TherAplay Evidence Based Design | Studio 5

IDES 424 | Marie Lindahl

Investigation Phase

Case Study #1 - Furniture

Objective:

"Children with autism have sitting and on-task behavior problems in class. In this study, the effect of three alternative classroom-seating devices such as regular classroom chairs, therapy balls, and air cushions were examined on students' classroom behavior," (Neurol 2017).

Materials and Methods:

"15 students with autism participated in this A1-B-A2-C multiple treatments study from Mashhad's Tabasom School, Mashhad, Iran in 2014. Students' behaviors were video recorded in three phases: sitting on their common chairs during phase A, air-sit cushioned in phase B, and ball chairs in phase C. Sitting times and on-task behaviors were quantified by momentary time sampling and compared during different phases for important changes during 8 wk. Additionally, the Gilliam Autism Rating Scale-Second Edition test was used to examine stereotyped movements, social and communication skills of the students in the before and after research," (Neurol 2017).

Results:

"Significant increases in in-seat behaviors in 86.7% (thirteen out of 15) of the students and on-task behaviors in 53.3% of the students (eight out of 15) when seated on therapy balls. Air cushions had no significant effects on in-seat/on-task behaviors. The results also showed significant decrease in stereotyped movement and increase in communication and social skills of these students. The teachers also preferred the use of the balls and/or air-cushioned chairs for their students.," (Neurol 2017).

Conclusion:

"Therapy ball chairs facilitated in-seat behavior and decreased autism related behavior of the students with Autism Spectrum Disorder in class.," (Neurol 2017).

Common Chair

Ball Chair

Air-sit Cushion

Table 1

The Effects of Different Seating on In-Seat Behavior

	Mean *														
Type of chair	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
Chair1	44.1	34.7	54.5	54.2	26	19	41.5	44.7	47.5	44.7	51.5	41.2	45.5	14.6	45.8
Cushion	35.4	22.2	58.5	53.2	19.2	46.3	40.3	51.2	52.5	51.2	43.8	38	58.6	45.6	57
Chair2	40.5	44.5	57.2	54	22.8	41.6	17.6	46.4	56	46.4	51.2	46.8	56	36.8	59.2
Ball	58.8	51	57.6	59.7	40	59.2	50.7	58.1	58.3	58.1	48.5	44.1	45	40.6	56.6

S= Student

*:= (mean of 60 times observation per session, for six sessions during 2 wk

Investigation Phase

Case Study #2 - Colors

Methods:

"Thirty-four children took part in the study, 20 with autism and 14 typically developing children (all males). Children were screened for color vision deficiencies using the Ishihara Color Vision Test (Ishihara 1987). One child with autism failed to complete the test and was excluded from the study, resulting in a final sample of 19 children with autism. All children with autism were high functioning, attended schools for children with autism and had been diagnosed by clinicians according to the criteria of DSM—IV (APA 1994). None of the children in either group had received a diagnosis of Attention Deficit Hyperactivity Disorder (ADHD). Typically developing children and children with autism were matched for non-verbal cognitive ability as assessed by Raven's Coloured Progressive Matrices (Sets A, Ab and B, Raven et al. 1990), (t (31) = 0.10, p = 0.92) and chronological age (t (31) = 1.71, p = 0.1), (see Table 1)" (Franklin, 2008).

Procedures:

"Each participant completed both the visual search task and the delayed matching-to-sample task, with the order of task counterbalanced for each sample. The tasks were conducted under Illuminant C (simulated natural daylight), temp = 6,500 K." (Franklin, 2008).

Methods:

"The percentage of correct responses for the color trials and the form trials on the delayed matching-to-sample and visual search tasks was calculated. A three-way mixed ANOVA with the repeated measures factors of Domain (color/form) and Task (delayed matching-to-sample/visual search) and an independent groups factor of Group (children with autism/controls) was conducted on the accuracy percentages." (Franklin, 2008).

Table 1 Chronological age and Raven's Matrices raw scores for both samples, Experiment 1

	Age			Ravens		
	Mean	*SD*	Range	Mean	*SD*	Range
Autistic ($N = 19$)	10.9	1.7	7–13	29.5	5.9	15–36
Control ($N = 14$)	9.8	2.2	7–13	29.7	4.2	19–35

Table 2 *Y*, *x*, *y* and L*a*b* co-ordinates of stimuli

	Y	*x*	*y*	L*	a*	b*
Yellow1	128	0.46	0.46	82.35	0	76.71
Yellow2	148	0.46	0.48	87.23	−6.32	85.86
Red1	28.5	0.55	0.31	43.61	55.20	25.18
Red2	26.4	0.53	0.28	42.11	58.78	12.01
Green1	32.4	0.21	0.45	46.22	−59.18	10.82
Green2	34.1	0.19	0.39	47.29	−57.58	−1.26

Investigation Phase

Case Study #3 - Lighting

Methods:

"A total of 152 children with an ASD participated in this study (referred to as the "ASD" group). The ages ranged from 5 to 19 years with an average age of 10.7 ± 3.4 years; the group consisted of 135 boys (10.9 ± 3.5 years) and 17 girls (9.8 ± 2.6 years). Of the 152 participants, 145 were patients receiving clinical services at the University of Missouri Thompson Center for Autism and Neurodevelopmental Disorders, an interdisciplinary academic medical center specializing in diagnosis and treatment of ASD. Diagnostic interviews, caregiver questionnaires, and observation focusing on DSM-IV criteria (American Psychiatric Association, 2000) were used for the diagnosis of ASD in these individuals. Evaluations were conducted by a pediatrician and/or neuropsychologist; if there was disagreement, the results were discussed jointly to reach a consensus diagnosis. The remaining 7 children were diagnosed using a variety of measures, which were reviewed by the authors to confirm the ASD diagnosis. In addition, each of these 7 families completed the Social Communication Questionnaire Lifetime (SCQ) (Eaves et al. 2006) and Social Responsive Scale Questionnaire (SRS) (Constantino and Gruber 2005), all of which were scored above the ASD cutoff" (Daluwatte, 2012).

