

Evidence Base for the DIRFloortime® Approach

Diane Cullinane, M.D.

2024

DIRFloortime® is a developmental approach to the treatment of children with autism and other developmental challenges. In DIRFloortime, a parent or other adult interacts with a child in a way that is sensitive to the subtleties of the child's actions, humanistically infers emotion and intent, and seeks to understand and respond to their ideas. Through reciprocal interactions, adult and child create shared meanings. The adult is always respectful of the child and tailors interactions with an appreciation of the child's individual differences in sensory and motor abilities and preferences. Through many such interactions the child forms a warm, trusting relationship with the adult, and through that relationship can be challenged to reach higher levels of communication, social relating, and cognitive abilities.

DIRFloortime is derived from over 50 years of study and research about child development from the fields of psychology, medicine, and education, including the study of language, attention, mental health, infant development, sensory processing, and motor development. This paper references some of the relevant research. Research forms one part of evidence-based practice.

“Evidence-based practice” means a decision making process which integrates the best available scientifically rigorous research, clinical expertise, and individual's characteristics. Evidence-based practice is an approach to treatment rather than a specific treatment. Evidence-based practice promotes the collection, interpretation, integration, and continuous evaluation of valid, important, and applicable individual- or family-reported, clinically-observed, and research-supported evidence. The best available evidence, matched to infant or toddler circumstances and preferences, is applied to ensure the quality of clinical judgments and facilitates the most cost-effective care. [California Welfare and Institutions Code 4686.2 (d) (3)]

Which outcomes to measure?

A starting point to measure effectiveness of intervention is to determine the goals of the intervention and the factors to be measured as outcomes. This is a major challenge in the field of developmental disabilities. Developmental interventions have two targets of intervention: 1) to improve parents' sensitivity and responsiveness and 2) to increase the child's functional development reflected in communication, social interaction, and cognitive abilities, and the correlation between the two. In contrast to behavioral approaches, which tend to have more specific skill targets, the goals of developmental interventions are broad based, and focus on the core features of autism, which have clear clinical significance.

Typical outcome measures:

- *Socialization, social interaction, social-emotional function*
- *Social communication*
- *Joint attention*
- *Initiation*

- *Spontaneous communication*
- *Reciprocal interaction; parent-child interaction*
- *Autism severity*
- *Language*
- *Functional development (using FEAS and FEDQ)*

These developmental measures are more closely aligned to the diagnostic criteria for autism spectrum disorder than those often used in older research such as IQ, performance on early academic skills and following commands. The National Research Council stated in 2001: “More appropriate outcome measures are improvement in initiation of spontaneous communication in functional activities, and generalization of language across activities people, and settings”

Lord, Catherine; McGee, James (Editors). Committee on Educational Interventions for Children with Autism. *Educating Children with Autism*. Division of Behavioral and Social Sciences and Education, National Research Council. Washington, DC: National Academy Press (2001) p 217

The DIR/Floortime approach has provided a developmental framework that has been studied and found to be accurate and effective in understanding behavior. The widely used *Bayley Scales of Infant development* has adopted the DIR milestones as the measure of social-emotional development through a process of careful standardization across populations.

Developmental models emphasize individual differences and the need to tailor intervention to the unique biological profile of the child and to the unique characteristics of the parent-child interaction. Research is challenging both because both the factors being measured are complex and because of the wide range of individual differences in the population. In considering the evidence for DIR/Floortime, it is important to appreciate the challenges to studying a complex model, and to consider the long history of study on the effectiveness of various facets of a developmental framework. These can be summarized by looking at the three major aspects of the DIR/Floortime approach: “D”- developmental framework, “I”- individual differences, and “R”-relationship and affective interactions.

“D” Developmental

A developmental approach is founded on work by major developmental theorists such as Piaget, Vygotsky, Erikson, and Kohlberg. A developmental approach considers behavior and learning in the greater context of a developmental or changing process. DIR theory was first described by Dr. Greenspan in 1975 and was further developed over the next 20 years, especially through his collaboration with Serena Wieder, PhD. He received high honors and acclaim for his work including American Psychiatric Association's highest award for child psychiatry research.

Greenspan, S.I. A Consideration of Some Learning Variables in the Context of Psychoanalytic Theory, (1975)

Greenspan, S.I. Intelligence and Adaptation, (1979)

Greenspan, S.I. Psychopathology and Adaptation in Infancy and Early Childhood (1981)

Greenspan, S.I. First Feelings (1985),

Greenspan, S.I. *The Essential Partnership* (1989)
Greenspan, S.I. *The Development of the Ego* (1989)
Greenspan, S.I. *Infancy and Early Childhood* (1992)

In 1997, Dr. Greenspan and Serena Wieder published, [The Child with Special Needs: Encouraging Intellectual and Emotional Growth](#) and in 2006 they published, [Engaging Autism](#).

A description of the DIR model can also be found in this 1999 publication.

Greenspan, S. I., & Wieder, S. (1999). A functional developmental approach to autism spectrum disorders. *Journal of the Association for Persons with Severe Handicaps*, 24(3), 147-161.
<https://doi.org/10.2511/rpsd.24.3.147>

In 1997, they reported the results of an extensive chart review of 200 children with autism who had received DIR/Floortime. This showed the promise of the DIR/FT approach: The goal of the review was to reveal patterns in presenting symptoms, underlying processing difficulties, early development, and response to intervention in order to generate hypotheses for future studies. The chart review suggests that a number of children with autistic spectrum diagnoses are, with an appropriate intervention program, capable of empathy, affective reciprocity, creative thinking, and healthy peer relationships; that an intervention approach that focuses on individual differences, developmental level, and affective interaction may be especially promising;

Greenspan, S.I. and Wieder, S. (1997) Developmental patterns and outcomes in infants and children with disorders in relating and communicating: A chart review of 200 cases of children with autistic spectrum diagnoses. *Journal of Developmental and Learning Disorders* 1:87-141.

8 years later, they reported the follow-up of a subgroup of children, showing that it is possible for children with autism to become empathetic, creative, and reflective thinkers.

