was located in Ohio and served individuals ranging from 2-22 years of age. This site provided services to address the communication, behavioral, and educational needs of children with autism. This site provided ABA therapy, individualized education plans, speech therapy, and music therapy.

Recruitment

In total, 39 autism centers and schools were contacted for phase one of the study, which involved surveying teachers. These 39 centers were found through searches on the internet and through schools recommending other schools. To reach out to the schools, a preliminary email was sent to the school administrator. If the supervisor responded, a phone call was then made, and if the administrator expressed interest during the phone call, the survey was then sent to the interested school via Qualtrics. Of the 39 centers contacted, 34 did not respond while 5 schools responded to the initial email and phone call and participated in the study. Attached to the survey sent with Qualtrics was a cover letter. The cover letter explained the study to the school administrator and teachers. Once the administrator understood and agreed to the survey, the administrator then distributed the surveys to their teachers through email.

For the second phase of the study, which entailed surveying children, the 5 schools used in phase one

were contacted. Of the 5 schools, 3 responded via email and agreed to participate. The survey was sent to the administrators at the 3 schools, who then sent out the survey via email to the teachers who had classrooms of students with high-functioning autism aged 10 to 13. The teachers then printed the surveys for the students and explained the survey to the students. The completed surveys were returned to the teachers who then returned the surveys to the school administrator. The authors then retrieved the completed surveys through the mail.

Participants

For phase one of the current study, 262 participants were recruited, of which 202 (78.6%) were female and 60 (22.8%) were male. Participant age ranged from 18-60+ with 62 participants aged 18-29, 36 participants aged 30-39, 71 participants aged 40-49, 69 participants aged 50-59, and 24 participants aged 60+. Participant roles included administrator (n=12), lead teacher (n=146), and teacher assistant/ aide (n=104). Participants taught various ages from preschool to middle school. Participants' experience in teaching children with autism ranged from one to 18 years of experience. Of the 262 participants, the average number of years of teaching experience was 8 years and 4 months. For phase two of the study, 74 students aged 10 to 13 participated. These children were students at the autism centers and schools that had been diagnosed as having high-functioning autism. This age group of children was chosen because the authors thought they would best be able to express their feelings and thoughts regarding the artwork.

Instrumentation

A total of 14 images were chosen for the teachers and children to evaluate. All images were shown in color. Images were selected out of a pool of 200 images previously tested in similar studies [25]. American Art Resource firm granted public access to 56 images of their artwork for the pilot study. All of the images chosen were owned by American Art Resources, a firm located in Texas that works specializing in Art Program Design, lighting and displays, and project management [22]. Out of the 56 images used in the pilot study, only 14 were used for the current study. This decision was made based off of the comments made by participants in the pilot study claiming that rating 56 images was too long of a survey. The 14 images chosen were the images with the highest rankings based off of the pilot data.

In addition to typical considerations for style, color, and content, researchers' selections were based on autism-specific considerations, including attention to the number of characters in the image, and how the characters were relating to each other (e.g. facing towards or away from each other). Subject matter included realistic, animals, people, landscape scenes, and representational images, of either familiar or unfamiliar characters.

To further specify between the different types of images chosen, 4 addition categories were given to the images. These categories were built environment, emotions, nature, and individual figures. Images were placed in built environment if they contained some sort of building that was man-made. Images were placed in the emotions category if they contained animals or human beings that displayed any sort of emotion, such as being scared, acting silly, or displaying friendship. Images were placed in the nature category if the image contained a depiction of nature while containing no man-made buildings. Finally, images were placed in the individual category if they contained only one animal. This way of further specifying between realistic images and representational images allowed the authors to study more in depth the way certain types of images made the teachers and children feel. The images are grouped into these sub categories below with the figure number given based on the chronological order of the images in the survey.

