Abstract

Caregivers of autistic children often face barriers to receiving effective training in evidence-based interventions, limiting their ability to consistently implement strategies that support communication and learning. Traditional training methods, while effective, present challenges with accessibility and scalability, particularly for families in underserved areas. Telepractice offers a promising solution by allowing BCBAs to deliver training remotely, expanding access without compromising quality. Researchers recognize telepractice as an effective way to train individuals to implement evidence-based interventions for children with autism spectrum disorder. The integration of artificial intelligence presents as an emerging opportunity to enhance the accuracy of data collection in applied behavior analysis. This study used a single-case multiple-baseline across-participant design to evaluate the effectiveness of telepractice in training caregivers to implement incidental teaching. The study also evaluated the reliability of data collected by BehaviorBuddy, an application in development. A Board Certified Behavior Analyst, trained caregivers via video-conferencing, and researchers compared BehaviorBuddy's data to clinician-collected and research-grade data. Results showed that telepractice-based Behavioral Skills Training improved caregiver fidelity, increased communication opportunities, and led to more child target mands. All caregivers reached 100% fidelity across at least two consecutive sessions within eight telepractice sessions. However, BehaviorBuddy's data consistently fell below clinician and research-grade measures, indicating limited reliability. These findings support telepractice as a promising, data-driven method for caregiver training while highlighting the need to refine the BehaviorBuddy application to improve accuracy and establish its role as a reliable data collection tool in applied settings.

BehaviorBuddy App

The researcher used the BehaviorBuddy application to analyze pre-recorded clinician-participant session videos and evaluate the reliability of the data output generated by the app. The application uses advanced features, including voice recognition software, to detect vocalizations from both the child and the caregiver. It generated a report that calculated caregiver fidelity based on the same fidelity task list followed by the clinician. Additionally, the application tracked whether the child met their target mand goals across a predetermined number of trials as established by the researcher.

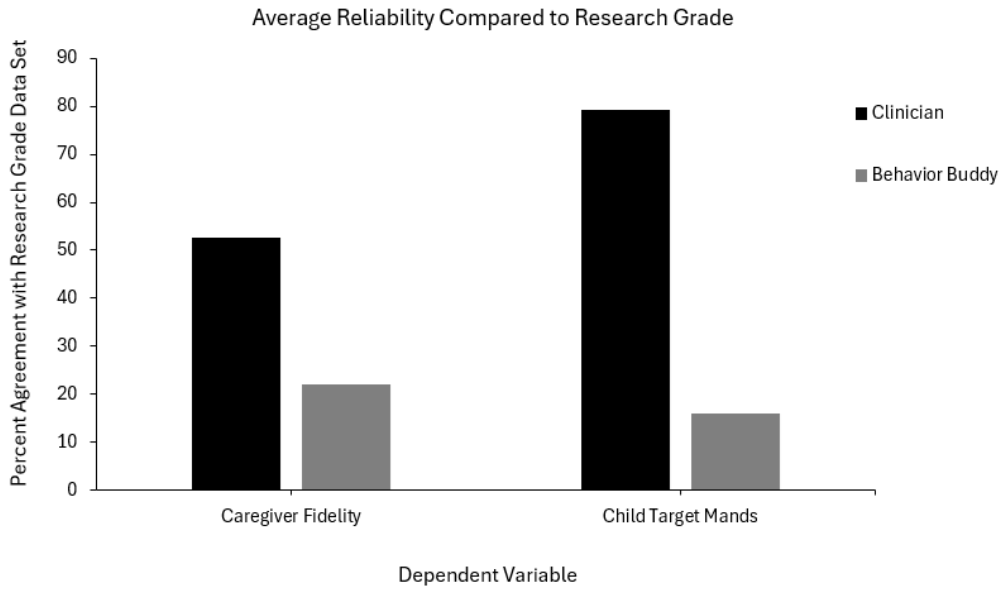

Figure 1. The graph depicts the total average of each dependent variable with percentage of agreement on the y-axis and the dependent variables on the x-axis.