Greenspan, S.I. and Wieder, S. (2005) Can Children with Autism Master the Core Deficits and Become Empathetic, Creative and Reflective? A Ten to Fifteen Year Follow-up of a Subgroup of Children with Autism Spectrum Disorders (ASD) Who Received a Comprehensive Developmental, Individual-Difference, Relationship-Based (DIR) Approach. *The Journal of Developmental and Learning Disorders* 9.

Previous approaches using behavioral principles relied upon outside motivators on the premise that children with autism did not have their own motivation to participate in social interaction or to learn. The DIR/Floortime approach revealed that all children will show purpose and initiative and will seek close social relationships when provided with interactions which respect their interests and are tailored to their individual differences.

In 2009, 20 authors, representing 17 major institutions, and 3 countries collaborated to write a paper which outlines principles of assessment and effective intervention for children with suspected autism under the age of 2. They concluded “Interventions should ultimately be directed toward specific functional concerns and be informed by key developmental principles, including the child’s role as an active learner, the social contexts of learning, and the pivotal role of the parent-child relationship.”

Zwaigenbaum et al (2009), [Clinical Assessment and Management of Toddlers with Suspected autism spectrum disorder: Insights from studies of High-risk infants](#).

In 2010, Wallace and Rogers published a review of controlled studies which identified four factors which were most important for effective intervention for infants with autism. These were: “(1) parent involvement in intervention, including ongoing parent coaching that focused both on parental responsiveness and sensitivity to child cues and on teaching families to provide the infant interventions, (2) individualization to each infant’s developmental profile, (3) focusing on a broad rather than a narrow range of learning targets, and (4) temporal characteristics involving beginning as early as the risk is detected and providing greater intensity and duration of the intervention.”

Wallace Katherine S. and Rogers Sally J. Intervening in infancy: implications for autism spectrum disorders *Journal of Child Psychology and Psychiatry* (2010)

Developmental intervention models are incorporating these elements, which are all fundamental features of the DIRFloortime approach. The following are some of the research studies that report the effectiveness of developmental approach since 2000:

In 2002, a report of a developmentally based early intervention program for children with autism in Scotland showed significant improvement in children.

Salt 2002 *The Scottish Centre for Autism preschool treatment programme* The National Autistic Society Vol 6 (1) 33

See Salt 2001 for a description of the program:

Salt, J., Sellars, V., Shemilt, J., Boyd, S., Coulson, T., & McCool, S. (2001). The Scottish Centre for Autism preschool treatment programme: I: A developmental approach to early intervention. *Autism*, 5(4), 362-373.

In 2004, Aldred et. al. conducted a pilot randomized controlled trial of an intervention that focused on sensitive adult responses and promoting parent-child communication. The active treatment group showed significant improvement on ADOS total score, social interaction, language, parent-child interaction.

Aldred, C., Green, J., & Adams, C. (2004). A new social communication intervention for children with autism: pilot randomised controlled treatment study suggesting effectiveness. *Journal of Child Psychology and Psychiatry*, 45(8), 1420-1430.

See the following for a description of the intervention:

Aldred, C., Phillips, R., Pollard, C., & Adams, C. (2001). Multidisciplinary social communication intervention for children with autism and pervasive developmental disorder: the Child's Talk project. *Educational and child psychology*, 18(2), 76-87.

In 2012, Aldred et al. published an analysis of the 2004 study showing the mediational effects of the intervention.

Aldred, C., Green, J., Emsley, R., & McConachie, H. (2012). Brief report: Mediation of treatment effect in a communication intervention for pre-school children with autism. *Journal of Autism and Developmental Disorders*, 42, 447-454.

<https://doi.org/10.1007/s10803-011-1248-3>

In 2003 and 2005 Mahoney reported positive outcomes for an approach called Responsive Teaching. This approach focused on parent responsiveness with results on

improved child outcomes. In 2009, Mahoney further described “Relationship-Focused Intervention” as a “key element in early intervention.”

Mahoney, G., & Perales, F. (2003). Using relationship-focused intervention to enhance the social—emotional functioning of young children with autism spectrum disorders. *Topics in Early Childhood Special Education, 23*(2), 74-86.

Mahoney, G., & Perales, F. (2005). Relationship-focused early intervention with children with pervasive developmental disorders and other disabilities: A comparative study. *Journal of Developmental & Behavioral Pediatrics, 26*(2), 77-85.

Mahoney, G. (2009). Relationship Focused Intervention (RFI): Enhancing the Role of Parents in Children's Developmental Intervention. *International journal of early childhood special education, 1*(1).

In 2018, Alquraini et al. published a RCT showing positive effects for children with autism using responsive teaching in social language and fine motor areas.

Alquraini, T., Al-Odaib, A., Al-Dhalaan, H., Merza, H., & Mahoney, G. (2018). Feasibility of responsive teaching with mothers and young children with autism in Saudi Arabia. *Journal of Early Intervention, 40*(4), 304-316.

In 2019, a secondary analysis of that study showed that parents showed improvement in stress and depression.

Alquraini, T., Al-Adaib, A., Al-Dhalaan, H., Merza, H., & Mahoney, G. (2019). Relationship based intervention with young children with autism in Saudi Arabia: Impediments and consequences of parenting stress and depression. *International Journal of Disability Development and Education, 66*, 233-248. <https://doi.org/10.1080/1034912X.2018.1487042>

In 2007, Schertz and Odom reported positive outcomes on a developmental intervention called Joint Attention Mediated Learning (JAML) with parent-mediated intervention for toddlers with autism.

Schertz, H. H., & Odom, S. L. (2007). Promoting joint attention in toddlers with autism: A parent-mediated developmental model. *Journal of autism and developmental disorders, 37*(8), 1562-1575.

In 2013, Schertz et al. reported an initial RCT of JAML and in 2018, Schertz et al. reported a subsequent RCT of JAML showing positive effects on social communication.

