# Synthesis of Rapid Responding Typology

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**Introduction**

Autism spectrum disorder (ASD) is characterized, in varying degrees, by difficulties in social interaction, verbal and nonverbal communication and repetitive behaviors. Autism is considered a spectrum disorder because these symptoms can vary in severity and presentation, which in the past has resulted in various diagnoses. In 2013 the Diagnostic and Statistical Manual of Mental Disorders released its fifth version (DSM-5), and in this latest version of the DSM, all autism disorders (autism, Asperger's, PDD-NOS) were merged into one umbrella diagnosis.

The idea, however, that autism is a disorder that can manifest in a variety of different ways, and to varying degrees, is key in understanding differential rates of response to treatment of the disorder. Some have deficits that debilitate their trajectory, while other possess skills that greatly aid their development when treatment is applied. In some cases, children can respond so well to treatment that they lose the diagnosis of ASD.

Who are these children? What makes it possible for them improve so drastically that they are no longer considered to have autism? The main objective of this monograph will be to answer this question and to detail the characteristics of children that respond well to treatment and rapidly acquire skills and improve deficits.

**History**

Lovaas, 1987

In 1987, O. Ivar Lovaas published a controversial article claiming to have found an intervention that could "cure" autism. This "cure" was a rigorous behavioral intervention that, through discrete trials, teaches and reinforces desired behaviors and punishes pathological behavior. Lovaas began this study with the following hypothesis:

Clients vary widely in the amount of gains obtained but show treatment gains in

proportion to the time devoted to treatment…. The present article reports a behavioral-

intervention project (begun in 1970) that sought to maximize behavioral treatment gains

by treating autistic children during most of their waking hours for many years…. We

hypothesized that contruction of a special, intense, and comprehensive learning

environment for very young autistic children would allow some of them to catch up with

their normal peers by first grade. (p. 3)

The original hypothesis was that a child's treatment gains would be in proportion to the number

of hours of intensive behavioral intervention received. Lovaas hypothesized that by maximizing

the amount of hours of intervention, outcomes would be maximized as well. Thus, his

experimental group received 40 hours of treatment a week and the control group received 10

hours or less, both for at least 2 years.

The results were shocking. Of the experimental group, 47 percent achieved "best

outcome," which in this study was defined as: 1) passing through a normal first grade class in a

public school, and 2) obtaining an average or above average IQ score. The remaining 52 percent

of the experimental group did not make as great of gains. The same was true for the control

group with only one of the forty (results coming from two control groups) subjects achieving

best outcome.

These results demonstrated that the number of hours of intensive behavioral therapy do

make a difference. The difference in results between the experimental group and the control

group is noteworthy; however, one subject in the control group was able to achieve the same as

the 47 percent in the experimental group, while only receiving 10 hours or less of services.

Additionally, as previously stated, 52 percent of the experimental group were unable to achieve "normal" functioning, despite receiving the same amount of treatment as the best outcome group. Lovaas noted in his findings the following:

> At least two distinctively different groups emerged from the follow-up data in the experimental group. Perhaps this finding implies different etiologies...At intake, all subjects evidenced deficiencies across a wide range of behaviors, and during treatment they showed a broad improvement across all observed behaviors (p. 8).

The data showed two distinctly different types of response to the intervention. One group that acquired skills quickly and thus progressed more rapidly, and another that did not make progress at nearly the same exponential rate. These results suggested that treatment was not the only variable related to outcome. There appeared to be within child factors that differentiated the children's capacity to internalize treatment. At the beginning of the study the following pretreatment variables were gathered on all children from both groups:

1. Chronological Age at Diagnosis

2. Chronological Age at Start of Treatment

3. Prorated Mental Age (Mental Age/Chronological Age X 30)

4. Recognizable Words

5. Toy Play

6. Self-Stimulation

7. Sum Pathology

8. Abnormal Speech

At the end of the study, the only variable significantly related to outcome was that of prorated mental age, which was the only pretreatment variable that incorporated initial IQ score. Lovaas

further stated that with a discriminant analysis of the eight variables they were able to retrospectively predict perfectly the 9 subjects who did achieve best outcome. Furthermore, when they applied this analysis to control group 1, they identified 8 subjects who they speculated, with the aid of intensive treatment, could have achieved best outcome.