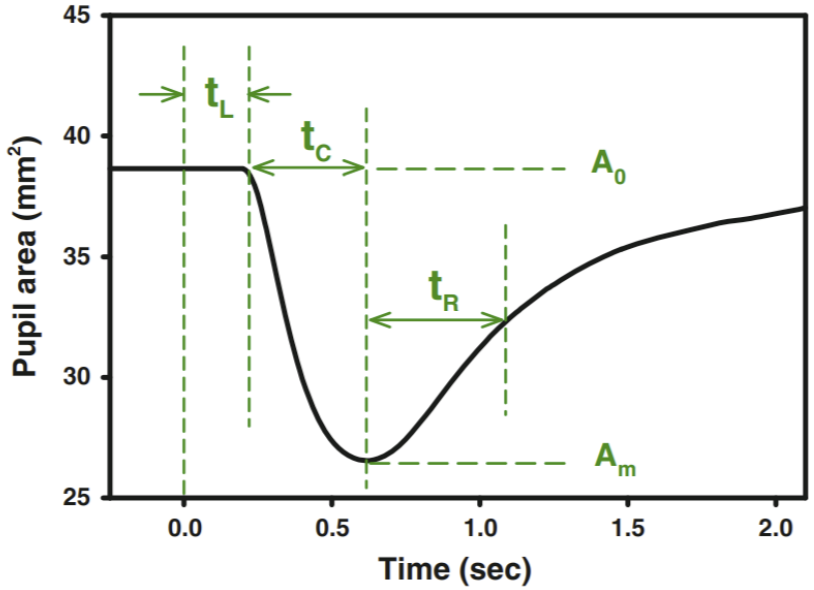
Results:

"The mean and standard deviations of all measured PLR and HRV parameters in the TD, ASD, and NDD groups are shown in Tables 2 and 3, respectively. The ANCOVA model revealed that the stimulation condition (adaptation and stimulus intensity) had a statistically significant effect (p\0.0001) on all PLR parameters, including the constriction time (tC), relative constriction amplitude (DA%), latency (tL), redilation time (tR), constriction velocity (vC), and redilation velocity (vR). A" (Daluwatte, 2012).

Table 1 Distribution of IQ and medication use in TD, ASD and NDD groups

Group	IQ	w/o med	w/med
TD	High-IQ	98	0
	Low-IQ	2	0
ASD	High-IQ	44	34
	Low-IQ	23	21
ASD diagnosis			
Asperger	High-IQ	9	11
	Low-IQ	2	0
Autism	High-IQ	23	14
	Low-IQ	19	15
PDD-NOS	High-IQ	12	9
	Low-IQ	2	6
NDD	High-IQ	9	9
	Low-IQ	7	9

High-IQ: IQ score of 80 or higher (at or above 9.1th percentile)
Low-IQ: IQ score lower than 80 (below 9.1th percentile)



Investigation Phase

Case Study #4 - Wayfinding

Methods:

"We have taken a mixed method approach to understanding visual supports for children with ASD. We made use of previous research led by the first author, including a multiyear ethnographic study of caregivers of children with autism [18], focus groups centered on children with autism spectrum disorder and their caregivers [17], and an in sit study of the deployment of a new ubiquitous computing technology for classrooms behavior management of children with special needs [19]. Building on these results, we then undertook a qualitative field study to understand the needs of students and teachers in special education classrooms with a specific focus on visual communications and education tools. We worked with three schools in the Orange County, California area: an Interagency Assessment Center for children from 18 months to 3 years old from across the county, a special education preschool, and an integrated elementary school that hosts regular education classrooms, general special education classrooms, and autism-specific classrooms" (Hayes, 2009).

Results:

"Through fieldwork, interviews, participatory design sessions, and focus group discussions, we designed, developed, and evaluated three novel ubicomp visual supports. In this section, we describe the results of these efforts, both in terms of their evaluation of our interventions and in terms of design implications for the creation of ubicomp technologies in support of children with ASD. We place particular emphasis here on the results of the focus group evaluation. However, as noted in the Sect. 3, it is impossible in such an interactive and iterative design process to completely tease out results that originated in these sessions from those that came about in our discussions with design partners and through our early interviews and fieldwork" (Hayes, 2009).

Table 2: Rating the significance of the five human senses in contributing to a positive guestroom experience (satisfaction with the accommodation)

	A	B	C	D	E	F	G	H	Total	Rank
Auditory	2	2	2	4	4	3	4	4	25	4
Olfactory	4	1	1	2	2	2	2	3	17	2
Sight	3	4	3	1	1	1	1	1	15	1
Taste	5	5	5	5	5	4	5	5	39	5
Tactile	1	3	4	3	3	5	3	2	24	3

Fig. 2 (*top left*) A visual prompt to be shown to a child upon requesting that child to "clean up;" (*top center*) Options to answer a question about today's weather; (*top-right*) An oversized button that plays a recorded sound when pressed for mediated speech functionality; (*bottom*) A "communication wallet" carried by a child containing a subset of frequently used cards

Fig. 3 Mocotos prototype showing library of available cards. When in this mode, selecting a card will enlarge it in the center for previewing

Fig. 7 (*left*) A student sits at his desk during individual work time, while the large display indicates that everyone is working. (*top-right*) The large classroom display showing multiple children's schedules at once. In this case, the schedules are all the same, but that is not necessarily true in all cases. (*bottom right*) An individual student's vSked device showing the first activity of the day, picking a reward toward which the child will work

Investigation Phase

Case Study #5 - Acoustics

Objective:

"This study examined the effects of Ayres's sensory integration intervention on the behavior and task engagement of young children with autism spectrum disorders (ASD). Clinical observations and caregiver reports of behavior and engagement also were explored to help guide future investigations" (Watling, 2020).

Methods:

"This single-subject study used an ABAB design to compare the immediate effect of Ayres's sensory integration and a play scenario on the undesired behavior and task engagement of 4 children with ASD" (Watling, 2020).