One image was a drawing by a child with autism, selected out of a book of images created by children with autism spectrum disorders. This image was added to explore the possible differences that might exist between art created by typically developing individuals and art created by those with autism spectrum disorders. This image is tested alongside other images to determine whether children might prefer pictures created by their peers. This image was also placed into the subcategory of being representational as well as the emotions category.

The classification system used by Nanda et al., was implemented in the current study [25]. This classification system has three broad categories, ranging from realistic to abstract, with subcategories, as listed here:

Realistic: Images that realistically depict scenes from the world around us;

Photograph (Re);

Painting (Rp)

Representational: Images that represent content from the real world using artistic styling and renditions.

Abstract-representational (Ar): Use of abstraction (e.g. exaggeration, distortion) of forms and colors, while ensuring subject matter is representative of the real world.

Animated (An): Representational or animation-style images that represent real subject matter.

Child Art (Ch): Drawings by children that represent specific content, but have their own unique style.

Nonrepresentational/Abstract (Ab): Images that are not representational in the depiction of real-life subject matter [25].

The set of images that were chosen for the current study was comprised of four realistic images, 9 representational images, and one child-made art image in Table 1 for classifications. In general, representational images were animated, characterized by bright colors and humorous action, while realistic images are characterized by an actual photograph of an organic object or landscape setting, and always included realistic content. Images were grouped according to the built environment (Figure 1), emotions (Figure 2), nature (Figure 3) and individual figures (Figure 4).

The survey questionnaire used by Nanda et al. was modified for the classroom context. Participants were asked to rate each picture on a 5-point Likert scaled based on how the participant thought students would feel when viewing the picture (1=much worse, 2=worse, 3=no difference, 4=better, 5=much better) and whether the participant would hang the picture in his or her classroom (1=definitely not, 2=probably not, 3=not sure, 4=probably, 5=definitely) [25]. The questionnaire requested open-ended responses to obtain teacher feedback on artwork and art criterion, such as color, composition, and style, with consideration for how these aspects would be expected to impact children with autism.

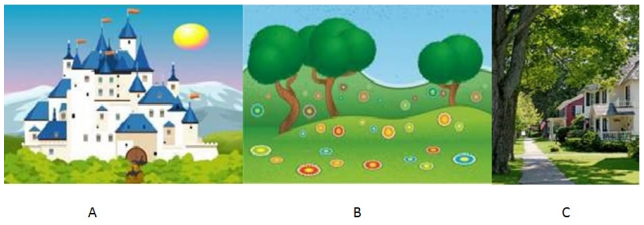


Figure 1. Figures grouped according to built environment. A) PO6 - Representational image used in the survey. The dimensions of this image on the survey measured 5.29″ x 5.29″. B) P14 - Representational image used in the survey. Dimensions of this image on the survey measured 6.5″ x 4.69″. C) P07 - Realistic image from the survey. The dimensions of this image on the survey measured 3.48″ x 5.24″.

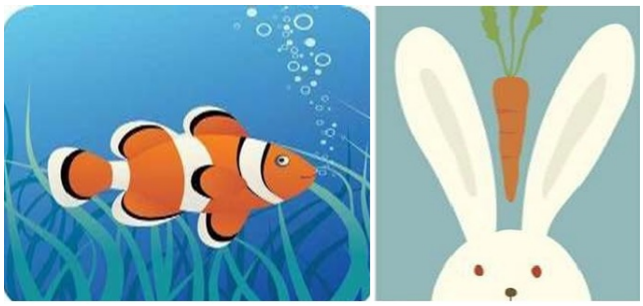
Figure 2. Figures grouped according to emotions. A) P13 - Child-made art image created by a child with autism spectrum disorder used in the survey. The dimensions of this image on the survey measured 5.98″ x 6.16″. B) P11- Representational image used in the survey. The dimensions of this image on the survey measured 6.26″ x 4.33″. C) P08 - Representational image used in the survey. The dimensions of this image on the survey measured 4.92″ x 4.93″. D) P10 - - Realistic image from the survey. The dimensions of this image on the survey measured 6.24″ x 4.98″. E) P02 - Representational image used in the survey. The dimensions of this image on the survey measured 4.17″ x 5.12″. F) P04 - Representational image used in the survey. The dimensions of this image on the survey measured 4.92″ x 4.93″.

