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LENA Grow and Language/Social Skills

What you'll learn in this paper:

- The relationship between a child's early language environment and key developmental outcomes such as language and social-skills
- How LENA can be used to measure a child's language environment
- How LENA Grow®, a professional development program for early educators, can help improve children's language and social-skills

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Language and social skills: On the decline

A survey conducted in 2023 by the American Speech-Language-Hearing Association (ASHA) revealed that 69% of speech-language pathologists have seen an increase in speech-language referrals since 2020.[1] A recent study found that children who attended kindergarten during the pandemic in 2020 had significantly lower language skills compared to pre-pandemic children.[2] Another study found that infants born during the pandemic had an increased risk for delayed development on both communication and social- skills metrics.[3] However, this decline in language and social skills is part of a broader trend that began before the pandemic, influenced by factors such as increased screen time, reduced face-to-face interactions, and changes in family dynamics, which have collectively impacted children's early development.

Past research has established a strong link between a child's early language environment and development of their language and social-emotional skills.[4,5,6,7,8,9] In the field of early childhood education, fostering meaningful interactions between educators and children contributes greatly to the quality of the learning environment.

The decline of language and social skills among young children underscores the need for effective interventions to help mitigate these adverse impacts.

How can we measure early talk?

Given the importance of a child's early language environment to their development, having a reliable and valid measurement tool by which to assess it is crucial. The LENA (Language ENvironment Analysis) tool was developed to fill that need. LENA technology has given researchers the opportunity to collect an unprecedented quantity of data on children's natural language environments and has provided caregivers and educators with a means to receive and utilize feedback reports. LENA was developed as a technological means of quantifying naturalistic language environments, including measuring the words spoken by adults , the child speech-related vocalizations , and, most importantly, the number of adult-child alternations (i.e., conversational turns) they experience.

The importance of conversational turns

LENA has shined a light on conversational turns. Conversational turns are verbal alternations between an adult and an infant, toddler, or preschool-aged child. LENA's programs for educators and caregivers focus on talking *with* a child not just *to* a child. These interactions are signifiers of high-quality language environments and measure engagement. Sometimes referred to as "serve-and-return interactions," conversational turns have been linked to brain structure and function, accelerated social skill development, advanced early literacy skill development, long-term outcomes, and IQ scores.[9,10,11,12,13]

How are conversational turns related to language and social skills?

LENA has demonstrated that the number of conversational turns (compared to other audio environment measures) tends to be the metric that is most strongly related to child development.[14] A recent meta-analysis across multiple studies of current research on LENA measures and child language development found that conversational turns consistently predicted child language skills. Numerous studies in developmental neuroscience as well have now shown a connection between conversational turns and development in the language centers of the brain.[11,12,13,16,17,18] LENA researchers investigated the long-term impacts of early turn-taking by following up on a sample of 146 middle school children who participated in a LENA study when these children were infants and toddlers. They found that conversational turns collected when children were 18-24 months of age predicted their language and IQ scores in middle school.[10]

LENA data also has shown connections between social skills development and early child language exposure.[19,20] A recent study using LENA data found that conversational turns measured when children were 18 months of age were significantly related to social-skill measures for them at 30 months.[9] A follow-up study to this work found similar results for these children again at 77 months.[20]

Early language and the child care environment

Although most of the research on early language exposure has been focused on a child's language environment in the home, there has also recently been work on language exposure in the early childhood classroom environment and its relationship to child development.[21,22,23] This is important research, given that the average child spends 27 hours a week in a child care environment. Recent analyses found that while language environments varied widely throughout the day between and within classrooms, the number of conversational turns between teachers and children was a robust predictor of child vocabulary scores, even after adjusting for family income.[22,23]

This research underscores the importance of a child's early language experience in both the home and the classroom for language and social-skills outcomes and demonstrates the need for supportive and engaging language environments during the early childhood years.