Results:

"No clear patterns of change in undesired behavior or task management emerged through objective measurement. Subjective data suggested that each child exhibited positive changes during and after intervention" (Watling, 2020).

Conclusion:

"When effects are measured immediately after intervention, short-term Ayres's sensory integration does not have a substantially different effect than a play scenario on undesired behavior or engagement of young children with ASD. However, subjective data suggest that Ayres's sensory integration may produce an effect that is evident during treatment sessions and in home environments" (Watling, 2020).

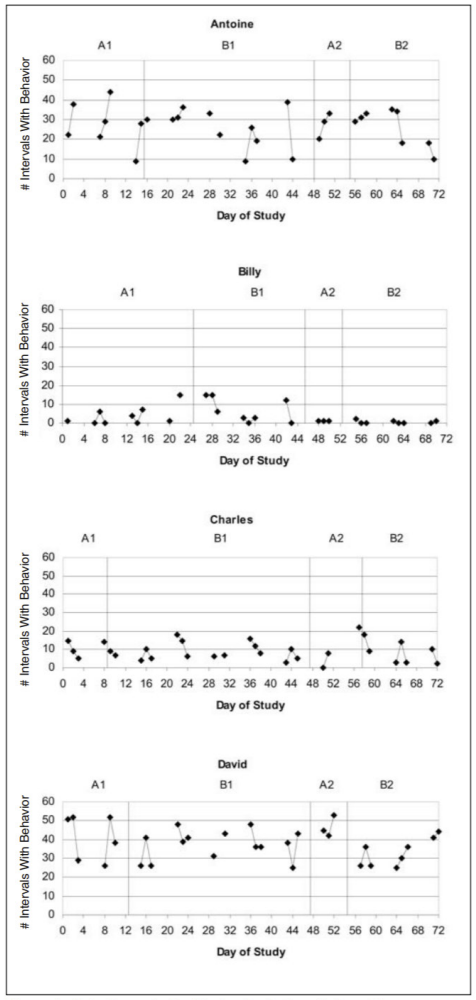


Figure 1. Data for undesired behavior in the clinic setting immediately after Ayres's sensory integration for each participant.

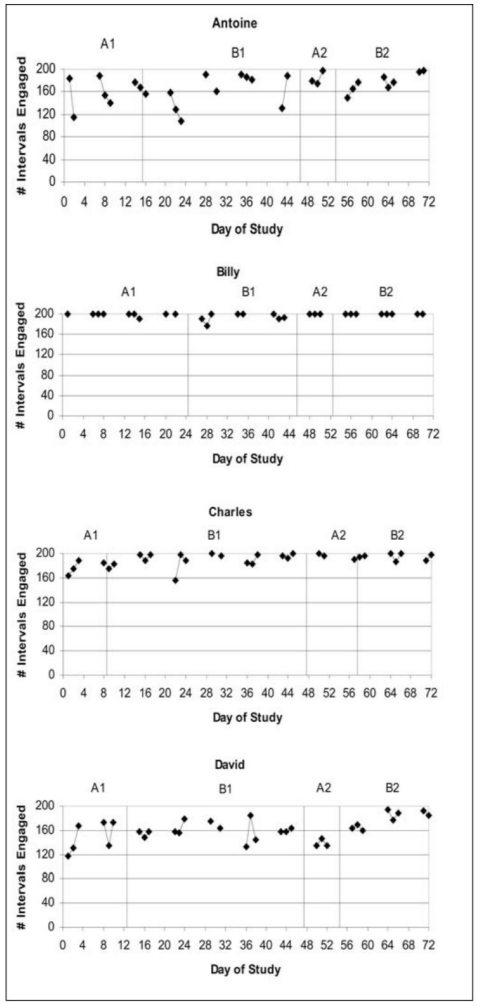


Figure 2. Data for engagement in the clinic setting immediately after Ayres's sensory integration for each participant.

Investigation Phase

Case Study #6 - Materials

Methods:

"This is a case-control study with male children and adolescentswith ASD, aged 4–16 years, consecutively recruited from Neuro-pediatrics Service at Hospital de Clínicas de Porto Alegre; controlswere recruited from the community in the same area, which fol-lowed routine visit to Basic Health Unit, both between 2014 and2015. The controls were selected according to socioeconomic sta-tus and age (exact year and a permitted deviation of ±4 months), inaddition all of the controls did not use medications, in order to avoidvariations in characteristics. Diagnosis of ASD was confirmed usingDiagnostic and Statistical Mental Disorder IV criteria (AmericanPsychiatric Association, 1994). This study was approved by theResearch Ethics Committee of Hospital de Clínicas de Porto Alegre-Protocol number 13-0321 and parents/guardians signed informedconsent forms. Exclusion criteria were patients with diagnosis fromgenetics syndromes or metabolic disorders, for example, FragileX-Syndrome, Down's Syndrome and Tuberous Scleroses" (Castro, 2016).

Results:

"Forty-nine males with ASD and matched controls wereincluded; the mean age was 10.06 ± 3.82 and 10.02 ± 2.83 years,respectively. The median age of onset of symptoms was 1.5 years(0–7) for ASD children. The nutritional status of our sample is shown in Table 1.Most ASD and controls were classified as adequate according toheight-to-age; in contrast, according to BMI-to-age, the ASD grouppresented an association with obesity and controls with adequate status. Additionally, the ASD group showed high thinness preva-lence" (Castro, 2016)

Table 1
Classification according to WHO through z-score for anthropometric data*.

Variable	Controls n (%)	ASD n (%)	p value
Height-for-age			
Adequate height-for-age	46 (93.87)	41 (83.67)	0.734
Low height-for-age	3 (6.12)	8 (16.32)	
BMI-for-age			
Thinness	3 (6.12)	11 (22.44)	0.032
Adequate	**25 (51.02)**	15 (30.61)	
Overweight	12 (24.48)	5 (10.20)	
Obesity	9 (18.36)	**18 (36.73)**	

ASD: Autism spectrum disorder. BMI:Body mass index.
Bold value indicates the association (*chi square test*).
* Height/age (n = 49) and BMI/age (n = 40), according to WHO (2009).