Procedures

The surveys were distributed to the teachers at 3 of the sites via Qualtrics, which is an online research database that specializes in data collection and surveys. The data collected from the surveys was analyzed using a statistical software program, Statistical Package for the Social Sciences (SPSS). Two of the sites requested that they be sent the survey via the mail to complete as a hard copy using paper and pen rather than Qualtrics. Teachers were given two weeks to respond to the surveys. Upon completion, the surveys were retrieved by the researchers or via Qualtrics.

A B C

Figure 3. Figures grouped according to nature. A) P03 - Representational image used in the survey. The dimensions of this image on the survey measured 5.87″ x 4.3″. B) P12 - Realistic image used in the survey. The dimensions of this image on the survey measured 6.4″ x 4.53″. C) P09 - Representational image used in the survey. The dimensions of this image on the survey measured 4.44″ x 4.44″.



A B

Figure 4. Individual figures. A) P01 - Representational image used in the survey. The dimensions of this image on the survey measured 4.44” x 4.44”. B) P05 - Representational image used in the survey. The dimensions of this image on the survey measured 5.26″ x 5.28″.

Table 1. Description, classification, and mean ratings for individual images as rated by the participants.

Image	Code	Classification	Content notes	Feeling	Hang rating
PO1	AnOneFish	Representational (animated)	Single animal	3.65	3.4
PO2	AnDog	Representational (animated)	Group animal/ playful	3.19	2.57
PO3	ArJungle	Representational (abstract)	Scene	3.34	3.14
PO4	AnMonkeys	Representational (animated)	Group animal/ playful	3.73	3.3
PO5	AnRabbitEars	Representational (animated)	Single animal	3.32	3.1
PO6	AnCastle	Representational (animated)	Scene	3.55	3.26
PO7	ReStreet	Realistic (photograph)	Scene	3.24	3
PO8	AnGroupFish	Representational (animated)	Group animal	3.93	3.78
PO9	RpTree	Realistic (painting)	Scene/single tree	3.21	3.15
PO10	ReChildren	Realistic (photograph)	Group human	3.69	3.61
PO11	AnTurtles	Representational (animated)	Group animal	3.7	3.49
PO12	ReLandscape	Realistic (photograph)	Scene	2.96	2.74
PO13	ChPeople	Representational (child art)	Group human	3.28	2.97
PO14	ArLandscape	Representational (abstract)	Scene	3.43	3.22

For phase two of the study, which included children, hard copy surveys were distributed to teachers at three schools. The teachers were instructed to distribute the surveys to their students. Of the 3 schools, 74 children completed the surveys. The children and administrators had 3 weeks to return the completed surveys.

Results

Teacher responses

Frequencies for survey responses for each image are presented for teachers’ expectations of children’s feelings when viewing the image and the teachers’ interest in hanging the image in their classroom (Table 1). T-tests were conducted to see if there was a significant difference between the representational images and realistic images.

Table 1 displays mean ratings. Average ratings for the two categories, expectations of feelings and likelihood of hanging images in the classroom,

were summed to obtain an overall ranking score (Table 2 and Figure 5).

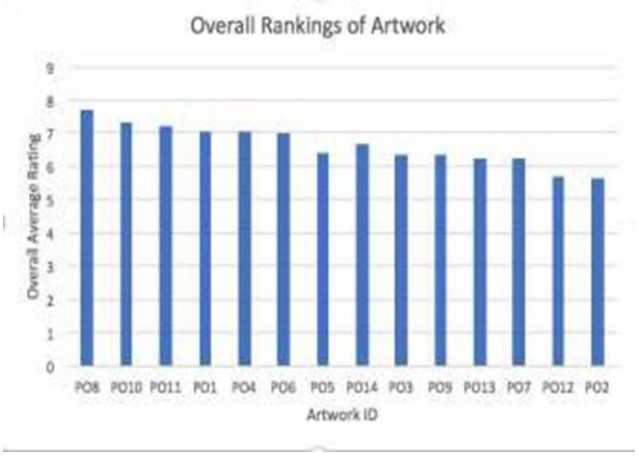


Figure 5. Graphical depiction of the overall rankings of each piece of artwork according to the teachers.