LENA Grow and conversational turns in the classroom

Given the need in early education for supportive language environments that boost teacher-child interactions, LENA provides a professional development program for early educators called LENA Grow. Aimed at increasing interactions between teachers and the children in their care, the program follows a five-week cycle of measurement, quantitative feedback, reflective coaching, and practice. During each "LENA Day," which is one day a week for the duration of a sequence [5-10 weeks], children wear a LENA device that gathers information on their language environment. This data is then translated into easy-to-read feedback reports, which highlight classroom level and individual children's language experiences. With these reports, teachers work alongside coaches to develop strategies to increase their conversational turns. After coaching sessions, teachers then put these strategies into action. They can measure their progress and hone their skills on subsequent "LENA Days."

Evaluating LENA Grow using translational research

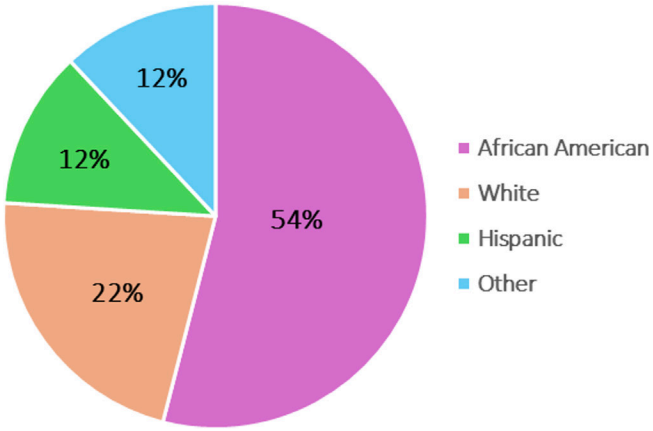
We present findings here from an evaluation study of the LENA Grow program, which encourages teachers to create richer opportunities for language development and to foster improved social skills through greater teacher-child engagement. These improvements in classroom interactions have the potential to profoundly influence children's developmental trajectories, particularly for those already experiencing delays, by addressing gaps during critical stages of growth.

We employed a translational research approach in this study, which adapts insights from controlled studies to practical, everyday settings. This method enables programs like LENA Grow within the complexities of real-world conditions while still generating meaningful conclusions. By bridging the gap between theoretical frameworks and applied practice, translational research is particularly suited for understanding how interventions function in dynamic, unpredictable environments like child care centers.

Research design

A total of 29 child care centers participated, encompassing 828 children aged 2 to 48 months in 75 unique classrooms across the regions of the Mid-Atlantic, the Southeast, and the Great Lakes. Classrooms were assigned to either a treatment group, where teachers participated in the professional development program, or a control group, where teachers did not participate. Despite the lack of randomization, children were balanced across groups with respect to available demographic information. In total, 51 classrooms with 435 children participated in the LENA Grow program, while 38 classrooms with 393 children served as the control group. Demographic information on race and ethnicity was available for approximately 50% of the children, and proportions were similar across both groups. Race/ethnicity percentages based on known cases are shown below in Figure 1.