Schertz, H. H., Odom, S. L., Baggett, K. M., & Sideris, J. H. (2013). Effects of joint attention mediated learning for toddlers with autism spectrum disorders: An initial randomized controlled study. *Early Childhood Research Quarterly, 28*(2), 249-258.

Schertz, H. H., Odom, S. L., Baggett, K. M., & Sideris, J. H. (2018). Mediating parent learning to promote social communication for toddlers with autism: Effects from a randomized controlled trial. *Journal of autism and developmental disorders, 48*, 853-867.

In 2007, Solomon reported a pilot study on the Play Project which showed significant increases in child subscale scores on the FEAS after an 8-12 month program using Floortime.

Solomon, R., J. Necheles, C. Ferch, and D. Bruckman. "Pilot study of a parent training program for young children with autism: The P.L.A.Y. Project Home Consultation program." *Autism* 11, no. 3 (2007) 205-224.

In 2014, Solomon et al. reported their findings on a large randomized controlled trial conducted with 128 children with autism, that used a manualized, parent-mediated intervention program called the PLAY Project, which is based on the DIRFloortime approach. Parents showed marked improvement in the ability to read their child's cues, follow their child's lead, and obtain reciprocal social exchanges. Children showed marked improvement in engagement and initiation and functional development.

Solomon R, Van Egeren L, Mahoney G, Quon-Huber M, Zimmerman P. (2014) PLAY Project Home Consultation Intervention Program for Young Children with Autism Spectrum Disorders: A Randomized Controlled Trial. *J Dev Beh Pediatrics*. 35(8): 475-485.

In June 2011, Pajareya published a pilot RCT of DIRFloortime with preschool children with ASD. Results showed improvements in FEAS, CARS, and the functional emotional questionnaires, confirming the results of the Solomon 2007 study. She then conducted a second study over 12 months, also with positive outcomes.

Pajareya, K., & Nopmaneejumruslers, K. (2011). A pilot randomized controlled trial of DIR/Floortime™ parent training intervention for pre-school children with autistic spectrum disorders. *Autism*, 15(5), 563-577.

Pajareya, K., & Nopmaneejumruslers, K. (2012). A one-year prospective follow-up study of a DIR/Floortime™ parent training intervention for preschool children with autistic spectrum disorders. *Journal of the Medical Association of Thailand*, 95(9), 1184.

In 2019 Pajareya et al. reported a RCT using DIR with children with developmental disabilities, showing improvements in attention and initiation.

Pajareya, K., Sutthritpongsa, S., & Kongkasuwan, R. (2019). DIR/Floortime® parent training intervention for children with developmental disabilities: a randomized controlled trial. *Siriraj Medical Journal*, 71(5), 331-338.

Elder et. al (2010) demonstrated significant changes in child and parent behaviors as a result of training fathers in following their child's lead, imitating with animation, commenting on the child's actions and expectant waiting. There were significant changes in the child's behaviors, including increase in child initiating, and child's non-speech vocalizations.

Elder, J.; O'Donaldson, S.; Kairella, J; Valcante, G; Bendixon, R; Ferdig, R; Self, E; Walker, J; Palau, C & Serrano, M. (published online 2010). In-home training for fathers of children with autism: A follow up study evaluation of four individual training. *Journal of Child Family Study*. 20(3); 263-271.

In 2010, building on the earlier study by Aldred, Green et.al. reported positive results from the PACT program (Preschool Autism Communication Trial), a parent-mediated training program, which was effective in increasing parental sensitivity and responsiveness, with increased child initiations and parent-child attention.

Green, J.; Charman, T.; McConachie, H.; Aldred, C.; Slonims, V.; Howlin, O.; Le Couteur, A.; Leadbitter, K.; Hudry, K.; Byford, S.; Barrett, B.; Temple, K.; MacDonald, W.; Pickles, A.; & the PACT Consortium (2010). Parent mediated communication-focused treatment in children with autism (PACT): A randomized controlled trial. *Lancet*. 2010 Jun 19; 375(9732): 2152–2160.

In 2016, Pickles et.al. did a follow up of the PACT study after 5.75 years, which showed long term benefit of the early intervention.

Pickles, A., Le Couteur, A., Leadbitter, K., Salomone, E., Cole-Fletcher, R., Tobin, H., ... & Aldred, C. (2016). Parent-mediated social communication therapy for young children with autism (PACT): long-term follow-up of a randomised controlled trial. *The Lancet*, 388(10059), 2501-2509.

In 2023, Carruthers et al. found that child initiations mediated the majority of the treatment effect in the above long term benefit study.

Carruthers, S., Pickles, A., Charman, T., McConachie, H., Le Couteur, A., Slonims, V., Howlin, P., Collum, R., Salomone, E., Tobin, H., Gammer, I., Maxwell, J., Aldred, C., Parr, J., Leadbitter, K., & Green, J. (2023). Mediation of 6-year mid-childhood follow-up outcomes after pre-school social communication (PACT) therapy for autistic children: randomised controlled trial. *Journal of Child Psychology and Psychiatry*. <https://doi:10.1111/jcpp.13798>

Also in 2016 Rahman utilized the same treatment in India and Pakistan with positive effects.

Rahman, A., Divan, G., Hamdani, S. U., Vajaratkar, V., Taylor, C., Leadbitter, K., ... & Patel, V. (2016). Effectiveness of the parent-mediated intervention for children with autism spectrum disorder in south Asia in India and Pakistan (PASS): a randomised controlled trial. *The Lancet Psychiatry*, 3(2), 128-136.

A developmental treatment called SPEIC- Scheme to promote early interactive conversation- was studied over a 12 month period in 10 children with ASD or children at risk for ASD. The outcomes included increase in attention, joint attention and communication.

Smith, C., & Bohane, L. (2010). Isle of Wight study: a neuro-developmental therapy to promote social attention and shared emotion in young children with high-functioning autistic spectrum difficulties. *Procedia-Social and Behavioral Sciences*, 5, 698-706.