Caregiver Behavior

The first caregiver behavior measured was the caregiver's *fidelity in implementing incidental teaching*. The BCBA evaluated caregiver implementation fidelity using a procedural task list adapted from Neely (2016), as detailed in Table 1. The fidelity checklist contained 10 possible behaviors. Caregiver implementation fidelity was measured as the percentage of steps completed correctly during each session. Since multiple communication opportunities could be presented within a session, the overall mean percentage of steps completed correctly across all opportunities in the session was calculated to evaluate caregiver fidelity.

Table 1

BehaviorBuddy Incidental Teaching Fidelity Sheet

Criteria
1. Does the caregiver start the opportunity by asking, "What do you want?"
2. Does the caregiver wait 3-6 seconds after asking "what do you want?" (or 1st prompt) before prompting again?
3. If the child does not correctly respond to "what do you want?" (or 1st prompt), does the parent provide a clear vocal model at the target communication level?
4. Does the parent wait 3-6 seconds after the first vocal model before prompting again?
5. If the child does not correctly respond to the first vocal model, does the parent provide a second vocal model at the target communication level?
6. Does the parent wait 3-6 seconds after the second vocal model before prompting again?
7. If the child does not correctly respond to the second vocal model, does the parent provide a final vocal model at the target communication level?
8. If the child provides a correct response, does the parent repeat and expand within 3 seconds prior to saying anything else?
9. Does the parent provide no more than 3 vocal models in a single opportunity?
10. Does the parent wait at least 3 seconds before starting another opportunity?

The second caregiver behavior measured was the *frequency of communication opportunities offered* during each 1-minute session. Caregivers created communication

opportunities by arranging the environment, such as placing preferred items out of reach but in sight, sabotaging task completion, or engaging in unexpected behaviors during a routine. The clinician counted an opportunity only when the child demonstrated motivation for the item by initiating the communication opportunity and the caregiver stating, “What do you want?”. Children initiated communication by looking at or reaching towards a preferred item (ex: toy, snack).

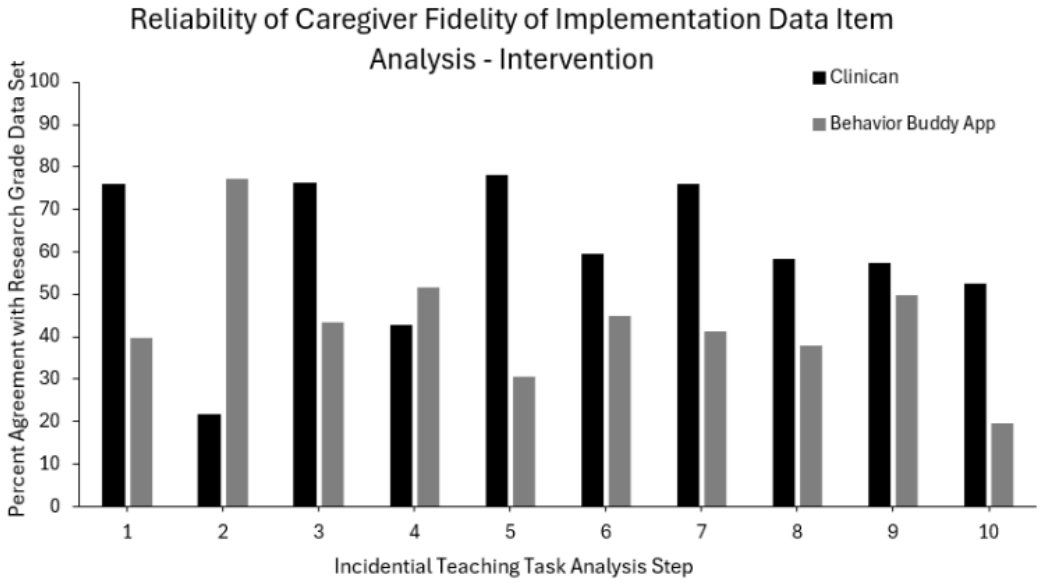

Figure 2. The graph depicts the reliability of caregiver fidelity between the clinician and research grade and the behaviorbuddy and research grade data set. The y-axis represents the percentage of agreement, and the x-axis represents each step of the item analysis.