Table 2. Overall image rankings as rated by the teachers

Rank	Image	Code	Rating
1	PO8	AnGroupFish	7.71
2	PO10	ReChildren	7.3
3	PO11	AnTurtles	7.19
4	PO1	AnOneFish	7.05
5	PO4	AnMonkeys	7.03
6	PO6	AnCastle	6.99
7	PO5	AnRabbitEars	6.42
8	PO14	ArLandscape	6.65
9	PO3	ArJungle	6.36
10	PO9	RpTree	6.33
11	PO13	ChPeople	6.25
12	PO7	ReStreet	6.24
13	PO12	ReLandscape	5.7
14	PO2	AnDog	5.66

Attending to individual images, Images 1, 4, 8, 10 and 11 were most frequently selected as images that would help students feel better or much better, with image 8 being the highest rated of all (Table 2). Images 1, 4, 8, and 11 of the highly ranked images were representational animated images while image 10 was a realistic photograph. Regarding Image 5, 2.3% of teachers reported that this image would make children feel much better and only 32.7% reported that the image would make the children feel better. Image 12 received 1.9% likelihood that the image would make the children feel much better, and 20.2% likelihood of making children feel better. As for image 8, 57.8% of teachers indicated they would probably or definitely hang this image in their classroom.

Although 53% of teachers thought Image 10 (a realistic photograph image) would make the children feel better or much better, after Image 8 they rated Image 10 as the one they would most likely hang in their classroom 43.30% of teachers indicated they would probably not and definitely not hang image 5 (representational image) while 47.1% of teachers indicated they would probably not and definitely not hang image 12 (realistic image).

Artwork ratings were then compared across the two categories: representational and realistic. The child artwork was considered separately from the representational images, due to its distinctive features, and the interest in understanding the role the impact of artwork created by peers. The average feeling score for representational artwork (M=3.54) for realistic artwork (M=3.28) and for child art work (M=3.33) indicated that most teachers reported students would feel no difference when looking at the pictures from all categories. The average hanging scores for representational artwork (M=3.16), realistic (M=3.05), and autism child-made art work (M=2.93) indicated on average, teachers reported they were not sure if they would hang the pictures in their classroom.

For the representational artwork, the majority (40.8%) of teachers indicated students would feel no difference when looking at the pictures, followed by better (38.5%), much better (11.8%), much worse (2.7%), and worse (5.8%). Twelve responses (.5%) were not recorded. For the realistic artwork, the majority (50.5%) of teachers reported students would feel no difference when they looked at the picture, followed by better (29.9%), much better (7.2%), worse (8.3%) and much worse (4.2%).

Regarding hanging the pictures in their classroom, for the representational artwork, the majority

(39.2%) of teachers indicated they were not sure, followed by probably (27.81%), probably not (16.3%), definitely (15.2%) and definitely not (1.1%). 12 participants' (.62%) responses were not recorded. For the realistic artwork, the majority (34.0%) of teachers reported they were not sure if they would hang the picture in their classroom, followed by probably not (5.4%), definitely (17.6%), probably (16.2%), and definitely not (5.5%).

An independent sample T-test was conducted comparing representational and realistic art with total scores. Levene's test for equality of variance was significant F (1, 2) =7.48, $p<.05$ when alpha was set to .05 ($p=.006$). However, for the representational and realistic images, the lower quadrant of the 95% confidence interval was .115 and the upper quadrant was .220. Because zero was not included in the 95% confidence interval, it can be assumed that the representational versus realistic mean difference was indeed not significant. There was also no significant difference between the standard deviation of the feelings toward and likeliness to hang of representational pictures (SD=1.09) and the standard deviation of the realistic pictures (SD=1.02).