For further information about this approach see:

Smith, C., Goddard, S., & Fluck, M. (2004). A scheme to promote social attention and functional language in young children with communication difficulties and autistic spectrum disorder. *Educational Psychology in Practice*, 20(4), 319-333.

In 2011, a single subject study design was used to evaluate the effectiveness of Floor Time Play with a 3.6 year-old boy with autism. The study used an observation and intervention phase and utilized circles of communication as the measure of change. Results showed a significant improvement using Floor Time play strategies, and mother's journal included insights on the changes observed.

Dionne and Martini, *Revue canadienne d'ergotherapie*; June 2011 78 (3)

In a randomized controlled trial, Casenhiser et al. (2011-online date) presented the results of a DIRFloortime based, social-communication intervention. A significant association was found between improvements in caregiver behaviors and improvements in children's social-communicative measures. Results indicate that the treatment group showed significantly greater enjoyment in interactions with their parents, were significantly more attentive and involved in interactions with their parents and initiated more joint attention. Initiation of joint attention and involvement were predictive of increase in language skills.

Casenhiser, D. M., Shanker, S. G., & Stieben, J. (2013). Learning through interaction in children with autism: Preliminary data from a social-communication-based intervention. *Autism*, 17(2), 220-241.

Casenhiser et. al. (2015) reanalyzed their data from their 2011 research and documented that the children in the treatment group outperformed the community treatment group on measures of language including, number of utterances produced, and various speech act categories such as sharing, commenting, rejecting/protesting, social conventions and responses to comments.

Casenhiser, D. M., Binns, A., McGill, F., Morderer, O., & Shanker, S. G. (2015). Measuring and supporting language function for children with autism: Evidence from a randomized control trial of a social-interaction-based therapy. *Journal of Autism and Developmental Disorders*, 45, 846-857.

In 2013, Siller et. al. conducted a randomized, clinical trial with 70 children with ASD, 6 years of age or younger, using Focused Playtime Intervention (FPI). The intervention was designed to promote responsive parental behaviors in a family-centered intervention. The intervention focused on play, social engagement, and encouraging increasingly complex child communication and play. Results showed a significant treatment effect on responsive parental behaviors and a conditional effect on children's expressive language outcomes, showing that children with baseline language skills below 12 months are most likely to benefit from FPI.

Siller, M; Hutman, T & Sigman, M. (2013). A parent-mediated intervention to increase responsive parental behaviors and child communication in children with ASD: A randomized, clinical trial. *Journal of Autism and Developmental Disorders*. March. 43(3), 540-550.

In 2014, Siller et.al. reported that Focused Playtime Intervention (FPI), also increases attachment related behaviors.

A Parent-Mediated Intervention that Targets Responsive Parental Behaviors Increases Attachment Behaviors in Children with ASD: Results from a Randomized Clinical Trial. Siller, Michael; Swanson, Meghan; Gerber, Alan; Hutman, Ted; Sigman, Marian. *Journal of Autism and Developmental Disorders*, v44 n7 p1720-1732 Jul 2014

In 2014, Liao and colleagues conducted a study on the effects of the DIR/Floortime intervention with eleven children with autism (ages 45-69 months). The mothers were trained in DIRFloortime during pre-intervention 1:1 counseling sessions and a three-hour lecture. Each parent conducted the intervention for at least 10 hours a week for ten weeks. There were significant improvements in each child's two-way communication, behavioral organization and problem-solving and daily living skills with medium to large effect sizes.

Liao, S.; Hwang, Y; Chen, Y.; Lee, P.; Chen, S & YiLin. (2014). Home-based DIR/Floortime intervention program for preschoolers with autism spectrum disorders: Preliminary findings. *Physical and Occupational Therapy in Pediatrics*. Early online: 1-12.

A 40-year program, called the Turtle Project, conducted a 4-year study of a comprehensive developmental relationship-based intervention for children with autism. Positive outcomes were found for autistic symptoms and cognitive development.

Di Renzo, M., Di Castelbianco, F. B., Petrillo, M., Racinaro, L., & Rea, M. (2015). Assessment of a long-term developmental relationship-based approach in children with autism spectrum disorder. *Psychological reports*, 117(1), 26-49.

Di Renzo, M., Bianchi di Castelbianco, F., Vanadia, E., Petrillo, M., Racinaro, L., & Rea, M. (2016). From the emotional integration to the cognitive construction: the developmental approach of turtle project in children with autism spectrum disorder. *Autism Open Access*, 6(1), 160-9.

In 2018, Reis et.al. reported the outcome of an intervention based on DIRFloortime for 25 children, 3-6 years of age, over 10 months. Positive effects were found on social communication and sensory processing.

Reis, H. I., Pereira, A. P., & Almeida, L. S. (2018). Intervention effects on communication skills and sensory regulation on children with ASD. *Journal of Occupational Therapy, Schools, & Early Intervention*, 11(3), 346-359.

In 2019, Ho and Lin reported a RCT of a DIR program in Taiwan, conducted over 14 weeks. They report benefits in emotional development and parenting skills.

Ho, M. H., & Lin, L. Y. (2020). Efficacy of parent-training programs for preschool children with autism spectrum disorder: A randomized controlled trial. *Research in Autism Spectrum Disorders*, 71, 101495.

As this list demonstrates, research continues to advance showing the effectiveness of developmental approaches broadly, and DIRFloortime specifically.

“I” Individual Difference

In the 1970s Jean Ayres pioneered discoveries about innate sensory processing differences.

Ayres JA. (1979). *Sensory Integration and the Child*. Western Psychological Services. Los Angeles, CA.

This provided a new way of understanding movement and regulatory behaviors. In addition, this work showed that these biological differences could be influenced and changed by specific therapeutic interventions. Over the past 40 years, a large body of research has further described biological differences in sensory-motor processing in autism and other children, and the effects of sensory based treatment.

The National Research Council of the National Academy of Sciences, in their 2001 landmark report, “Educating Children with Autism,” called for tailoring the treatment approach to the unique features of the individual child.