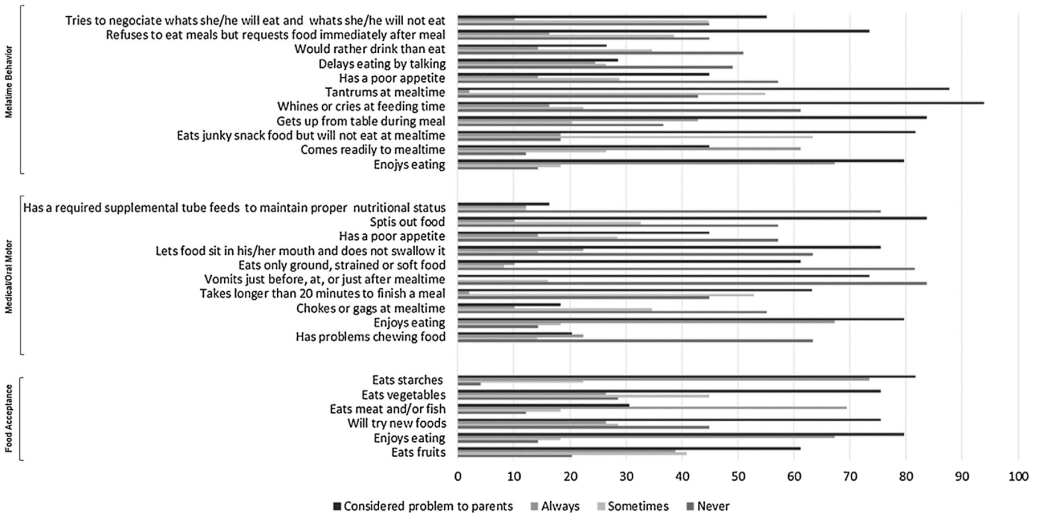
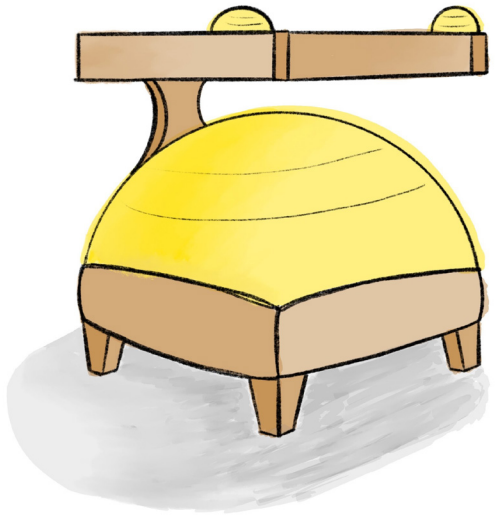


Fig. 1. Three factors of Behavior Pediatric Assessment Scale in male children with ASD and parents' feelings regarding whether or not the behavior is a problem for them.

The Gumdrop Chair

Concept #1

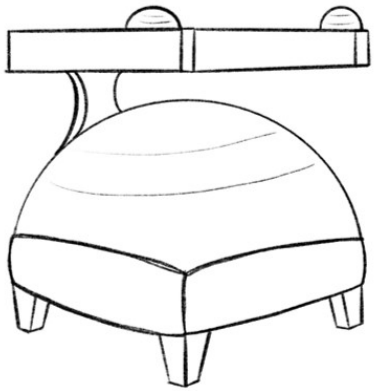


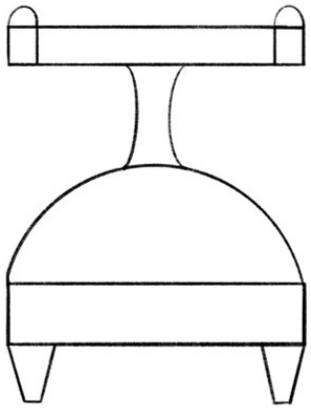
What is it?

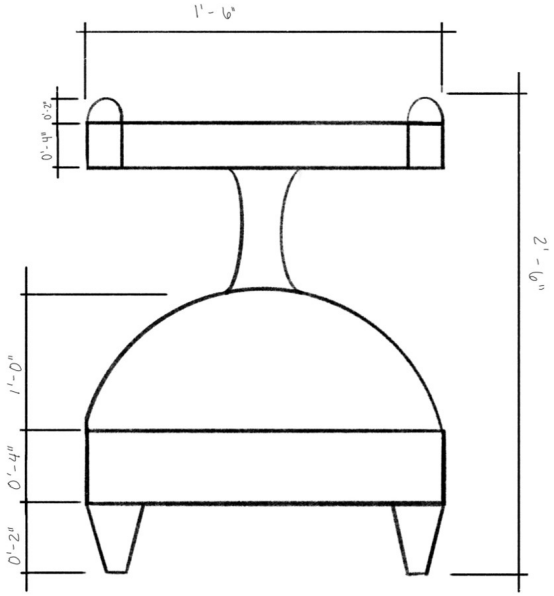
The Gumdrop Chair is designed using the same technique as the ball chair. Since the Ball Chair provoked the best results in the children, I decided to base my design off of the same technique. But instead, this chair is stationary and doesn't utilize rolling casters. I wanted to make the user feel supported, like a hug, while also giving them the flexibility to move and bounce to calm themselves. On the arm rests, there are smaller textured balls to encourage fidgeting. This chair acts more like a sofa, rather than a desk chair. This would be a great tool to help kinds focus when they're being read to, or a therapy chair to help children calm themselves.

How Does it Work?