The realization that within child characteristics could be more predictive of outcome than intensity of treatment is what led Lovaas to suggest the possibility of two different disabilities. While this possibility remains speculative, the divergent rates of responses among subjects verified the existence of individuals who could learn to manage, and in some cases eliminate, autistic behaviors. The claim, however, that autism can be "cured" was, and still is, highly controversial (Feins et. Al., 2013).

McEachin, 1993

In 1993, John J. McEachin, Tristam Smith, and O. Ivar Lovaas published a follow-up on the subjects current progress. The main objectives of this study were first, to examine (several years after the final evaluation at age 7) if the experimental group had maintained gains and second, to focus on subjects who had achieved best outcome at the end of first grade in the 1987 study. In other words, they examined the extent to which these best outcome subjects could be considered free of autistic symptomatology.

The follow-up focused on three main areas: intellectual functioning, school placement, and adaptive and maladaptive behavior. They found that the experimental group had maintained gains in intellectual functioning between age 7 and the time of this evaluation, finding that the experimental group had a mean IQ of 83. The control group (results coming from one of the original control groups) had retained scores from evaluation at age 7 with a mean IQ of 52. Two subjects from the experimental group had changed classification for school placement. One of

the best outcome group switched from a regular ed class to a class with services, and another

switched from a class with services to a regular ed class. No other subjects from the experimental

group had changed classifications. From the control group, none of the 19 children were in a

regular ed class, as had been the case at the age 7 evaluation. For adaptive and maladaptive

behavior, the experimental group had a mean overall score of 72 on the Vineland, and the control

group had a mean of 48.

In addition to these results, the best outcome group was compared to a non-clinical

comparison group, which was composed of typically developing children. Children were

compared on intellectual functioning, adaptive behavior, and personality functioniong. Results

are shown in Table 1.

| | Intellectual Functioning | Adaptive Behavior | Personality Functioning |
|---|---|---|---|
| **Best Outcome** | Mean IQ: 111 | Mean Vineland Adaptive Behavior Composite: 94 | Personality Inventory for Children: 55 |
| **Non-Clinical Comparison** | Mean IQ: 119 | Mean Vineland Adaptive Behavior Composite: 101 | Personality Inventory for Children:  49 |

Table 1. Comparison of best outcome group to non-clinical comparison group for intellectual functioning, adaptive behavior, and personality functioning (McEachin, Smith, & Lovaas, 1993).

The results demonstrated that the best outcome group's results in intellectual functioning,

adaptive behavior, and personality functioning were comparable to that of typically developing

children. As a group, these individuals scored within the average range for all three composites.

While some considered these two studies to be groundbreaking, there has been a fair amount of controversy surrounding them. Were these best outcome cases higher functioning? Were they misdiagnosed? Did they ever have autism at all? These are questions that will be addressed later in this paper.

Sallows and Graupner, 2005

In 2005, a landmark study was published by Glen O. Sallows and Tamlynn Graupner that endeavored to replicate the parameters of the early intensive behavioral intervention developed at UCLA. The objectives of this study were first, to determine if a community-based program without the resources, support, and supervision of a university center could achieve similar results as those seen at UCLA; second, to explore the extent to which individuals who achieved test scores in the average range retained residual symptoms of autism; third, to determine whether pretreatment variables could accurately predict outcome; and lastly, this study endeavored to discover if the results of the 1987 seminal article could be replicated without the use of aversives, something Lovaas had insisted was necessary for improvement.

The study began with 24 children (although one did drop out) who were randomly assigned to either a clinic-directed group (replicating the parameters developed at UCLA) (n=13), or to a parent-directed group (received intensive hours but less supervision) (n=10). Table 2 displays the average number of hours of one-on-one treatment received for the first two years.

