



This study of BrainWare Safari and Autism was accomplished in conjunction with Carole Richards of North Coast Education Services (NCES), Solon, Ohio. NCES has developed a specialty in solving special education problems for children with learning disabilities, including Asperger's and other Autism Spectrum Disorders (ASD).<sup>1</sup> 34 families completed both evaluations and had BrainWare Safari accounts set up. The study subjects ranged in age from 5.5 to 16 years old, and included both males (28) and females (5). Subjects represented the entire spectrum of ASD from Classic Autism to PDD-NOS (pervasive developmental disorder-not otherwise specified) to high-functioning Autism to Asperger's, with varied cognitive, social and communication abilities. Education approaches included home-schooling, regular school and school with pull-out time.

The BrainWare Safari Behavioral Rating Scale and selected questions from the Childhood Autism Rating Scale (CARS)<sup>2</sup> were used for the evaluation. The evaluation was completed prior to the child using BrainWare, most often by one professional and one parent. In some cases, only the parent was available to do the evaluation. The evaluation was repeated after 12 weeks. At 6 to 8 weeks, we checked with the families to determine which children should continue and if there were any for whom the program was not suitable.

### **Results**

Three of the five girls and 14 of the 28 boys went far enough to be post-evaluated, or 52% of the children who started working with BrainWare completed enough to be post-evaluated 12 weeks later. *Throughout this analysis, working for 8 to 12 weeks in BrainWare and completing a post-evaluation is deemed successful in BrainWare.*

On average  $85 \pm 34$  levels of BrainWare Safari were completed. The maximum number of levels completed was 161 and the minimum level was 38. All participants passed at least one level of each of the 20 exercises in the program.

It was expected some of the children in the study might find the exercises and/or the format of the program difficult or frustrating, given the nature of ASD. The reasons for discontinuing the program, for the most part, related to specific difficulties with which these children struggled (see text box for more information).

Reasons for being unable to complete the recommended time in the study:

- Could not focus on activities, too much to distinguish
- Needed too much help
- Frustration became too high very early
- Not interested enough
- Struggled with even the lowest levels
- Only wanted to see the start-up animation over and over
- Refused – would fight when tried to get them to use it
- Too difficult/ too hard
- Unable to do it, motor skills are not good enough to do it.
- Unable to stay with it long enough
- Family issues preventing the time to spend
- Internet connection difficulties

### **Conclusions and Recommendations**

Based on the experiences of these children with a variety of ASD diagnoses, it is difficult to provide clear-cut guidance based on diagnosis, gender, age or the various pre-evaluation criteria that were used. Like many considerations for children with ASD, each child must be evaluated and an assessment made by parents and a knowledgeable professional. However, some general conclusions and recommendations can be made, based on our observations in this study.

- A child with ASD between the ages 9 and 12 will most likely be successful in persevering in the program for a sufficient time (8 to 12 weeks) to benefit from the experience.
- Although participants with all diagnoses showed improvement, those with Asperger's and High Functioning Autism were the most successful in working with BrainWare Safari and were likely to benefit from the experience.
- On average, regardless of diagnosis, children ages 6 to 8 who completed the program, showed a fair level of increase in sensorimotor and perceptual processing skills.
- On average, regardless of diagnosis, children ages 9 and above who completed the program, showed a fair level of increase in attention skills, perceptual processing, thinking and life management.
- Improvements in CARS ratings were also seen, particularly related to relationships. Given the broad range of the scale, the many improvements that were noted in these children is especially encouraging.
- A number of study participants struggled with clicking to the beat. In future product development, the company may wish to consider technology solutions for this group of users. In the interim, additional assistance from a parent, teacher or counselor may be needed for children ASD using BrainWare.

1. Contact North Coast Education Services for more information about their services. [www.northcoasted.com](http://www.northcoasted.com). (440)247-1622

2. A copy of the evaluation questions is available upon request



**Perceptions and Comments**

Comments from the parents provide important information and insights into the value of using BrainWare for those with ASD, some of these comments have been highlighted with information about the child's characteristics and noted difficulties.

Participant Characteristics	Areas of Improvement	Noted comments during BrainWare use
PDD-NOS; 5.5 YO, excellent memory, double digit math in head	I have noticed that he has shown some improvements in tolerance.	Clicking to the beat – caused tears and frustration.
Autism, 7 YO	Short-term memory seems improved. He loved Web Weaving.	Difficult to work on as frustrations increased.
Asperger's, 8 YO, intense, can hyperfocus, supersensitive to loud noises, struggles with fine motor skills	Fewer periods of stuttering, is not as easily frustrated by challenges, fine motor skills are more coordinated, and drawing is more realistic.	Clicking to the beat – caused tears.
High Functioning, 9 YO, pretty smart, weak vocabulary, good in math, can be obsessive	The biggest change has been persistence to continue.	The swimming game (Piranha Pass) was hard until he figured out "the trick".
ASD, 9 YO, very echolalic, likes to read, doesn't like to talk about what he read, great sense of humor, sings while he does his homework.	I noted subtle changes in many of his skills but since he is non-verbal it is hard to notice more. He liked it. It was a positive experience overall. He is making more eye contact to engage his most familiar people. He is a better problem solver. His anger threshold seems to have improved.	It was hard to click to the beat.
Asperger's, 10 YO, struggles socially, does well academically, awkward motor control, reluctant reader	The changes were subtle but he does react more quickly to questions and requests. He started concentrating better and paying attention to what others said. He did not need a lot of help figuring out what do to in the program.	He had great difficulty with rhythm activities at first, but found the logic problems easy. He did not need a lot of help figuring out what do to in the program.
Asperger's, 10 YO, mechanical intelligence, understands how things work, patient to discover new ideas, problems at school following directions and staying on tasks	I can see how this game had a big impact on his repeatable memory. He is definitely more confident to repeat and often memorize given instruction or hear text (like phone number or name). His focus is better and his memory is better.	We had problems at the beginning figuring out how to work. The hardest exercises were Rhythm Ribbet, Turtle Recall, and Tic Tac Toe.
Intermediate Autism, 10 YO, Female, enjoys science & history, good memory, concentration needs work, growing socially	The most noticeable change has been a confidence boost. She has also shown improvement in memory and concentration, which has helped with her school work. Her reasoning abilities definitely improved, and she displays less frustration.	We ended up needing to take time off in December when she was the most frustrated, but returned to it in January.
Autism, 10 YO, sound sensitivity, attention issues, fine motor deficits, awkward with computer	His computer skills improved. He seems to be able to sit for longer periods and has begun using both hands more to perform tasks. His communication skills have improved lately.	We did feel like in some cases the program raised the bar too quickly. When it became too hard and he became real frustrated with it.
Asperger's, 12 YO, outgoing with adults, "little man", sweet, happy, 2 or 3 levels behind in math, great reader with low comprehension and good spelling, fine and gross motor skills delayed	He told his teacher that it helped him become more organized at school. It has helped with classifying things.	We worked not very often. He became too frustrated so we worked when we could. Clicking to the beat was the hardest.
PDD/Asperger's, 11 YO, Female, creative, trouble with math, behind academically, has teacher's aide but no pull-outs, unorganized causes problems with homework, withdraws when she has enough of people	As it turns out we didn't use it as often as wanted. However, during this time her Math went from an F to B in one period.	The easy exercise for her was Jungle Labyrinth. The hardest exercise was Web Weaving.