The Gumdrop Chair is meant to fit a child size frame. Using a child's frame for sizing reference will help the child to feel snug and secure in the chair, while also being able to freely move and fidget. This piece will be used to help children sit and read, watch television, sit through therapy, or sit and calm their emotions. This chair exhibits sensory features that were proven to help with children who struggle portraying emotions and comforting themselves. According to the case study, the Ball Chair worked wonders for children with autism, which his why I decided to use the main feature of the Ball Chair in my design.







The Sensory Board

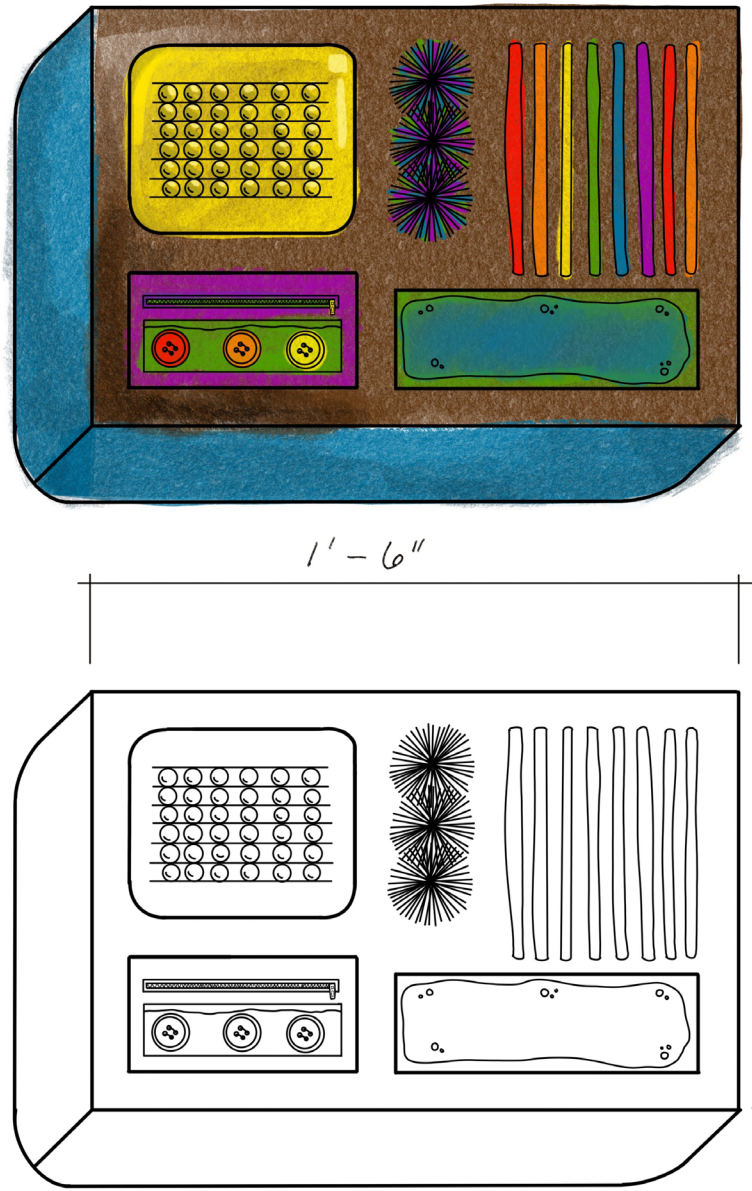
Concept #2

What is it?

The sensory board is a weighted desk with built-in sensory toys attached t the surface. The commonly used sensory toys are great for helping calm, focus, or strengthen a child's sensory sensitivities. This piece will be used on the lap of the child. The weight of the object will help the child feel like they are anchored to where their sitting, while helping them to feel calm and focused.

How Does it Work?

The weight attached to the bottom of the sensory board plays the same role as a weighted blanket. Feeling weight can help children to feel the benefits of "pressure therapy," which is a common practice used with children with autism. The weight mimics that of a hug or swaddle. The sensory board allows the children to develop stronger hand-eye coordination and sensory skills. It occupies the brain and mimics easy puzzle-like activities that helps those with autism stay focused for longer periods of time. These toys are also used with children with ADHD and ADD and have proven to extend the attention span of many children.



The Piggy Pad

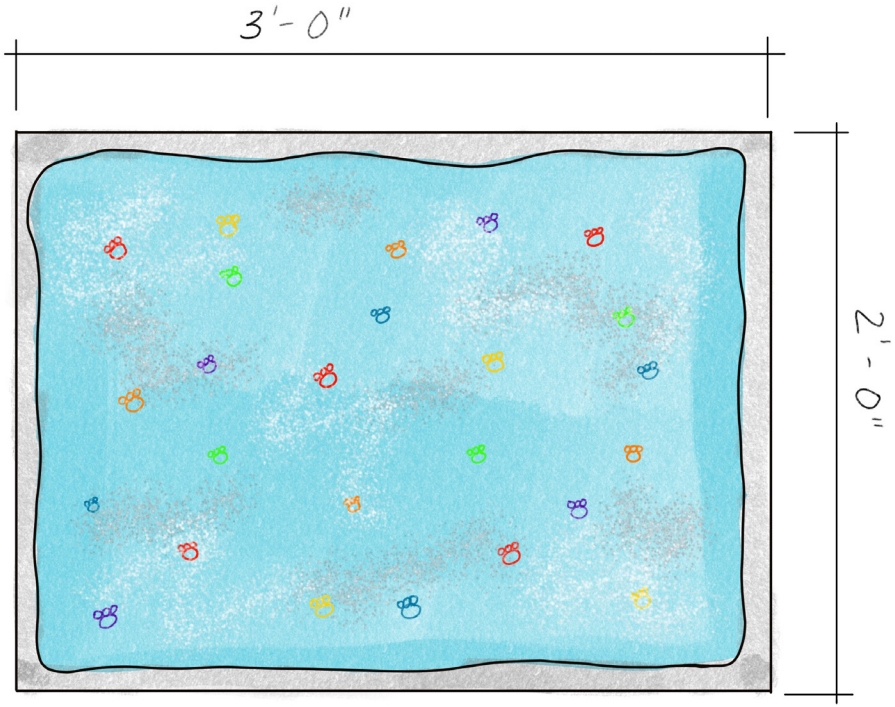
Concept #3

What is it?