In total, 6800 responses were taken from the teachers when sub-grouping the images into 4 groups of the built images (n=1036), the emotion images (n=3144), the nature images (n=2096), and the individual figure images (n=524). ANOVA revealed significant results of .001 when alpha was set to a .005 level. The teachers' feel ratings and hang ratings for each image was combined. The standard deviation and mean for the built images (SD=1.02, M=2.36), the emotion images (SD=1.02, M=3.43), the nature images (SD=1.01, M=3.15), and the individual figure images (SD=.934, M=3.53) was calculated.

A Games-Howell Multiple Comparisons Test was run (Figure 6). There was a significant mean difference between built images and emotion images (MD=-1.77), built images and nature images (MD=.108), and individual figure images (MD=.268). There was no statistically significant difference between emotion images and individual figure images (MD=-.091, p=.176). There was also a significant mean difference between emotion images and nature images (MD=.285) and between nature images and individual figure images (MD=-.376). An independent samples T- test was run regarding emotion images and individual figures with the significant value found to be .005.

Games-Howell

(I) VAR00001	(J) VAR00001	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Built (1)	2.00	-.17709*	.03654	.000	-.2710	-.0831
	3.00	.10838*	.03863	.026	.0091	.2077
	4.00	-.26805*	.05169	.000	-.4010	-.1351
Emotions (2)	1.00	.17709*	.03654	.000	.0831	.2710
	3.00	.28546*	.02858	.000	.2120	.3589
	4.00	-.09097	.04468	.176	-.2060	.0241
Nature (3)	1.00	-.10838*	.03863	.026	-.2077	-.0091
	2.00	-.28546*	.02858	.000	-.3589	-.2120
	4.00	-.37643*	.04641	.000	-.4959	-.2570
Indv Fig (4)	1.00	.26805*	.05169	.000	.1351	.4010
	2.00	.09097	.04468	.176	-.0241	.2060
	3.00	.37643*	.04641	.000	.2570	.4959

*. The mean difference is significant at the 0.05 level.

Figure 6. Display of the Games-Howell results showing both significant results as well as insignificant results.

Child responses

The data collected from the children was then analyzed alongside the teacher's responses. Both the children's feelings toward each image as well as the children's likeliness to hang the images were recorded. The mean ratings by the children of each image were recorded in Table 1. An independent samples T-test, with alpha being set at .05, was conducted to analyze whether there was a statistically significant difference between the representational mean ratings versus the realistic mean ratings by the children. ANOVA was run using SPSS.

ANOVA was run with the feel ratings and the hang ratings combined, and the means for the representational (M=3.29) images and realistic (M=3.25) images were found. The standard deviations were calculated for the representational (SD=1.28) images and also the realistic (SD=1.30) images. The lower quadrant of the 95% confidence interval for the representational images was 3.22 with the upper quadrant being 3.35. The lower quadrant of the 95% confidence interval for the realistic images was 3.14 and the upper quadrant was 3.35.

The independent samples T-test found the significant value to be 0.266 between the representational and realistic image values, with the significant 2-tailed value to be .545. The mean difference between the realistic and representational images was .038. With the value of .266 being larger than the p-value set to .05, and the 95% confidence interval not including zero (-.085 to .

160), the results can be interpreted as being statistically insignificant.

Referring to the individual images, images 1, 5, 9, 10, and 13 were most frequently selected as images that would help the students themselves feel better or much better, with image 1 being the highest rated of all by the children (Tables 3 and 4). In relation to the students' likeliness to hang specific images, Images 1, 3, 10, 11, 13 were received the overall highest average scores (Table 3). With the average feel rating and the average hang rating combined, Image 6 received the lowest rating by the children (M=2.21). 93.2% of the students replied to the survey saying that image 6 would make them feel "much worse" while the remaining 6.8% of the students replied saying that the image would make them feel "worse". For image 6, 93.2% of the students on the survey claimed that they would "definitely not" hang this image, while the remaining 6.7% of the students were "not sure" if they would hang image 6.