Figure 1. Race/Ethnicity of Sample for Known Cases

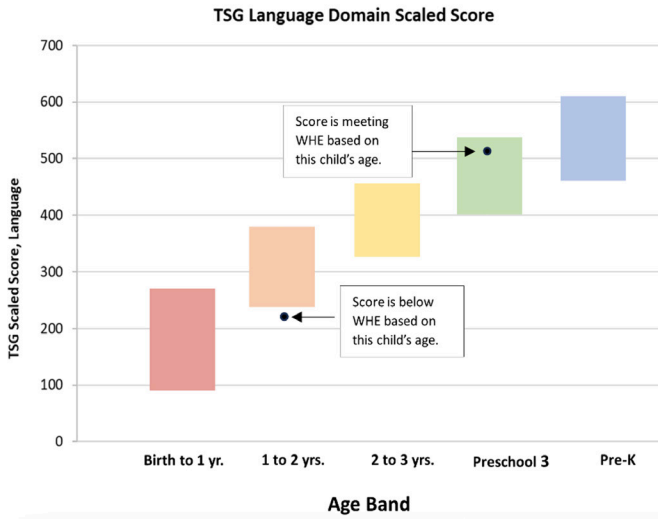


Evaluation measures used for child outcomes

The main evaluation measures used in this study were scores from Teaching Strategies GOLD® (TSG), a teacher-completed observational assessment system that evaluates children across 10 developmental domains. We examined the scores for the language and social-emotional domains of TSG. Children were categorized by Widely Held Expectation (WHE) benchmarks based on their age and TSG domain scores. Figure 2 below illustrates how WHE benchmarks are used along with a child's TSG domain score and age group. If a child's TSG score falls within or above the colored band for their age group, then they are considered to have met the WHE benchmark. This situation is represented in the figure by the dot inside the green box for a preschool child. If, however, a child's score falls below the expected score range for their age group, they are flagged as not meeting WHE expectations for that domain based on their age. This situation is represented in the figure by the dot that is below the orange box for the child aged 1 to 2 years.

Focusing on children who fall behind these benchmarks is critical because they are more likely to face challenges later in their educational journey, potentially impacting their academic performance, social development, and long-term success in school. Early identification and intervention can address developmental delays and support these children in catching up with their peers.

Figure 2. How TS GOLD® Scaled Scores Related to Widely Held Expectations (WHE)



The chart illustrates one child whose TSG score was "below expectations" and another child whose score was "above expectations" based on benchmarks for their age group."

Before implementation of the program, teachers in both Grow and control classrooms completed a TSG assessment for all participating children and then completed it again after the program was completed, corresponding to TSG's quarterly checkpoints.

Evaluation measure results

Table 1 shows pre-post results for TSG scores in the Language domain, comparing the children in the LENA Grow classrooms to the children from the control group classrooms. By looking at the "mean diff" column, we can see in these results that children in the LENA Grow classrooms experienced a significantly larger increase in their TSG language scores from pre- to post-intervention, compared to children in the control group ($p < 0.001$). Importantly, we see similar results *within each age band*, wherein children with teachers who participated in LENA Grow showed significantly greater gains on their language domain scores compared to the control children. The effect size, which is a measure of the magnitude of the difference, is largest and in the moderate range for the infant and preschool subgroups. These results demonstrate that LENA Grow, a program designed to increase teacher-child conversational turns, was effective at improving child language across different developmental stages. This is non-trivial, because it shows that a laser focus on this specific, crucial skill can impact child development at all ages.

Table 1. Independent Samples T-Tests Comparing Pre-Post Language Change, Treatment vs. Control Group; Overall and by Age Bands.

	Treatment			Control			Independent Samples Test				
Age Band	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	**Mean Diff.**	**SD**	**t**	**Sig.**	**Effect Size**
All Ages	435	34.4	38.3	393	18.2	46.0	16.2	2.9	5.53	0.000*	0.27
0-1	36	57.3	26.4	25	24.8	81.2	32.5	14.5	2.25	0.028*	0.49
1-2	98	40.2	42.3	83	28.5	36.5	11.7	5.9	1.98	0.049*	0.19
2-3	139	27.5	39.3	140	15.7	49.0	11.8	5.3	2.22	0.027*	0.19
Preschool 3	98	30.5	35.0	88	19.1	36.6	11.5	5.3	2.18	0.030*	0.22
Pre-K	64	33.3	34.8	57	5.0	39.8	28.3	6.8	4.18	0.000*	0.52

**Statistical significance is at the <.05 level*

Subgroup analysis: Children below widely held expectations (WHE)