Lord, Catherine; McGee, James (Editors). Committee on Educational Interventions for Children with Autism. *Educating Children with Autism*. Division of Behavioral and Social Sciences and Education, National Research Council. Washington, DC: National Academy Press (2001) p 217

A 2011 pilot randomized control study showed the effectiveness of sensory integration treatment for children with autism. Results showed improvement in social responsiveness, sensory processing, functional motor skills, and social-emotional factors with a significant decrease in autistic mannerisms.

Pfeiffer, B. A., Koenig, K., Kinnealey, M., Sheppard, M., & Henderson, L. (2011). Research Scholars Initiative—Effectiveness of sensory integration interventions in children with autism spectrum disorders: A pilot study. *American Journal of Occupational Therapy*, 65, 76–85

In 2018, a systemic review with analysis of four studies showed the benefits of parental training regarding sensory processing.

Miller-Kuhaneck, H., & Watling, R. (2018). Parental or teacher education and coaching to support function and participation of children and youth with sensory processing and sensory integration challenges: A systematic review. *American Journal of Occupational Therapy*, 72(1), 7201190030p1-7201190030p11.

Also in 2018, A systemic review of sensory integration (updated in 2020) showed the efficacy of the Ayres sensory integration therapy.

Schaaf, R. C., Dumont, R. L., Arbesman, M., & May-Benson, T. A. (2018). Efficacy of occupational therapy using Ayres Sensory Integration®: A systematic review. *American Journal of Occupational Therapy*, 72(1), 7201190010p1-7201190010p10.

Although sensory processing has not yet been deemed as evidence-based practice in recent reviews of autism treatment, research is beginning to accumulate regarding its effectiveness in autism. DIRFloortime places great emphasis on tailoring intervention to individual differences, not only sensory processing, but also motor planning, and every individual's unique interests, talents, and abilities.

In 2012, a meta-analysis of studies which incorporate the interest of the child showed effectiveness on influencing child outcomes.

Dunst, C. J., Trivette, C. M., & Hamby, D. W. (2012). Meta-analysis of studies incorporating the interests of young children with autism spectrum disorders into early intervention practices. *Autism research and treatment*, 2012.

This study in 2014 showed benefits of sensory integration/occupational therapy.

Schaaf, R. C., Benevides, T., Mailloux, Z., Faller, P., Hunt, J., Van Hooydonk, E., Freeman, R., Leiby, B., Sendecki, J., & Kelly, D. (2014). An intervention for sensory difficulties in children with autism: A randomized trial. *Journal of Autism and Developmental Disorders*, 44(7), 1493-1506. <https://doi:10.1007/s10803-013-1983-8>

Research continues to show the importance of sensory processing differences in autism.

Ausderau, K., Sideris, J., Furlong, M., Little, L. M., Bulluck, J., & Baranek, G. T. (2014). National survey of sensory features in children with ASD: Factor structure of the sensory experience questionnaire (3.0). *Journal of autism and developmental disorders*, 44, 915-925. <https://doi:10.1007/s10803-013-1945-1>

Schaaf, R. C., Mailloux, Z., Ridgway, E., Berruti, A. S., Dumont, R. L., Jones, E. A., Leiby, B.E., Sancimino, C., Yi, M., & Molholm, S. (2022). Sensory phenotypes in autism: Making a case for the inclusion of sensory integration functions. *Journal of Autism and Developmental Disorders*, 1-13. <https://doi.org/10.1007/s10803-022-05763-0>

Research also documents the prevalence of motor challenges in autism.

Zampella, C. J., Wang, L. A., Haley, M., Hutchinson, A. G., & de Marchena, A. (2021). Motor skill differences in autism spectrum disorder: A clinically focused review. *Current Psychiatry Reports*, 23(10), 1–11. <https://doi.org/10.1007/s11920-021-01280-6>

“R” Relationship and Affect

Developmental models have evolved from many years of discovery in the field of infant mental health. Beginning in the 1950s, there was a new understanding of the importance of parent-infant interaction, known as attachment theory.

Bowlby, J. (1951). *Maternal care and mental health*. World Health Organization (WHO). Monograph Series, no. 51. Geneva: World Health Organization.

Ainsworth, M., Bell, S.M., & Stayton, D. (1974). Infant-mother attachment and social development: Socialization as a product of reciprocal responsiveness to signals. In M. Richards, ed., *The Integration of the child into a social world*. Cambridge: Cambridge University Press.

Stern, D. (1974). Mother and infant at play: The dyadic interaction involving facial, vocal, and gaze behaviors. In M. Lewis and L. Rosenblum, eds., *The effect of the infant on its caregiver*. New York: John Wiley & Sons, Inc.

Dr. Greenspan and Serena Wieder contributed to the field with their study of the importance of mother-child interactions in high-risk infants.

National Center for Clinical Infant Programs (1987). *Infants in Multirisk Families. Case Studies in Preventive Intervention*. Stanley I. Greenspan, Serena Wieder, Robert A. Nover, Alicia Lieberman, Reginald S. Lourie, Mary E. Robinson, eds. Clinical infant Reports, Number three. International Universities Press.

Other researchers contributed to the appreciation of parent-child interaction for child development:

Mundi, P., Sigman M., Kasari C. (1990). A longitudinal study of joint attention and language development in autistic children. *Journal of Autism and developmental Disorders* 20:115-128.

Alan Fogel (1993), *Developing Through Relationships*, The University of Chicago Press. Synopsis available at <http://www.press.uchicago.edu/presssite/metadata.epl?mode=synopsis&bookkey=52786>

Gernsbacher M.A., (2006). Toward a behavior of reciprocity. *Journal of Developmental Processes*, 1, 139-152. http://psych.wisc.edu/lang/pdf/gernsbacher_reciprocity.pdf

“Parent mediated” or “Parent implemented” interventions are now recognized as evidence based on recent reviews. There are many studies that find correlations between the strength of parental sensitivity and responsiveness and child outcomes, including:

Mahoney, G., Perales, F., Wiggers, B., & Herman, B. (2006). Responsive Teaching: Early Intervention for Children with Down Syndrome and Other Disabilities. *Down Syndrome Research and Practice*, 11(1), 18-28.