The Piggy Pad is a rug-like pad that is filled with a gel-like substance. The pad is meant to be slid under a desk for children to step on while working, or it can be used alone! The pad is filled with little toys, sequence and glitter, similar to the smaller pads made for a tabletop (shown on the right). This pad can be used with or without the children's socks on, and can be cleaned very easily.

How Does it Work?

The Piggy Pad allows the children to work sensory skills with their feet, instead of their hands. Children can stand, sit, or lay down on the pad. The gel inside the pad allows the children to push the toys around, draw shapes in the gel, or simple just feel and enjoy the textures of the pad.

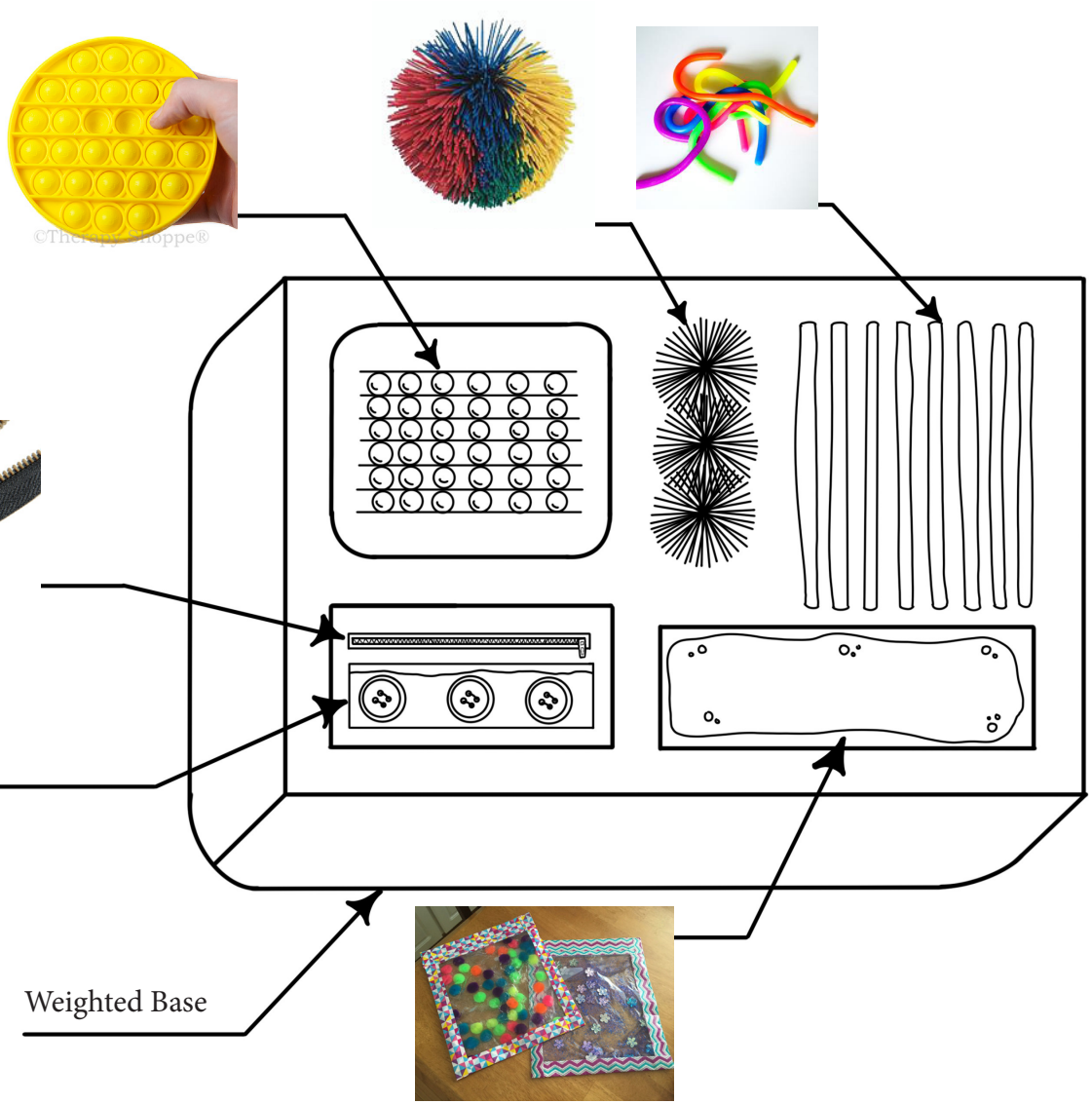


What I Decided...