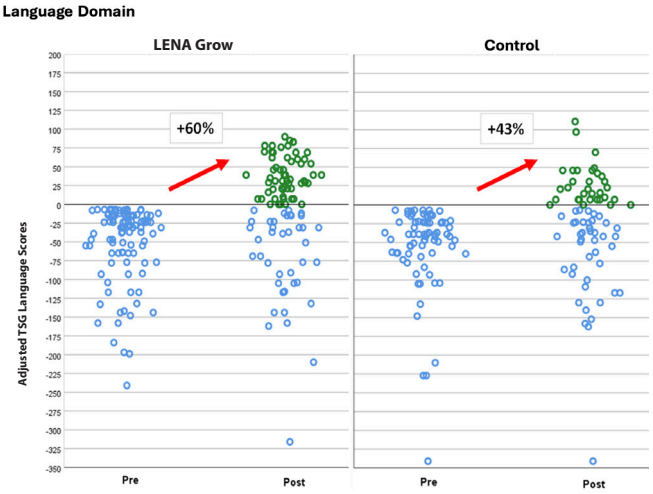
We turn now to children who are at risk for language or developmental delays as indicated by TSG Widely Held Expectations categorization. We looked at the data on children who are at risk for language or developmental delays as indicated by TSG Widely Held Expectations categorization. Figure 3 displays results for the language domain where 21% of all children in the study were initially flagged as "at-risk" on the WHE language benchmark. These children are represented in the figure by the blue dots on the left side of the boxes representing the treatment and control groups.

The dots on the right side of each box in this figure show the status of these children on the post TSG, with the green dots representing children who met the WHE benchmarks for language after the Grow program (or after business as usual for the Control Group) and the blue dots representing children who were still below the WHE at post. This figure shows that 60% of the initial at-risk children who had teachers participating in the LENA program were meeting expectations on language after the program while only 43% of initially at-risk children in the Control classrooms were subsequently meeting WHE expectations on language. A logistic regression analysis further indicates that **children in the LENA Grow group who were initially below WHE on language were twice as likely to score within or above the WHE benchmarks after the Grow program**, compared to control group children.

Comparable results were found for the children who started out below WHE on the social-emotional domain, represented in Figure 4 by the purple dots. We see from the right side of the "Grow" column of Figure 4 that 67% of initially at-risk children who were in LENA Grow classrooms met social-emotional expectations after the program, compared to only 46% of the initially at-risk control group children. Logistic regression analyses indicated that **children in the LENA Grow group who initially were below the social-emotional WHE were more than twice as likely to score within or above WHE benchmarks after the program**.

By enhancing engagement through increased teacher-child interactions, the LENA Grow program led to notable improvements in children's language scores across all age groups, as well as improvement for delayed children on both language and social-emotional development. These results are particularly important in the context of the recent COVID-19 pandemic, which has disrupted critical developmental periods for many young children. The intervention's effectiveness across different age groups and its pronounced benefits for children with developmental delays underscore the urgency and potential impact of implementing such programs widely.

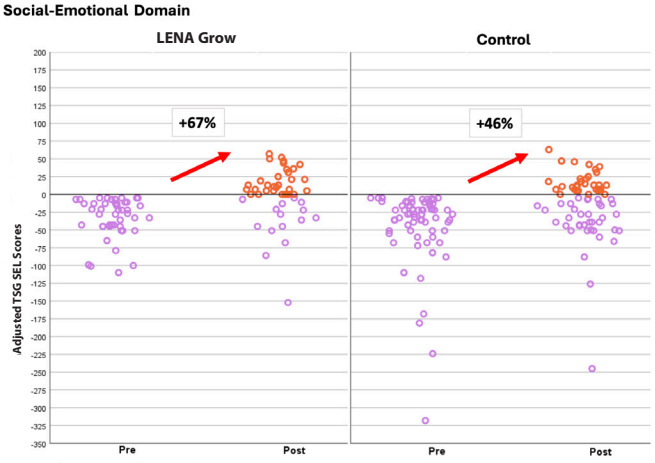
Figure 3. LENA Grow Children Were More Likely Than Control Children to Score Above Widely Held Expectations on TS GOLD® Language Domain



Odds Ratio, Grow vs. Control = 1.98; *p* < 0.05

The Y axis represents scores above and below WHE, with the WHE threshold at zero.