Solomon, R., Necheles, J., Ferch, C., & Bruckman, D. (2007). Pilot study of a parent training program for young children with autism: The PLAY Project Home Consultation program. *Autism*, 11(3), 205-224.

Siller, M., & Sigman, M. (2008). Modeling longitudinal change in the language abilities of children with autism: Parent behaviors and child characteristics as predictors of change. *Developmental psychology*, 44(6), 1691.

Ingersoll, B., & Wainer, A. (2013). Initial efficacy of Project ImPACT: A parent-mediated social communication intervention for young children with ASD. *Journal of autism and developmental disorders*, 43(12), 2943-2952.

Siller, M., Swanson, M., Gerber, A., Hutman, T., & Sigman, M. (2014). A parent-mediated intervention that targets responsive parental behaviors increases attachment behaviors in children with ASD: Results from a randomized clinical trial. *Journal of autism and developmental disorders*, 44(7), 1720-1732.

Bottema-Beutel, K., Yoder, P. J., Hochman, J. M., & Watson, L. R. (2014). The role of supported joint engagement and parent utterances in language and social communication development in children with autism spectrum disorder. *Journal of autism and developmental disorders*, 44(9), 2162-2174.

Patterson, S. Y., Elder, L., Gulsrud, A., & Kasari, C. (2014). The association between parental interaction style and children’s joint engagement in families with toddlers with autism. *Autism*, 18(5), 511-518.

Pajareya, K., Sutchritpongsa, S., & Kongkasuwan, R. (2019). DIR/Floortime® Parent Training Intervention for Children with Developmental Disabilities: a Randomized Controlled Trial. *Sriraj Medical Journal*, 71(5), 331-338.

Schertz et al. used a qualitative analysis to describe factors affecting parent self-efficacy, showing the value of their involvement.

Schertz, H. H., Lester, J. N., Erden, E., Safran, S., & Githens, P. (2020). Challenges and contributors to self-efficacy for caregivers of toddlers with autism. *Autism*, 24(5), 1260-1272.

And Liu and Schertz reported parents’ outcomes using JAML, and its effects on child outcomes.

Liu, X., & Schertz, H. H. (2022). Parents outcomes of parent-mediated intervention for toddlers with autism. *Topics in Early Childhood Special Education*, 42(3), 259-268.

Schertz, H. H., Liu, X., Odom, S. L., & Baggett, K. M. (2022). Parents’ application of mediated learning principles as predictors of toddler social initiations. *Autism*, 26(6), 1536-1549.

Mahoney and Solomon analyzed how parent’s interaction mediated the effects on children’s outcomes in the study of PLAY Project.

Mahoney, G., & Solomon, R. (2016). Mechanism of developmental change in the PLAY project home consultation program: Evidence from a randomized control trial. *Journal of autism and developmental disorders*, 46, 1860-1871.

In 2020 Mahoney and Solomon again analyzed the 2014 study regarding the effects of parental depression on outcome. They found that levels of parental depression did not affect parents' interaction or child engagement and that those with more depression at the onset had the greatest improvement in their depression symptoms.

Mahoney, G. J., & Solomon, R. M. (2020). Effects of parental depression symptoms on parents and children with autism spectrum disorder in the play project home consultation program. *International Journal of Early Childhood Special Education*, 12(1), 28-40. <https://doi.org/10.20489/intjecse.722333>

Karaaslan and Mahony analyze how maternal responsiveness mediated pivotal behaviors, which contributed to outcomes in a program using Responsive Teaching.

Karaaslan, O., Diken, I., & Mahoney, G. (2013). A randomized control study of Responsive Teaching with young Turkish Children and their mothers. *Topics in Early Childhood Special Education*, 33, 18-27. <https://doi.org/10.1177/0271121411429749>

Karaaslan, O., & Mahoney, G. (2015). Mediation analyses of the effects of responsive teaching on the developmental functioning of preschool children with disabilities. *Journal of Early Intervention*, 37(4), 286-299.

In 2016, a randomized controlled trial demonstrated a “significant and large effect” of a 12 course of DIR to increase “parental reflexive function capacities.”

Sealy, Julie, and Ira P. Glovinsky. "Strengthening the reflective functioning capacities of parents who have a child with a neurodevelopmental disability through a brief, relationship-focused intervention." *Infant Mental Health Journal* 37, no. 2 (2016): 115-124.

In 2020, Leadbitter et al. published a qualitative study showing that parents who participated in PACT experienced improvements in the quality of the relationships and interactions with their children.

Leadbitter, K., Macdonald, W., Taylor, C., Buckle, K. L., & PACT Consortium. (2020). Parent perceptions of participation in a parent-mediated communication-focused intervention with their young child with autism spectrum disorder. *Autism*, 24(8), 2129-2141. <https://doi.org/10.1177/1362361320936394>

The following 6 articles are reports about VIPP- Video Interaction to Promote Positive Parenting- VIPP uses video feedback to increase caregivers' awareness of their infant's social communication and guide their responses to build infant social engagement and interaction. These studies illustrate the impact of caregivers' relationship on the developmental course of high risk and children with autism. Green et al. (2013) reported an initial pilot case series of iBASIS-VIPP with infants 8-10 months of age at high risk for autism. In 2015, Green et al. (2015) showed broad effects in a RCT using iBASIS-VIPP with high-risk infants, and a follow-up study showed extended treatment effects (Green 2017). In 2015, a RCT reported effects of a version of VIPP, called VIPP-AUTI, adapted for young children with a diagnosis of autism (Poslawsky et al., 2015). And in 2021, a RCT reported decreased symptom severity with infants showing early signs of autism (Whitehouse et al., 2021).

Poslawsky, I. E., Naber, F. B., Bakermans-Kranenburg, M. J., De Jonge, M. V., Van Engeland, H., & Van IJzendoorn, M. H. (2014). Development of a video-feedback intervention to promote positive parenting for children with autism (VIPP-AUTI). *Attachment & Human Development*, 16(4), 343-355.