The average Full Scale IQ for all 23 children increased from 51 to 76, a 25-point increase. Of these 23 children, 8 of them achieved average or above average IQs after 1-year of treatment (5 clinic-directed and 3 parent-directed), while the remaining 12 children did not show a significant increase in IQ, consistent with previous research (Smith et. al., 2000). This study

specified that 48 percent of ALL 23 children demonstrated what was termed as "rapid learning."

Figure 1 below is an image published by Sallows and Graupner in the 2005 seminal article and

displays the clear split between rapid learner's progress and moderate learner's.

| 1:1 Hours per week (SD) | Clinic-Directed | Parent-Directed |
|---|---|---|
| Year 1 | 38.60 (2.91) | 31.67 (5.81) |
| Year 2 | 36.55 (3.83) | 30.88 (4.04) |
| In-home Supervision (Both Years) | 6-10 hrs. per week | 6 hrs. per month |

Table 2. Average number of hours of treatment and in-home supervision received per week for first two years (Sallows & Graupner, 2005)

On average, Rapid Learners, made gains in mental age of 18 months per year, with the

greatest amount of gains being made in the first year. Moderate Learners also showed progress

and gains, but not at such a dramatic rate. This study again reported an emergence of two very

distinct groups of responders. Pretreatment variables proved to be the greatest predictor of

outcome in this study with the strongest predictors being imitation, daily living skills,

socialization, and rapid acquisition of new material. The ability to imitate proved to be

particularly significant. Imitation alone was highly correlated with outcome in full scale IQ,

language, and social skills.

- ● Rapid Learners
- ▲ Moderate Learners

Baseline  Treatment

Children

Three Week Probes
Verbal Imitation (90 % Correct)

Baseline  Treatment

Children

Three Week Probes
Non Verbal Imitation (90 % Correct)

Baseline  Treatment

Children

Three Week Probes
Receptive Instructions (80 % Correct)