Figure 4. LENA Grow Children Were More Likely Than Control Children to Move Above Widely Held Expectations for the TS GOLD® Social-Emotional Domain



Odds Ratio, Grow vs. Control = 2.35; p < 0.05

The Y axis represents scores above and below WHE, with the WHE threshold at zero.

Conclusion

Given these significant findings and comparisons to a control group, the results presented here prove that LENA Grow can significantly improve child outcomes, particularly in the case of children who are delayed in language or social skills. The LENA Grow program not only helps delayed children achieve key developmental milestones but also fosters an environment where all children can thrive, reinforcing the belief that every child deserves the chance to reach their full potential.

Beyond its immediate impact on children, this evaluation also aligns with research showing the substantial economic and societal benefits of early childhood interventions. For example, work from the National Bureau of Economic Research indicates that such programs yield a 13.7% annual return on investment and a benefit-cost ratio of 7.3 over the long term.[25] Additionally, early childhood development programs have been linked to increased educational attainment and higher future earnings, key outcomes that benefit both individuals and society over the long term.[26] Investing in early childhood programs like LENA Grow can lead to profound societal and economic gains, including reduced need for costly special education services, fewer behavioral interventions, and increased future earnings. These measurable improvements provide hope not only for children and their families but for the future prosperity of entire communities.

The urgency of addressing developmental delays has become even greater in the wake of the disruption of the COVID-19 pandemic and broader trends driven by factors including increased screen time, reduced face-to-face interactions, and shifting family and community dynamics that have influenced early childhood development. LENA Grow offers a solution by addressing these gaps early, giving at-risk children a better chance to catch up and succeed while also mitigating the long-term economic consequences of these disruptions. Programs like LENA Grow are more than just professional development for educators; they represent an investment in the future of children, families, and society at large.

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Citations

[1] ASHA. (2023). ASHA Identify the Signs Campaign Survey Results.

[2] Nevo, E. (2024). The effect of the COVID-19 pandemic on low SES kindergarteners' language abilities. *Early Childhood Education Journal*, 52(3), 459-469.

[3] Giesbrecht, G. F., Lebel, C., Dennis, C.-L., Silang, K., Xie, E. B., Tough, S., McDonald, S., & Tomfohr-Madsen, L. (2023). Risk for developmental delay among infants born during the COVID-19 pandemic. *Journal of Developmental & Behavioral Pediatrics*, 44(6), e412-e420.

[4] Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Paul H. Brookes Publishing Co.

[5] Weizman, Z. O., & Snow, C. E. (2001). Lexical input as related to children's vocabulary acquisition: Effects of sophisticated exposure and support for meaning. *Developmental Psychology*, 37(2), 265-279.

[6] Hoff, E. (2003). The specificity of environmental influence: Socioeconomic status affects early vocabulary development via maternal speech. *Child Development,* 74(5), 1368-1378.

[7] Rowe, M. L., Raudenbush, S. W., & Goldin-Meadow, S. (2012). The pace of vocabulary growth helps predict later vocabulary skill. *Child Development*, 83(2), 508-525.

[8] Hirsh-Pasek, K., Adamson, L. B., Bakeman, R., Owen, M. T., Golinkoff, R. M., Pace, A., Yust, P. K. S., & Suma, K. (2015). The contribution of early communication quality of low-income children's language success. *Psychological Science*, 26(7), 1071-1083.

[9] Gómez, E., & Strasser, K. (2021). Language and socioemotional development in early childhood: The role of conversational turns. *Developmental Science*, 24(5), e13109.

[10] Gilkerson, J., Richards, J. A., Warren, S. F., Oller, D. K., Russo, R., & Vohr, B. (2018). Language experience in the second year of life and language outcomes in late childhood. *Pediatrics*, 142(4).