Concept #2 : Sensory Board

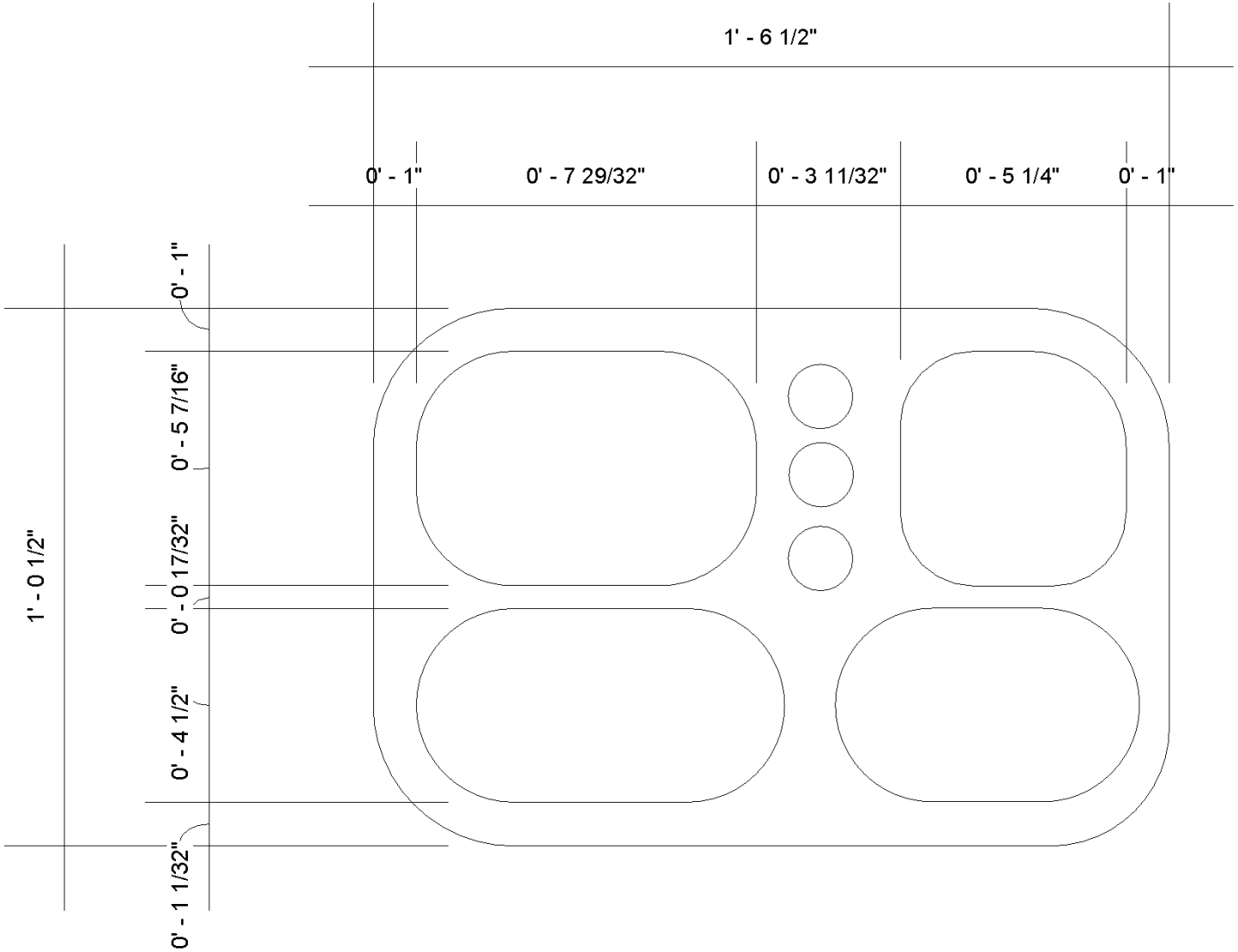
Why it is Effective

The Sensory Board is an effective piece of furniture that will help children during therapy or when conversioning. The weighted padding on the bottom will help children feel more secure and comfortable while the fidget toys will provide color and physical stimulation to the child. This will help the child stay focused and engage in conversations.