Baseline  Treatment

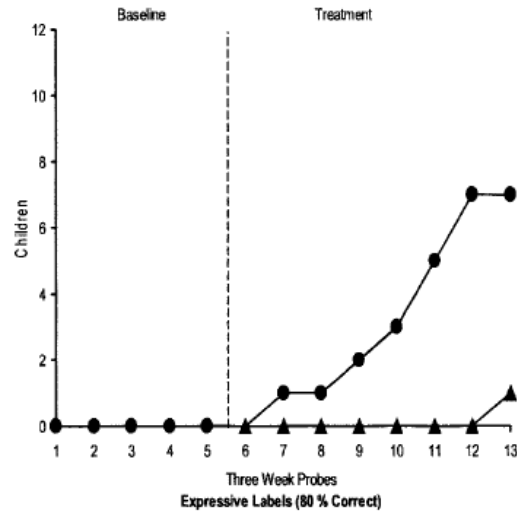Children

Three Week Probes
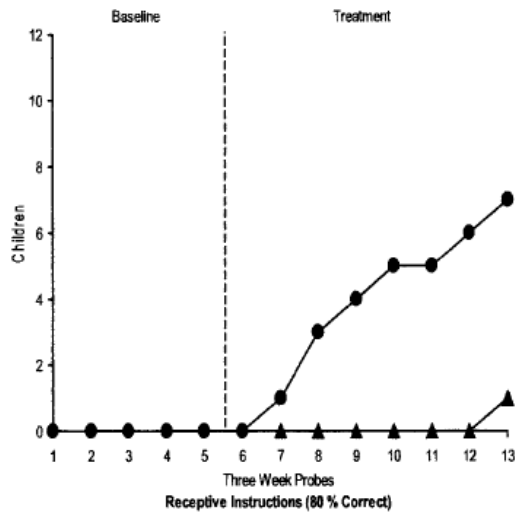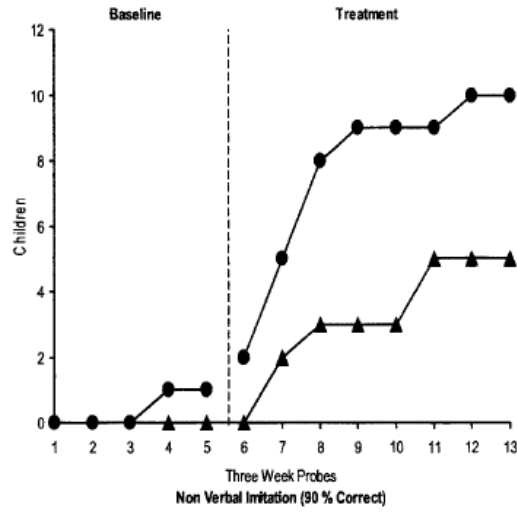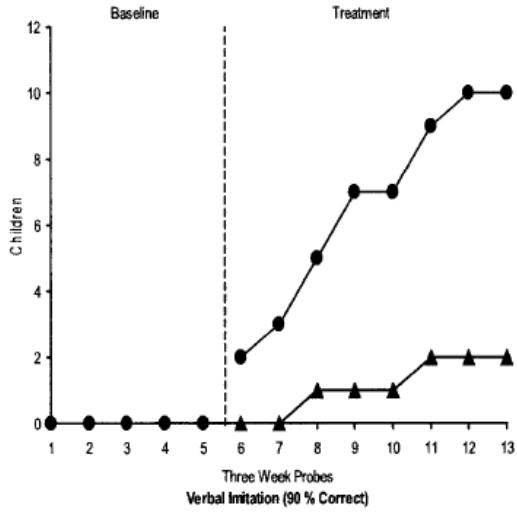Expressive Labels (80 % Correct)

Figure 1. Performance of Rapid Learners and Moderate Learners on Early
Learning Measure. Image is from Sallows & Graupner, 2005.

<u>Definition of a Rapid Responder</u>

From the preceding three articles we see the evidence of two different types of responders

to intensive behavioral therapy. From these articles it is possible to construct the following

relative definition of a rapid responder,

1.  rapidly acquires skills in response to treatment

2.  resulting in gains in mental age at an average rate of 12-18 months per year, greatest

    gains being made within the first year of treatment and

3.  an average of 1.5-2 SD increase in IQ.

This definition is specific to how these individuals respond to treatment, the following section will identify child characteristics associated with rapid learning.

**Who are the Rapid Responders? Within Child Factors**

<u>Cognitive Functioning</u>

Higher intellectual functioning has been linked to better outcomes (Lovaas, 1987; Szatmari et. al., 1989; Harris and Handleman, 2000; Bibby et al., 2002; Goldstein, 2002; Eikeseth, 2002; Howlin et. al., 2004; Billstedt, 2005; Sallows and Graupner, 2005; Remington et. al., 2007; Feins et. al., 2013; Anderson, Liang & Lord, 2014). So what is considered to be higher intellectual functioning? Howlin et al. (2004), studied a group of 68 adults who had an IQ score greater than 50 as children. Their results showed that having an IQ greater than 70 was necessary but not sufficient for individuals to achieve optimal outcome; however, social and adaptive outcomes were found to be more strongly correlated verbal IQ than with performance IQ.

The literature has not been consistent on whether an IQ score greater than 70 is necessary. For example, in Remington et al., 2007, the mean IQ of the "most positive responders" at baseline was 65, whereas "least positive responders" had a mean IQ score of 47.67. This demonstrates that it may not be necessary to have an IQ greater than 70 to make gains typically associated with rapid responding.

A possible explanation for this could be that verbal IQ, instead of performance IQ, is the stronger variable and has greater predictive power. As stated above in Howlin et al. (2004), this was found to be true, as social and adaptive outcomes were more strongly correlated with verbal IQ than performance IQ. This has been supported in other literature as well (Anderson, Liang, & Lord, 2014). Venter, Lord, and Schopler (1992) followed a group of 58 high functioning autistic

preschool age children for eight years and also found that verbal skills emerged as the greatest predictor of later social-adaptive functioning.