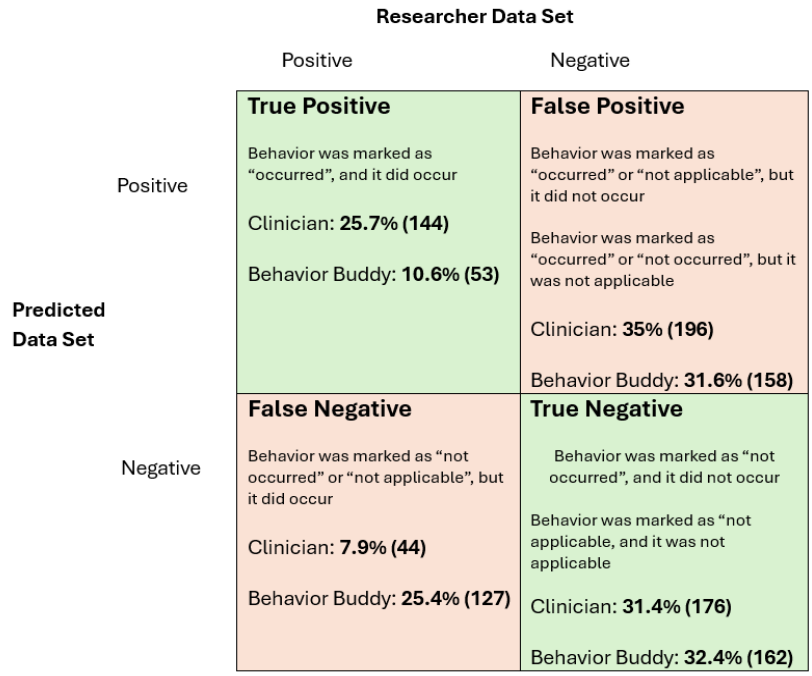

Figure 3. Confusion Matrix- Caregiver Fidelity

	Clinician vs. Research Grade	BehaviorBuddy App vs. Research Grade
Accuracy	57%	43%
Specificity	47%	51%
Precision	42%	25%
Recall	77%	29%
F1 Score	54%	27%
Cohen's Kappa	0.20	-0.19

Figure 4. Performance Metrics for caregiver fidelity with Clinican vs. Research Grade depicted in blue and BehaviorBuddy vs. Research Grade depicted in orange