Table 3. Displays the average feel rating and average likeliness to hang for each piece of artwork as rated by the students.

Image	Code	Classification	Content notes	Feel rating	Hang rating
PO1	AnOneFish	Representational (animated)	Single animal	4.63	3.89
PO2	AnDog	Representational (animated)	Group animal/playful	3.92	3.86
PO3	ArJungle	Representational (abstract)	Scene	3.15	3.93
PO4	AnMonkeys	Representational (animated)	Group animal/playful	3.18	3.8
PO5	AnRabbitEars	Representational (animated)	Single animal	4.23	3.88
PO6	AnCastle	Representational (animated)	Scene	1.08	1.14
PO7	ReStreet	Realistic (photograph)	Scene	1.55	2.08
PO8	AnGroupFish	Representational (animated)	Group animal	1.62	2.08
PO9	RpTree	Realistic (painting)	Scene/single tree	4.14	3.86
PO10	ReChildren	Realistic (photograph)	Group human	4.14	4
PO11	AnTurtles	Representational (animated)	Group animal	3.58	4
PO12	ReLandscape	Realistic (photograph)	Scene	3	3.22
PO13	ChPeople	Representational (child art)	Group human	3.99	3.92
PO14	ArLandscape	Representational (abstract)	Scene	2.81	2.14

Table 4. Display of the combined average feel rating and hang rating as rated by the students.

Rank	Image	Code	Rating
1	PO1	AnOneFish	8.52
2	PO10	ReChildren	8.14
3	PO5	AnRabbitEars	8.11
4	PO9	RpTree	8
5	PO13	ChPeople	7.91
6	PO2	AnDog	7.78
7	PO11	AnTurtles	7.58
8	PO3	ArJungle	7.08
9	PO4	AnMonkeys	6.98
10	PO12	ReLandscape	6.22
11	PO14	ArLandscape	4.95

12	PO8	AnGroupFish	3.7
13	PO7	ReStreet	3.63
14	PO6	AnCastle	2.21

To further study any significant statistical trends of the representational and realistic images regarding the children's responses, the images were sub-grouped into four image categories; built images (n=309), emotion images (n=886), nature images (n=591), and individual figure images (n=294) with an overall total of 2080 children responses included. The overall standard deviations (SD) and means (M) of the 4 groups of images was calculated. This mean combined the children's hang responses with the feeling ratings. The four grouping of images was the built images (SD=.881, M=1.54), the emotion images (SD=1.06, M=3.50), the nature images (SD=1.14, M=3.41), and the individual figures images (SD=.901, M=4.23).

ANOVA revealed the children responses between the 4 sub-grouped images to be significant (p=.001) with alpha set to the .05 level. A Games- Howell Multiple Comparisons Test was conducted to further differentiate between which specific sub-grouping of the images were statistically significant (Figure 7). There was a statistically significant mean difference between the built images and all three of the subsequent image groups of emotions (MD=-1.97), nature (MD=-1.88), and individual figures (MD=-2.70). There was also a significant mean difference between the emotion images and the individual figures (MD=-.829). There was not a statistically difference between the means of the emotion images and the nature images (MD=0.0984, p=0.341).