Communication and Language Abilities

Early communication and language abilities have been found to be a consistent indicator of later outcomes (Helt et al. 2008; Mawhood et al. 2000; Venter et al., 1992;). However, early communication and language are general terms and specifying which characteristics have been found to be the most important in predicting outcomes, is complicated. The characteristics that have shown to have the most predictive power are: **the ability to imitate** (verbally and nonverbally) (Yoder and Layton, 1988; Weiss, 1999; Stone and Yoder, 2001; Charman et al., 2003; Sallows & Graupner, 2005; Toth et al., 2006; Luyster et al., 2007), **joint attention** (Bono, Daley, & Sigman, 2004; Charman et. al., 2003; Sigman & McGovern, 2005; Toth et. al., 2006), **and receptive language** (Weiss, 1999; Fein et al., 1999; Stevens et al., 2000; Luyster et al., 2007; Sutera et al., 2007).

The ability to imitate has been shown to be especially important. Imitation is a vehicle of learning, and the individuals who can imitate are able to learn at a faster rate and as a result learn more. Sallows and Graupner (2005) found that the pretreatment ability to imitate predicted the rate at which children acquired social skills, language skills, and gains in intellectual functioning.

Joint attention is a means of communication and a precursor to later language in child development. Joint attention is a hallmark weakness of those with autism, for many it does not come naturally, but for some it can be learned. The above studies found that children being able to initiate and respond to joint attention was a characteristic associated with rapid learning. Receptive language has been shown to be important because it indicates that the child can understand language.

<u>Severity of Autistic Symptomatology</u>

The majority of research has shown that severity of autistic symptomatology is a poor predictor of outcome (Fein et al., 1999; Stevens et al., 2000; Harris & Handleman, 2000; Szatmari, Bryson, Boyle, Streiner & Duku, 2003; Helt et al., 2008). However, there have been a few studies that have argued that individuals who move off the spectrum do show milder autistic symptoms when they are young (Sutera, 2007; Turner & Stone, 2007; Fein et al., 2013).

This controversy could in part be attributed to inconsistency in defining which autistic symptoms can negatively impact outcome.

<u>Restricted Repetitive Behaviors</u>

In connection with severity of autistic symptomatology, it has been hypothesized that restricted repetitive behaviors, instead of severity of social and communication symptoms, is the poor prognostic feature. This possibility is supported in the literature (Szatmari et al., 2006; Gabriels et al., 2005; Lord et al., 2006; Watt, Wetherby, Barber & Morgan, 2008; Anderson, Liang & Lord, 2014).

Feins et al. (2013) did not find this to be true and concluded that the presence of restricted repetitive behaviors does not preclude optimal outcome; however, they did concede that this result could've been affected by the retrospective nature of the study. In 2014 Anderson, Liang & Lord, published a ground breaking study that followed children from diagnosis at age 2 to age 19. They found that children with better outcomes had experienced a decrease in repetitive behaviors after age 2 (an age when many began treatment). This finding implied that the presence of repetitive behaviors is not as predictive as the child's ability to learn to manage and suppress those behaviors, freeing their attention for developing adaptive behaviors.

**Who are the Rapid Responders? External Factors**

Early Diagnosis & Intervention

　　Turner & Stone (2007) found that children who were more likely to lose the ASD diagnosis were children who had been under 30 months of age when diagnosed. The supposed reason for this is the relationship between early diagnosis and early intervention. Numerous studies have found that there are more positive outcomes associated with earlier age of intensive intervention (Harris & Handleman, 2000; Ben Itzchak & Zachor, 2009; Dawson et al., 2010; Ben Itzchak & Zachor, 2011; MacDonald, 2014). MacDonald (2014) compared 1-, 2-, and 3-year olds receiving an early intensive intervention and found that children who entered treatment prior to their second birthday made the greatest gains. Anderson, Liang, and Lord (2014) found that children who began treatment at age 2 (close to the time they received a diagnosis) had better outcomes.