[11] Romeo, R., Leonard, J. A., Grotzinger, H. M., Robinson, S. T., Megumi, T. E., Mackey, A. P., Scherer, E., Rowe, M. L., West, M. R., & Gabrieli, J. D. E. (2021). Neuroplasticity associated with changes in conversational turn-taking following a family-based intervention. *Developmental Cognitive Neuroscience*, 49(100967).

[12] Romeo, R. R., Segaran, J., Leonard, J. A., Robinson, S. T., West, M. R., Mackey, A. P., Yendiki, A., Rowe, M. L., & Gabrieli, J. D. E. (2018). Language exposure relates to structural neural connectivity in childhood. *The Journal of Neuroscience*, 38(36), 7870-7877.

[13] Romeo, R. R., Leonard, J. A., Robinson, S. T., West, M. R., Mackey, A. P., Rowe, M. L., & Gabrieli, J. D. E. (2018). Beyond the 30-million-word gap: Children's conversational exposure is associated with language-related brain function. *Psychological Science*, 29(5), 700-710.

[14] Zimmerman, F. J., Gilkerson, J., Richards, J. A., Christakis, D. A., Xu, D., Gray, S., & Yapanel, U. (2009). Teaching by listening: The importance of adult-child conversations to language development. *Pediatrics*, 124(1), 342-349.

[15] Wang, Y., Williams, R., Dilley, L., & Houston, D. M. (2020). A meta-analysis of the predictability of LENA™ automated measures for child language development. *Developmental Review*, 57, 100921.

[16] Fibla, L., Forbes, S. H., McCarthy, J., Mee, K., Magnotta, V., Deoni, S., Cameron, D., & Spencer, J. P. (2023). Language exposure and brain myelination in early development. *Journal of Neuroscience*, 43(23), 4279-4290.

[17] Huber, E., Corrigan, N. M., Yarnykh, V. L., Ramírez, N. F., & Kuhl, P. K. (2023). Language experience during infancy predicts white matter myelination at age 2 years. *The Journal of Neuroscience*, 43(9), 1590-1599.

[18] Merz, E. C., Maskus, E. A., Melvin, S. A., He, X., & Noble, K. G. (2020). Socioeconomic disparities in language input are associated with children's language-related brain structure and reading skills. *Child Development*, 91(3), 846-860.

[19] King, L. S., Querdasi, F. R., Humphreys, K. L., & Gotlib, I. H. (2021). Dimensions of the language environment in infancy and symptoms of psychopathology in toddlerhood [Advance online publication]. *Developmental Science*.

[20] Muzzio, E. G. (2022). Preliminary Findings: Early turn talking is associated with later social-emotional development. *The Volta Review*, 122(1).

[21] Custode, S. A., Bailey, J., Sun, L., Katz, L., Ullery, M., Messinger, D., Bulotsky-Shearer, R. J., & Perry, L. K. (2023). Preschool language environments and social interactions in an early intervention classroom: A pilot study. *Journal of Early Intervention*, 0(0), 1-18.

[22] Duncan, R. J., Anderson, K. L., King, Y. A., Finders, J. K., Schmitt, S. A., & Purpura, D. J. (2022). Predictors of preschool language environments and their relations to children's vocabulary. *Infant and Child Development*, e2381.

[23] Duncan, R. J., King, Y. A., Finders, J. K., Elicker, J., Schmitt, S. A., & Purpura, D. J. (2020). Prekindergarten classroom language environments and children's vocabulary skills. *Journal of Experimental Child Psychology*, 194, 104829.

[24] NICHD Early Child Care Research Network (Ed.). (2005). Child care and child development: *Results from the NICHD study of early child care and youth development*. Guilford Press.

[25] García, J. L., Heckman, J. J., Leaf, D. E., & Prados, M. J. (2017). T*he life-cycle benefits of an influential early childhood program*.

[26] Reynolds, A. J., Temple, J. A., Robertson, D. L., & Mann, E. A. (2001). Long-term effects of an early childhood intervention on educational achievement and juvenile arrest: A 15-year follow-up of low-income children in public schools. *Jama*, 285(18), 2339-2346.

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