Games-Howell

(I) VAR00001	(J) VAR00001	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Built (1)	2.00	-1.97377*	.06146	.000	-2.1321	-1.8155
	3.00	-1.87535*	.06875	.000	-2.0523	-1.6983
	4.00	-2.70395*	.07268	.000	-2.8912	-2.5167
Emotions (2)	1.00	1.97377*	.06146	.000	1.8155	2.1321
	3.00	.09842	.05901	.341	-.0534	.2502
	4.00	-.73018*	.06356	.000	-.8939	-.5664
Nature (3)	1.00	1.87535*	.06875	.000	1.6983	2.0523
	2.00	-.09842	.05901	.341	-.2502	.0534
	4.00	-.82860*	.07062	.000	-1.0105	-.6467
Indv Fig (4)	1.00	2.70395*	.07268	.000	2.5167	2.8912
	2.00	.73018*	.06356	.000	.5664	.8939
	3.00	.82860*	.07062	.000	.6467	1.0105

*. The mean difference is significant at the 0.05 level.

Figure 7. Display of the Games- Howell Comparison test regarding the 4 sub groups of images as rated by the children themselves.

Content analysis

Teachers' open-ended responses were analyzed for further information about the images, using a conventional content analysis [26]. For Image 8, the most positively ranked image, teachers made described it as calm, having positive colors, and enhancing positive focusing behaviors. Furthermore, teachers noted the image might serve a useful purpose, such as learning to count by counting the number of fish in the picture. The educational benefit of images was a theme present in other responses also.

Teachers who responded positively to image 10 liked the playfulness of the picture and the theme of friendship in the image. Four teachers observed the positive display of socialization.

Similarly, for image 11, teachers noted the depiction of friendship. However, for the same image, although 2 to 3 teachers described a sense of calmness and comfort, one teacher indicated the picture would be, "confusing for students" and one observed the darkness of the background as potentially inciting fear.

In addition to images 8 and 11, that both contained animals, images 1 and 4 received positive comments about their content because, as one teacher wrote, "students like animals." In general the presence of animals in a picture was a frequently cited reason for positive feelings and for interest in hanging images in the classroom. Other responses mentioned students' familiarity with characters such as Disney's "Nemo." Finally, responses to image 4 were focused on the humor of the image. Two lower raters suggested that, "not all students may like this picture" and that it might not be appropriate for all ages. However, overall, having an element of humor was associated with higher ratings.

Qualitative responses for the less desired images (such as image 5) were described as, "lacking action features" and "unappealing". Image 12 was described as "too busy," "unappealing," and "may cause student to feel lost." One teacher indicated it offered opportunity to "discuss clouds, streams, lakes, fields" and one suggested it would, "sustain interest," but the majority of teachers did not favor this image. In general teachers indicated while realistic scenes were calming, they did not expect children to be interested in them. In contrast,

images 2 and 5 were disliked due to their content being contradictory to reality.

In summary, reasons for positive ratings focused on the presence of animals (especially fish), a sense of calm or playfulness, depiction of positive social interactions, and images that served practical teaching purposes. Lower rankings tended to elicit explanations of images being uninteresting or inappropriate for the age and population. A number of explanations for these findings can be considered.

Discussion

Researchers have become increasingly interested in modification of the built environment as a means of providing more effective treatment and education for children with autism [1]. Specifically, artwork as an interior design component has the potential to be either distracting or therapeutic for children in this population [4,20]. However, a lack of empirical evidence on the subject leaves architects and interior designers with more questions than answers.

The goal of this study was to obtain initial insight from teachers regarding the use of art in spaces serving students with autism. Teachers were asked to rate various art images on how they expected them to impact the children and on whether the teachers would consider hanging the images in their classroom spaces. The results are intended to provide information for future experimental study.

Overall the findings from the teachers' results suggest the majority of teachers in this study felt that students with autism would not feel any better or worse if the artwork was adjusted in the classroom. The results from the teachers and children alike also indicate that overall, the children would not feel significantly better or worse regarding which images were hung in classrooms. This opinion persists across all categories of artwork (representational, realistic, and child-made artwork). Teachers rated the use of representational artwork to have the potential to be slightly more effective in improving the feelings of children in their classrooms compared to the other art forms assessed, by a small margin.