Poslawsky, I. E., Naber, F. B., Bakermans-Kranenburg, M. J., Van Daalen, E., Van Engeland, H., & Van IJzendoorn, M. H. (2015). Video-feedback Intervention to promote Positive Parenting adapted to Autism (VIPP-AUTI): A randomized controlled trial. *Autism*, 19(5), 588-603.

Green, J., Wan, M. W., Guiraud, J., Holsgrove, S., McNally, J., Slonims, V., ... & BASIS team. (2013). Intervention for infants at risk of developing autism: a case series. *Journal of autism and developmental disorders*, 43, 2502-2514.

Green, J., Charman, T., Pickles, A., Wan, M. W., Elsabbagh, M., Slonims, V., ... & Johnson, M. H. (2015). Parent-mediated intervention versus no intervention for infants at high risk of autism: a parallel, single-blind, randomised trial. *The Lancet Psychiatry*, 2(2), 133-140.

Green, J., Pickles, A., Pasco, G., Bedford, R., Wan, M. W., Elsabbagh, M., ... & McNally, J. (2017). Randomised trial of a parent-mediated intervention for infants at high risk for autism: Longitudinal outcomes to age 3 years. *Journal of Child Psychology and Psychiatry*, 58(12), 1330-1340.

Whitehouse, A. J., Varcin, K. J., Pillar, S., Billingham, W., Alvares, G. A., Barbaro, J., ... & Hudry, K. (2021). Effect of preemptive intervention on developmental outcomes among infants showing early signs of autism: A randomized clinical trial of outcomes to diagnosis. *JAMA Pediatrics*, 175(11), e213298-e213298.

Also, an adapted version of Responsive Teaching was reported in 2015 for children at high risk of autism.

Baranek, G. T., Watson, L. R., Turner-Brown, L., Field, S. H., Crais, E. R., Wakeford, L., ... & Reznick, J. S. (2015). Preliminary efficacy of adapted responsive teaching for infants at risk of autism spectrum disorder in a community sample. *Autism research and treatment*, 2015.

Increasingly, the emergence of autistic symptomatology is considered to be a process of derailing development with both constitutional and transactional causes.

Klin, A., Micheletti, M., Klaiman, C., Shultz, S., Constantino, J. N., & Jones, W. (2020). Affording autism an early brain development re-definition. *Development and Psychopathology*, 32(4), 1175-1189. <https://doi.org/10.1017/S0954579420000802>

Green, J. (2022). Autism as emergent and transactional. *Frontiers in Psychiatry*, 13, 988755. <https://doi.org/10.3389/fpsy.2022.988755>

Recent Reviews

Several recent reviews provide consensus regarding the research support for developmental interventions, including DIRFloortime.

1. In 2019, a systemic review was conducted on “Developmental social pragmatic interventions for preschoolers with autism spectrum disorder.” The review exclusively evaluated randomized controlled trials and covered six interventions. Ten studies reported outcomes of 716 preschool-aged children with autism spectrum disorder. “This review suggests the developmental social pragmatic

treatments positively impact children’s foundational communication capacities (i.e. attention, social referencing, joint attention, initiative, and reciprocity).”

Binns, A. V., & Oram Cardy, J. (2019). Developmental social pragmatic interventions for preschoolers with autism spectrum disorder: A systematic review. *Autism & Developmental Language Impairments*, 4, 2396941518824497.

2. In 2019, a meta-analysis was conducted on autism interventions for young children. This study “suggests that naturalistic developmental behavioral interventions and developmental intervention approaches have amassed enough quality evidence to be considered promising for supporting children with ASD in achieving a range of developmental outcomes.”

Sandbank, M., Bottema-Beutel, K., Crowley, S., Cassidy, M., Dunham, K., Feldman, J. I., ... & Woynaroski, T. G. (2020). Project AIM: Autism intervention meta-analysis for studies of young children. *Psychological Bulletin*, 146(1), 1.

3. In 2020, The National Clearinghouse on Autism Treatment at the University of North Carolina, looked at “Evidence-based practices for children, youth, and young adults with autism.” The report names as evidence-based 'naturalistic interventions' “which emerge from behavioral and/or developmental approaches to learning.” The report also names as evidence-based Parent Implemented Interventions. Many recognized developmental approaches are included in these two categories.

Steinbrenner, J. R., Hume, K., Odom, S. L., Morin, K. L., Nowell, S. W., Tomaszewski, B., ... & Savage, M. N. (2020). Evidence-based practices for children, youth, and young adults with autism. The University of North Carolina at Chapel Hill, Frank Porter Graham Child Development Institute, National Clearinghouse on Autism Evidence and Practice Review Team.

4. In 2020 a systematic review was conducted of specifically DIRFloortime programs. The conclusion was that “the evidence-base for this model is emerging.” “The most prominent positive outcome is social-emotional.”

Boshoff, K., Bowen, H., Paton, H., Cameron-Smith, S., Graetz, S., Young, A., & Lane, K. (2020). Child Development Outcomes of DIR/Floortime TM-based Programs: A Systematic Review. *Canadian Journal of Occupational Therapy*, 87(2), 153-164.

5. In 2021, a systematic review (the third iteration of previous reviews (Wong et. al.)) from interventions in the categories of parent implemented interventions and naturalistic interventions, including developmental approaches, met criteria for evidence-based practice.

Hume, K., Steinbrenner, J. R., Odom, S. L., Morin, K. L., Nowell, S. W., Tomaszewski, B., ... & Savage, M. N. (2021). Evidence-based practices for children, youth, and young adults with autism: Third generation review. *Journal of autism and developmental disorders*. 51(11), 4013–4032.
<https://doi.org/10.1007/s10803-020-04844-2>

6. In 2022, A meta-analysis of randomized controlled trials of Parent implemented interventions for children with autism, showed benefits, which included many developmental interventions, including DIR.