　　While the research is mostly in agreement that the earlier a child receives treatment, the better, the research on the most effective number of hours has not been as congruent. Helt (2008) did a thorough review of the research focused on outcomes for individuals with autism and found there is an inverse relationship between number of hours of intervention received and outcomes for rapid responders. Presumably this is because rapid responders receive fewer hours of service over time, making it difficult to draw any conclusions from this data. A number of studies have found that children benefit from 20 hours or more of intensive behavioral intervention (Anderson, Liang, & Lord, 2014; Lovaas, 1987; Sallows & Graupner, 2005); however, as has been discussed earlier in this paper, hours of intervention received alone cannot determine outcome.

**Resolving Controversy with Best Outcome**

When Lovaas first published the results on the 47 percent back in 1987, he addressed a point, in the discussion, that he was well aware many would accuse him of. That accusation being that the children who had "recovered" were misdiagnosed. The argument, which continues today, is that children who lose the diagnosis, never had autism at all. Another claim is that these "recovered" cases are simply high functioning and retain other autistic behaviors.

To what extent can a child lose the diagnosis of autism? What type of child is required to accomplish such a thing? Do they grow out of the diagnosis on their own? Or is treatment needed to accomplish such a feat?

Understanding the extent to which "recovery" is possible, and how, is central to understanding the significance of Rapid Responders. If able to identify children who have the potential to be Rapid Responders, we may also be able to identify children who have the capacity to move off the diagnosable spectrum. In recent years many studies have sought to prove the existence of this "best outcome" group, and to identify the variables involved in their "recovery." The following two landmark studies have been the pinnacle of this research and have proven the existence of "best outcome," and have made great strides in identifying characteristics of the individuals who do.

Fein et al., 2013: Optimal outcome in individuals with a history of autism

The purpose of this study was to "document cognitive, language, and social functioning in a group of children diagnosed with an ASD at a young age, who no longer carried this diagnosis." (p. 195) These cases were termed as "optimal outcome" for this study. The inclusion

criteria for optimal outcome was thorough and rigorous. Lovaas's definition of "best outcome" was considered insufficient. In this study, optimal outcome required that the individual not have any significant symptoms of autism and be able to function within normal intellectual range. Weaknesses in executive functioning or vulnerability to anxiety or depression, however, were permitted.

All participants in the optimal outcome group had verbal, nonverbal, and full-scale IQ standard scores greater than 77. Additional inclusion criteria were:

1. Documented diagnosis made before the age of 5. In the written diagnostic report there had to be evidence of early language delay (no words by 18 months or no phrases by 24 months).

2. Via phone screening, parents had to report that the participant had typically developing friends.

3. Participants were given an ADOS and could not meet criteria for ASD.

4. Scores on the Communication and Socialization domains of the Vineland had to be greater than 77.

5. Participants were fully included in regular education classrooms with no one-on-one assistance and no special education services to address autism deficits.

Thirty-four individuals met criteria for optimal outcome and were included in this study. These participants were compared against forty-four individuals with high-functioning autism, and thirty-four typically developing individuals.

No differences were found between the groups in the areas of sex, age, and nonverbal IQ; however, verbal IQ was significantly lower in the high-functioning group than the optimal outcome and typically developing groups. Looking at early history, the optimal outcome group

were reported as having somewhat milder social symptoms than the high-functioning group, but were no different in communication or repetitive behaviors. However, there was speculation that these findings could have been attributed to the retrospective nature of the study, because in some cases parents were recollecting information from as much as 15 years earlier. Adaptive behavior was in the average range on all scales and close to identical for both the optimal outcome and typically developing groups.

This study proved that individuals with autism can move off of the diagnosable spectrum. The proof came first by providing proof that these individuals had met the criteria for autism when they were young. Second, the study detailed the differences between those who have high functioning autism and those who are considered "cured." It was a common claim that no one moves off the spectrum, and "recovery" cases are simply higher functioning. This study disproved that claim by providing evidence that optimal outcome and high functioning autism are indeed different and distinct.