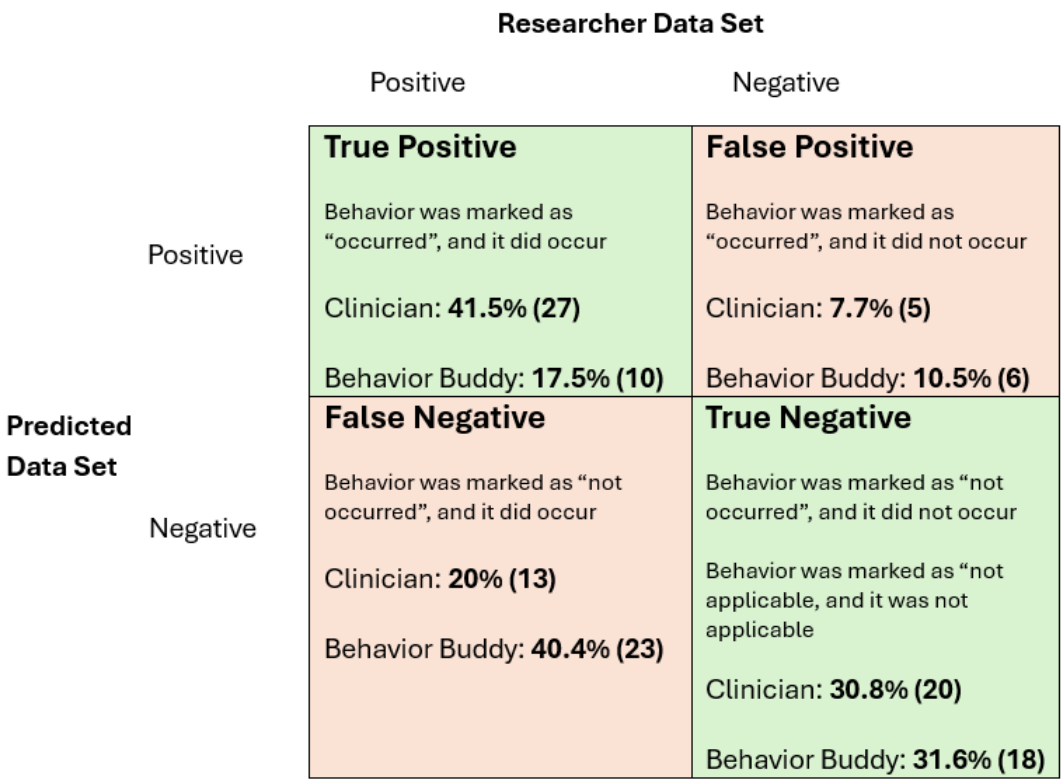

Figure 5. Confusion Matrix- Child Communication

	Clinician vs. Research Grade	BehaviorBuddy App vs. Research Grade
Accuracy	72%	49%
Specificity	80%	75%
Precision	84%	63%
Recall	68%	30%
F1 Score	75%	41%
Cohen's Kappa	0.448	0.048

Figure 6. Performance Metrics for child communication with Clinican vs. Research Grade depicted in blue and BehaviorBuddy vs. Research Grade depicted in orange

References

Behavior Analyst Certification Board Certificant Data. (2025). Behavior Analyst Certification Board. https://www.bacb.com/bacb-certificant-data/

Centers for Disease Control and Prevention. (2025). *Data and statistics on autism spectrum disorder*. Centers for Disease Control and Prevention. https://www.cdc.gov/autism/data-research/index.html

Farmer-Dougan V. (1994). Increasing requests by adults with developmental disabilities using incidental teaching by peers. *Journal of Applied Behavior Analysis*, *27*(3), 533–544. https://doi.org/10.1901/jaba.1994.27-533

Ferguson, J., Dounavi, K., & Craig, E. A. (2022). The efficacy of using telehealth to coach parents of children with autism spectrum disorder on how to use naturalistic teaching to increase mands, tacts and intraverbals. *Journal of Developmental and Physical Disabilities*. https://link.springer.com/article/10.1007/s10882-022-09859-4

Gerow, S., Kirkpatrick, M., McGinnis, K., Sulak, T. N., Davis, T. N., & Fritz, S. (2022). Evaluation of a telehealth ABA program for caregivers of children with ASD. *Behavior Modification*, *47*(2), 349–379. https://doi.org/10.1177/01454455221130001

Gibson, J. L., Pennington, R. C., Stenhoff, D. M., & Hopper, J. S. (2009). Using desktop videoconferencing to deliver interventions to a preschool student with autism. *Topics in Early Childhood Special Education*, *29*(4), 214–225. https://doi.org/10.1177/0271121409352873

Hodgetts, S., Zwaigenbaum, L., & Nicholas, D. (2014). Profile and predictors of service needs for families of children with autism spectrum disorders. *Autism*, *19*(6), 673–683. https://doi.org/10.1177/1362361314543531