Cheng, W. M., Smith, T. B., Butler, M., Taylor, T. M., & Clayton, D. (2022). Effects of parent-implemented interventions on outcomes of children with autism: A meta-analysis. *Journal of Autism and Developmental Disorders*, 1-17.

7. In 2022, Francis et al published a review of play-based interventions and their impact on mental health for autistic children. They found 10 studies, (3 using DIR), concluding there are beneficial effects on positive mental health outcomes.

Francis, G., Deniz, E., Torgerson, C., & Toseeb, U. (2022). Play-based interventions for mental health: A systematic review and meta-analysis focused on children and adolescents with autism spectrum disorder and developmental language disorder. *Autism & Developmental Language Impairments*, 7. <https://doi.org/10.1177/23969415211073118>

8. In 2023, an umbrella review of 58 systematic reviews identified “positive therapeutic effects” for developmental interventions.

Trembath, D., Varcin, K., Waddington, H., Sulek, R., Bent, C., Ashburner, J., ... & Whitehouse, A. (2023). Non-pharmacological interventions for autistic children: An umbrella review. *Autism*, 27(2), 275-295.

Future Research

There is a need for continued research to evaluate the effectiveness of treatment. Current needs include studies which are long term, evaluate children based on individual profiles in addition to diagnosis, older children and children at higher levels of function. Studies would benefit from further description of treatment strategies, and differences in parent styles as well as children’s abilities.

Future research will also be informed by genetics, new technologies to track complex patterns of interaction, and direct measurements of brain function. Autism is now understood to involve differences in the integration of various distinct brain functions. Developmental intervention is based upon the use of affective interactions to enhance integration of sensory-regulatory, communication and motor systems. Neuro-imaging techniques may be used to show how intervention changes brain function.

Undoubtedly, researchers will continue to refine our understanding of developmental differences, and how to best support child development to achieve the optimal long-term outcome.

Claims & Questions

Sweeping claims have been made about the effectiveness of behavioral approaches, specifically ABA. However, there continues to be reservation about the strength of evidence for addressing the core features of autism, and long-term success. The review by Sandbank referenced above, states, “Behavioral intervention approaches also show evidence of effectiveness, but methodological rigor remains a pressing concern in the area of research.”

Eric Shyman authored a book, Besieged by Behavior Analysis for Autism Spectrum, which details the history of use and concerns with ABA for autism.

Shyman, E. (2014). *Besieged by Behavior Analysis for Autism Spectrum Disorder: A Treatise for Comprehensive Educational Approaches*. Lexington Books.

In 2017, Laurent Mottron in Quebec, Canada authored an article that questions the underlying basis of ABA and the efficacy of ABA approaches in early intervention. The article provides references to other articles that raise concerns about ABA and offers recommendations for alternative approaches.

Mottron, L. Should we change targets and methods of early intervention in autism, in favor of a strengths-based education?. *Eur Child Adolesc Psychiatry* 26, 815–825 (2017). <https://doi.org/10.1007/s00787-017-0955-5>

The 2024 annual report of the Autism Comprehensive Care Demonstration Program, provided through Tricare, the insurance program for the US Department of Defense, reported the results of their monitoring of ABA services. At the end of 2022 they had 16,156 children enrolled, and studies a sample of 497. Tricare submits annual reports which provide a detailed analysis of the ABA services that are provided.

Of note:

Previous annual reports have discussed the status of the research literature regarding ABA services. While DHA continues to monitor the literature, there have been no significant advances in the ABA research with regards to defining dose-response (including intensity, frequency, or duration), for whom ABA is most effective, and what clinical outcomes could be expected as a result of ABA interventions. As of now, ABA services do not meet the TRICARE hierarchy of reliable evidence standard for proven medical care.

<https://health.mil/Reference-Center/Reports/2024/01/08/Annual-Report-on-Autism-Care-Demonstration>

As insurance companies are questioning the time, cost, and effectiveness of behavioral approaches, academic scholars are also increasingly reconsidering the basis and outcome of accepted practice. The voices of adults with autism have contributed to this reexamination of intervention methods, with questions about ethics, values, and self-identity.

Parent choice

Part of the definition of “evidence base” is clinical experience and expertise. While research efforts continue to explore the etiology, biology, and efficacy of treatment approaches for autism, clinical experience also continues to accumulate. DIR/Floortime programs have high family satisfaction ratings and are widely utilized throughout the world as an effective framework for assessment and intervention.

A review by the National Institute of Mental Health (NIMH) states, “There is no single best treatment package for all children with ASD. Decisions about the best treatment, or

combination of treatments, should be made by the parents with the assistance of a trusted expert diagnostic team.”

NIMH. (June 2, 2009). *Autism Spectrum Disorders (Pervasive Developmental Disorders)*. Retrieved June 8, 2009, from <http://www.nimh.nih.gov/health/topics/autism-spectrum-disorders-pervasive-developmental-disorders/index.shtml>

Because of the wide range of individual differences in children with autism, and the many unique relationships within families, it is necessary and proper for parents to have the information and options necessary to make informed choices about the type of services their child will receive. DIRFloortime has a solid base of empirical evidence, and is widely used for children of all ages and abilities. Evidence based practice means the clinician can utilize all types of information including clinical expertise, and a family’s individual values and preferences, in addition to published research. There is ample evidence for the effectiveness of DIRFloortime to support an informed parent choice.

Sandbank states, “States with insurance mandates that explicitly cover traditional behavioral interventions should furthermore revise their policies to also include NDBI and developmental approaches given that these approaches have now accrued substantial evidence for effects in young children on the autism spectrum from recently published RCTs.”

Sandbank, M., Bottema-Beutel, K., Crowley, S., Cassidy, M., Dunham, K., Feldman, J. I., ... & Woynaroski, T. G. (2020). Project AIM: Autism intervention meta-analysis for studies of young children. *Psychological Bulletin*, 146(1), 1.

Diane Cullinane, M.D. can be contacted at dacullinane@gmail.com
This paper can be copied and used for educational purposes without restriction.