Among the three groups there was no significant difference in sex, age, nonverbal IQ, and handedness. Characteristics that were associated with optimal outcome in this study were: high average IQ and milder social symptoms of ASD in childhood. Interestingly, the average verbal IQ score for the high functioning autism group was seven points lower than it was for the other two. This finding is congruent with past research that has indicated verbal IQ is more predictive of outcome than performance IQ.

Repetitive behavior in childhood, however, was not found to preclude optimal outcome. The authors did concede that this finding was in contrast to the majority of research. Furthermore, they speculated, once again, that this finding could be attributed to the fact that

parents were asked to recollect information from many years before. The concern that parent recollections were colored by the participant's outcome, was the greatest limitation of this study.

The following study, in contrast, was published a year later and was a prospective study that followed a group of children with autism for a number of years.

Anderson, Liang & Lord, 2014: Predicting young adult outcome among more or less cognitively able individuals with ASD

This was a prospective study that followed children from age 2 to age 19. This study began with 213 referrals, and 85 of those referrals received a diagnosis of autism at age 2. Subjects were then assessed at ages 2, 3, 5, 9 and 19, but analyses were primarily focused on ages 2, 3, and 19. Subjects were divided into two groups, those with a verbal IQ greater than or equal to 70, and those with a score less than 70.

Of the 32, VIQ $\geq$ 70 youths, 8 no longer retained a clinical diagnosis at age 19 (25 percent), which was termed as very positive outcome for this study. By age 3, verbal IQ alone predicted outcome at 19 for the majority of participants, with a concordance rate of 91% rate for VIQ<70 youths, and 82% for VIQ$\geq$70 youths. This confirmed, again, the predictive power of verbal IQ. Significant intellectual disabilities at 19 were predicted by age 2 about 85% of the time from both VIQ and NVIQ scores, however, prediction of young adult outcome for individuals with average or higher intelligence was more complex.

As stated in the article, "…. higher intellectual abilities create the potential for a range of accomplishments but does not guarantee positive outcome" (Anderson, Lord, & Liang, 2014, p. 492). Cognitive functioning was found to be important, but was not the only determinant of positive outcome. In addition to having a verbal IQ$\geq$70, results showed that Rapid Responders who attained very positive outcome were more likely to have have experienced a reduction of

repetitive behaviors between ages 2 and 3, participated in a minimum of early treatment (at least 20 hr.), and have no report of hyperactivity.

These differences did not begin to appear among subjects until after age 2. At age 2, the Very Positive Outcome group were no less impaired than the rest of the VIQ≥70 group; however, by age 3 group differences began to arise. This difference was believed to be due to the fact that all 8 of very positive outcome group had received some individual treatment by age 3. Their participation in treatment may explain the reduction in repetitive behaviors as well.

These findings, while speculative, demonstrate that even if these intellectually able children appear to be impaired to a milder degree they can still benefit from early family participation in intervention. This reiterates the importance of early intervention for all children, as it can maximize their potential. How many more children with the potential to be Rapid Responders could achieve this outcome if provided treatment?

**Best evidence synthesis of Rapid Responding typology**

This paper has sought to review the research on rapid responding, and optimal outcome/very positive outcome/best outcome. While there are limited areas in which the research has been in agreement on rapid responding typology, this review has found some congruency among the following variables:

- Higher cognitive functioning, verbal IQ having greater predictive power than nonverbal IQ
- Ability to verbally and nonverbally imitate
- Ability to initiate and respond to joint attention
- Ability to understand language (receptive language)
- Ability to manage and suppress restricted repetitive behaviors

- Younger age of diagnosis

- Younger age beginning early intervention

While this list is a beginning, it is by no means exhaustive. Many of the articles reviewed did not focus specifically on rapid responding/learning, and so some implications were made by the author. Furthermore, this review has focused on variables that have been studied and measured in a variety of different studies. Variables that were under researched were not included, but may hold promise for the future.