Plan View

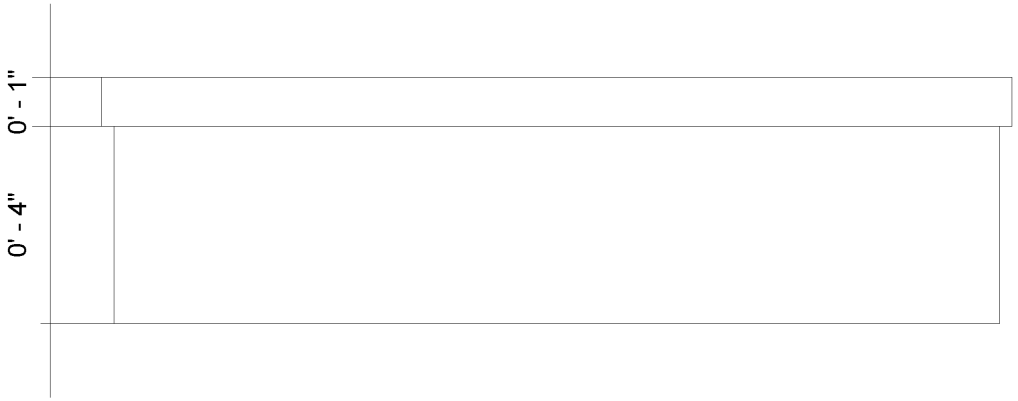
Concept #2 : Sensory Board



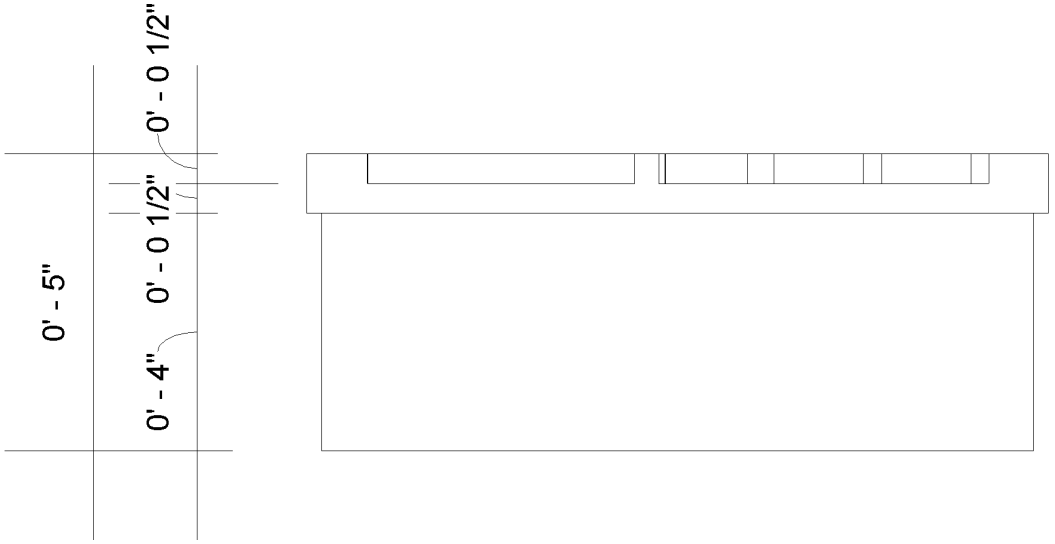
Section & Elevations

Concept #2 : Sensory Board

East Elevation



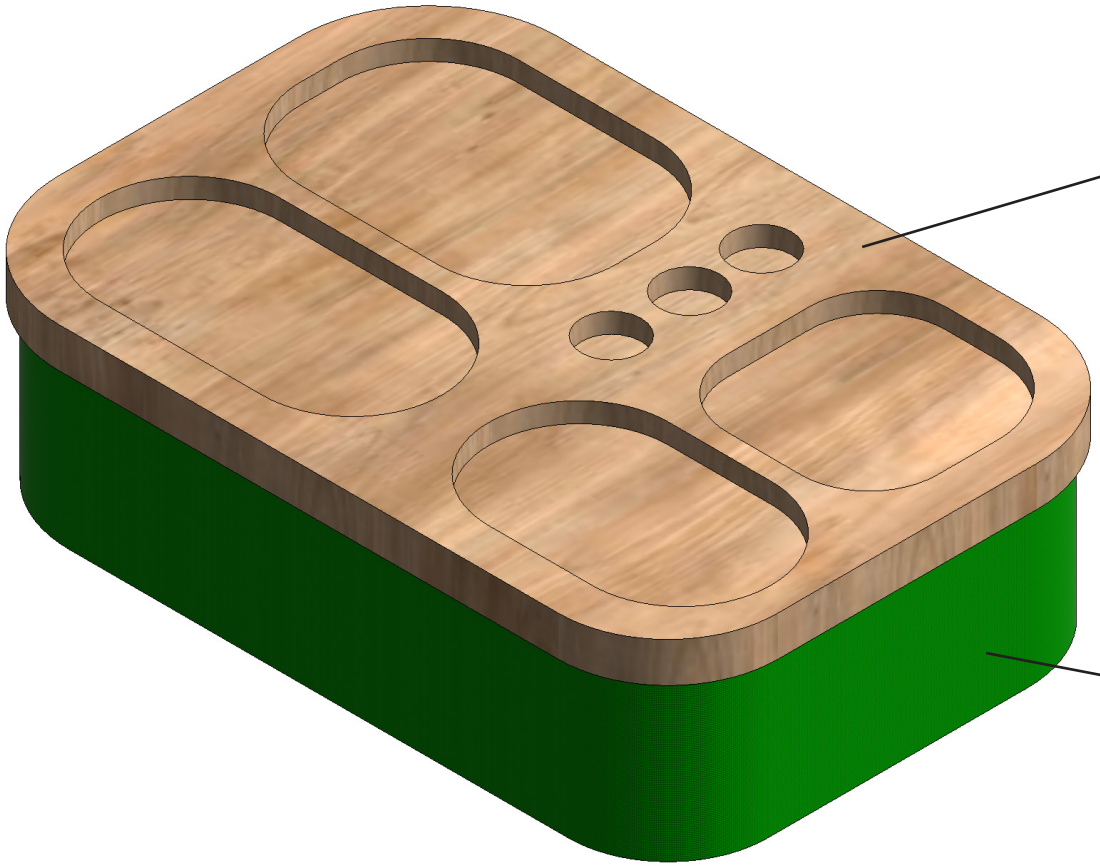
North Elevation



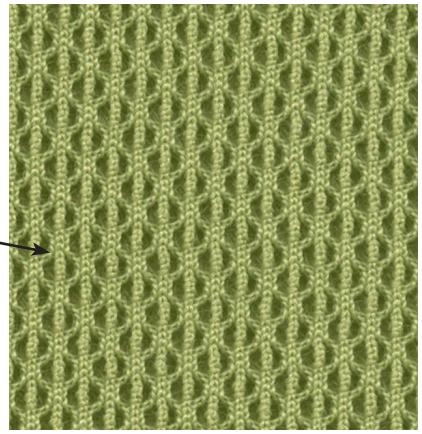
Section View

Perspective & Materials

Concept #2 : Sensory Board



Wood Laminate



Steelcase Upholstery - Connect

Charlotte, NC. (n.d.). Retrieved September 29, 2020, from https://datausa.io/profile/geo/charlotte-nc/

Hospital Interior Design Trends to Reduce Active and Latent Failures: Thought Leadership. (2019, June 10). Retrieved September 29, 2020, from https://hmcarchitects.com/news/hospital-interior-design-trends-to-reduce-active-and-latent-failures-2019-02-01/

Hmc_admin. (n.d.). 2019's Top Healthcare Interior Design Trends Modern Facilities Should Embrace. Retrieved September 29, 2020, from https://hmcarchitects.com/thought-leadership/2019s-top-healthcare-interior-design-trends-modern-facilities-should-embrace-slp/

Park BJ;Tsunetsugu Y;Kasetani T;Kagawa T;Miyazaki Y;. (n.d.). The physiological effects of Shinrin-yoku (taking in the forest atmosphere or forest bathing): Evidence from field experiments in 24 forests across Japan. Retrieved September 29, 2020, from https://pubmed.ncbi.nlm.nih.gov/19568835/

View Through a Window May Influence Recovery from Surgery. (n.d.). Retrieved September 29, 2020, from https://www.healthdesign.org/chd/knowledge-repository/view-through-window-may-influence-recovery-surgery

Is nature part of your hospital's healing process? (n.d.). Retrieved September 29, 2020, from https://www.hfmmagazine.com/articles/2787-is-nature-part-of-your-hospitals-healing-process

Petrovic, M. (2016, October 25). Case study: Goddard Littlefair designs healthcare clinic for 'One Stop Doctors'. Retrieved September 29, 2020, from https://www.commercialinteriordesign.com/thoughts/case-study-goddard-littlefair-designs-healthcare-clinic-for-one-stop-doctors