In terms of the further subgrouping, there was no statistically significant difference between the emotion images and the individual figure images when looking at the teachers' responses. There were, however, significant differences between the means of emotion images, built images, individual figures, and nature images for the teachers' responses. As for the children's responses, there was a statistically significant difference between the emotion images and all 3 of the other sub-groups. There was no significant differences of the children's preferences between the emotion images and nature images.

Often times, children with autism are unable to use abstract language, or use language in a metaphorical sense, therefore creating a lack of symbolic play in their environment [27]. The inability to create and use abstract language in children with autism could be the reasoning behind teachers slightly preferring representational artwork for the children. Children with autism learn using an associative mechanism, meaning that when viewing artwork, symbolic portrayals are not seen as having a referent in the world [28-32]. The representational artwork may better help the children to understand or use language in the abstract form while also reinforcing the idea of artwork being tied to the outside world.

Teachers were also slightly more likely to give a higher rating to artwork if it contained animals. Consequently, a majority of teachers also indicated they were not sure if they would hang any of the artwork selections used in this study in their classrooms. While there may be many reasons why teachers in this study responded with varying degrees of acceptance regarding the artwork, the overall neutral position on the usefulness of the images points to the lack of evidence-based investigation, and a possible disbelief that art could have significant impacts. It is hypothesized that teachers and children may have responded with some ambivalence to the questions asked because they did not have clear guidance regarding the use of artwork.

A number of considerations may be gleaned from comparison of the individual image results and the qualitative responses. 'Teachers' responses indicated they expected representational images to be preferred in their classrooms. Specifically, teachers preferred representational images that were both relaxed and colorful, and that depicted animals. They indicated a desire for images that displayed positive socialization behaviors and that

served practical teaching purposes. Teachers indicated humor was desirable, while dark, moody colors were not. They expressed displeasure with images that were confusing (contradicting reality), too complex, or that lacked a central focus or interesting content within the image itself.

Using this information from teachers and students, a controlled experiment should be conducted to ascertain the scientific effects, if any, of artwork on the behavior of children with autism. Further information should be obtained about the direct interactions of students with artwork. When selecting artwork for experiments the results of this survey can be considered. Namely, artwork that is representational, pleasant, colorful, and containing content such as animals is preferred by teachers, and expected by experienced teachers to have the best impact on children with autism. As this is in contrast to prior findings suggesting realistic images are the most restorative option in service settings, future researchers are advised to consider multiple forms of artwork in investigating the scientific outcomes of their use among this population [10].

In future studies, more emphasis needs to be placed on delving into the feelings of teachers and children regarding certain types of images, such as the emotion images, the nature images, individual figure images, and built environment images. Further sub-grouping may also be useful. Specific questions should be asked and gathered in future studies to come to know why there is a significant difference in the overall feelings of teachers and children between built environment images and individual figures, but no difference between emotion images and individual figures. Further examining should also be done to asses why there was no difference in feelings between certain subgroups for the children's responses between groups, such as the nature images and emotion images.

Conclusion

Further research must be conducted to study the behavioral impacts focal art images might have on children with autism. It is unclear due to the insignificant results of the current study whether or not representational or realistic types of artwork have a positive or negative effect on the behaviors of children with autism. Although teachers in our study did not demonstrate strong opinions on this topic, some insights were gathered on the selection of artwork for future study. Specifically, teachers preferred animated, representational images for their classrooms, and images that might have practical applications such as teaching socialization and learning to count.

Although there was no clear significant difference between the representational images and realistic images for the children and teachers alike, there were significant differences when further breaking down the specific types of images. It can be inferred from the current study that both teachers and students rated specific groupings of images different than others based on the images' inherit properties; whether that be a built environment, emotional images, individual figures, or images depicting nature. Accordingly, the authors propose the following research questions that should be explored through observation and experimental manipulation:

What effect (if any) does artwork in general have on the behavior of children with autism?

Are there specific autism-related behaviors associated with specific types of art?

What are the reasons, if any, that teachers and children rate images differently based on their specific qualities, such as depicting nature versus depicting a built environment?

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