One such budding variable is that of skill acquisition. Weiss (1999) found the following:

Every child who initially learned very quickly (e.g., mean of less than 2 days for acquisition of the first five items) continued to learn at very rapid rate. These children also showed the greatest changes in autism severity and in adaptive behavior…All children who struggled substantially with initial skill acquisition, however, continued to struggle with skill acquisition. These children also exhibited higher degrees of autistic behavior and lower adaptive behavior skills two years into treatment. (p.19)

Sallows and Graupner (2005) and Newsom and Rincover (1989) also found skill acquisition to be a promising variable and found that children who acquired skills quickly, continued to do so. As a result of this, these children acquired more skills overall, a finding with implications for all characteristics associated with rapid responding.

Perhaps the underlying feature of all of these variables is an ability to learn. Children with higher cognitive functioning have the potential for greater learning. If they can understand language they have more opportunities to learn. If they can pay attention to a person and engage with them, they have more opportunities to learn. If they can imitate, they can learn how to do and say things for themselves, leading to even more learning opportunities. If they can manage

restricted repetitive behaviors and direct their focus to learning adaptive skills, they will learn more adaptive behaviors. If they can acquire skills quickly, they will acquire more skills over time.

This idea is speculative, but congruent with most of the findings of the studies reviewed for this paper. The idea is similar to that of a dirty room compared to a clean room. If you are able to easily locate and find materials, you can get things done faster. If the room is messy and in disarray, it takes longer to do everything. The more skills these children have that are conducive to learning, and the less disruptive behaviors they have taking their attention, the greater their potential for learning, adapting, and achieving.

**Conclusion**

In summary, autism spectrum disorder (ASD) is characterized, in varying degrees, by difficulties in social interaction, verbal and nonverbal communication and repetitive behaviors. Autism is considered to be a spectrum disorder because it can vary in severity and presentation when manifested. Understanding this disorder as a spectrum disorder is key to understanding that every individual with autism is slightly different from the next. Each has their own skill set and each has their own deficits and weaknesses. Therefore, each has a different trajectory and outcome.

As treatment has been developed over time for autism, differential rates of responding have been observed and noted among children receiving interventions. Initially, these varying responses and outcomes were thought to be attributed to types of interventions and the intensity of the treatment (the number of hours of treatment the individual received a week). O. Ivar

Lovaas was the first to truly test this hypothesis in 1987, with a study that had children participate in the intervention for most of their waking hours every day (about 40 hours a week).

While the experimental group (which received the greatest amount of hours of treatment per week) did have a much more positive outcome than the control group, verifying that intensity of treatment does affect outcome, there was split in the experimental group between children that responded quickly and effectively to treatment and those who did not.

Lovaas noted that this may be due to different etiologies, implying that within child factors may be more determinant of outcome than intensity of treatment. This has been confirmed in studies since, as within child factors have consistently been the greatest predictor of child outcome. In 2005, Sallows & Graupner published a study detailing what they termed "Rapid Learners" and "Moderate Learners," introducing the idea of individuals who make greater and faster gains than others in response to treatment.

For the purposes of this paper, a Rapid Responder has been defined as an individual with autism, who:

1. rapidly acquires skills in response to treatment
2. resulting in gains in mental age at an average rate of 12-18 months per year, greatest gains being made within the first year of treatment and

   an average of 1.5-2 SD increase in IQ.

Pre-treatment characteristics that have been found to be associated with rapid responding are:

- Higher cognitive functioning, verbal IQ having greater predictive power than nonverbal IQ
- Ability to verbally and nonverbally imitate
- Ability to initiate and respond to joint attention

- Ability to understand language (receptive language)

- Ability to manage and suppress restricted repetitive behaviors

- Younger age of diagnosis

- Younger age beginning early intervention

The combination of the above pretreatment variables and younger age of diagnosis and intervention is correlated with better outcomes, with some individuals even losing the diagnosis of autism. It is possible that these variables make a difference because they enable the individual to learn at a faster rate, and as such are able to learn more.

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