Jia, Q., Wang, X., Zhou, R., Ma, B., Fei, F., & Han, H. (2023). Systematic Bibliometric and visualized analysis of research hotspots and trends in artificial intelligence in autism spectrum disorder. *Frontiers in Neuroinformatics*, *17*. https://doi.org/10.3389/fninf.2023.1310400

Knopp, K., Ferguson, J. L., Piazza, J., Weiss, M. J., Lee, M., Cihon, J. H., & Leaf, J. B. (2022). A comparison between direct telehealth and in-person methods of teaching expressive labels to children diagnosed with autism spectrum disorder. *Behavior Modification*, *47*(2), 432–453. https://doi.org/10.1177/01454455221130000

Kumar, M., Kim, S. H., Lord, C., & Narayanan, S. (2020). Improving speaker diarization for naturalistic child-adult conversational interactions using contextual information. *The Journal of the Acoustical Society of America.* https://pubs-aip-org.libweb.lib.utsa.edu/asa/jasa/article/147/2/EL196/995426/Improving-speaker-diarization-for-naturalistic

Lang, R., Machalicek, W., Rispoli, M., & Regester, A. (2009). Training parents to implement communication interventions for children with autism spectrum disorders (ASD): A systematic review. *Evidence-Based Communication Assessment and Intervention*, *3*(3), 174–190. https://doi.org/10.1080/17489530903338861

Machalicek, W., O'Reilly, M., Chan, J. M., Rispoli, M., Lang, R., Davis, T., Shogren, K., Sorrells, A., Lancioni, G., Sigafoos, J., Green, V., & Langthorne, P. (2009). Using

videoconferencing to support teachers to conduct preference assessments with students with autism and developmental disabilities. *Research in Autism Spectrum Disorders*, *3*(1), 32–41. https://doi.org/10.1016/j.rasd.2008.03.004

McDuffie, A., Machalicek, W., Oakes, A., Haebig, E., Weismer, S. E., & Abbeduto, L. (2013). Distance Video-Teleconferencing in Early Intervention: Pilot Study of a Naturalistic Parent-Implemented Language Intervention. *Topics in Early Childhood Special Education*, *33*(3), 172–185. https://doi.org/10.1177/0271121413476348

Meadan, H., Sands, M. M., & Chung, M. Y. (2023). Parent-implemented telepractice autism intervention: A case study of maintenance and generalization. *International Journal of Environmental Research and Public Health*, *20*(3), 1685. https://doi.org/10.3390/ijerph20031685

Neely, L., Rispoli, M., Gerow, S., & Hong, E. R. (2016). Preparing Interventionists via Telepractice in Incidental Teaching for Children with Autism. *Journal of Behavioral Education*, *25*(4), 393–416. https://doi.org/10.1007/s10864-016-9250-7

Rosenberg, N. E., Artman-Meeker, K., Kelly, E., & Yang, X. (2020). The effects of a bug-in-ear coaching package on implementation of incidental teaching by paraprofessionals in a K-12 school. *Journal of Behavioral Education*, *29*(2), 409–432. https://doi.org/10.1007/s10864-020-09379-1

Sathyanarayanan, S. (2024). Confusion matrix-based performance evaluation metrics. *African Journal of Biomedical Research*, 4023–4031. https://doi.org/10.53555/ajbr.v27i4s.4345

Sump, L. A., Richman, D. M., Schaefer, A. M., Grubb, L. M., & Brewer, A. T. (2018). Telehealth and in-person training outcomes for novice discrete trial training therapists. *Journal of Applied Behavior Analysis*, *51*(3), 466–481. https://doi.org/10.1002/jaba.461

Zhang, L., Weitlauf, A. S., Amat, A. Z., Swanson, A., Warren, Z. E., & Sarkar, N. (2019). Assessing Social Communication and collaboration in autism spectrum disorder using intelligent collaborative virtual environments. *Journal of Autism and Developmental Disorders*, *50*(1), 199–211. https://doi.org/10.1007/s10803-019-04246-z