IJLER International Journal of Language and Education Research

Volume 5, Issue 3, December 2023 p. 1-18

Ankara / Türkiye

Article Information

Article Type: *Research Article*

This article has been checked for similarity.

This is an open access article under the CC-BY-NC licence

Article History:
Received
06/11/2023
Received in revised form
11/12/2023
Accepted
11/12/2023

THE EFFECT OF THOUGHT BUBBLES ON READING COMPREHENSION SKILLS IN CHILDREN WITH AUTISM

Seda Karayazı-Özsayın[1]

Abstract

Literacy skills play a crucial role in the ongoing education and social interaction of children diagnosed with Autism Spectrum Disorder (ASD). For instance, the ability to read serves as an essential basis for their academic accomplishments, and higher academic achievements have been shown to lead to improved employment prospects and financial advantages. Additionally, there is a significant correlation between a child's reading proficiency and their adaptive communication skills within the ASD population. Nevertheless, a significant number of children with Autism Spectrum Disorder (ASD) demonstrate challenges in reading, characterized by a wide range of variations in both decoding and reading comprehension abilities. Although this population has challenges with reading comprehension, the current literature does not have enough information on effective interventions to solve the problem. The present study aims to improve the reading comprehension skills of individuals with ASD by using thought bubbles. Three participants with ASD attended. A multiple-baseline design across participants with a follow-up design was utilized. As a result, the thought bubble strategy successfully improved reading comprehension. Recommendations for future research are discussed.

Keywords: Autism, reading comprehension, thought bubbles.

[1] Dr., Adiyaman University, Faculty of Education, Special Education Department, Adiyaman/Turkey, E-mail: sozsayin@adiyaman.edu.tr, ORCID: 0000-0002-2445-5371

Introduction

Autism Spectrum Disorder (ASD) refers to any one of a category of disorders with an onset that often happens around the preschool years and is marked by challenges with social communication and social interaction as well as constrained and repetitive patterns in behaviors, interests, and activities (American Psychological Association, 2013). Autism symptoms manifest within the initial three years of a child's life, with subsequent long-term effects (Khowaja, Salim, Asemi, Ghulamani and Shah, 2020). The behavior of each child with autism differs from one to another. One child may exhibit high verbal skills, intelligence, and active participation, while another child may have little or no linguistic abilities and face intellectual difficulties (Khowaja et al., 2020). Children diagnosed with ASD have a wide variety of cognitive and verbal abilities. It is reasonable to anticipate that these children would likewise exhibit significant variation in their reading abilities from early on in life (Davidson and Weismer, 2014).

Prior studies have suggested that individuals diagnosed with ASD may encounter difficulties in developing literacy abilities, specifically in the area of reading comprehension (O'Connor and Klein, 2004; Reutebuch, El Zein, Kim, Weinberg and Vaughn, 2015). Several studies have found that students with ASD often improve in basic literacy abilities such as word recognition, but struggle with reading comprehension (Reutebuch et al., 2015; Karayazi-Ozsayin, 2017).

Individuals diagnosed with ASD often exhibit a difference between their relatively strong ability to read individual words and their poorer comprehension of what they have read. While they might not be very good at reading words at age-appropriate levels, their performance in word-reading activities often exceeds their capacity for comprehending reading passages, indicating a hyperlexic or poorly comprehended profile (Tirado and Saldana, 2016). According to Liu, Wang and Yi (2023), empirical research shows that a significant percentage of autistic children, ranging from 33% to 65%, experience challenges in reading comprehension throughout their school years (McIntyre, Solari, Grimm, Lerro, Gonzales and Mundy, 2017; Nation, Clarke, Wright and Williams, 2006; Ricketts, Jones, Happe and Charman, 2012). Additionally, Reutebuch et al. (2015) indicated that reading comprehension is currently recognized as the most common area of difficulty in the academic performance of students with

Autism Spectrum Disorder (ASD). Recent studies have been conducted to combine research on the difficulties in understanding written text among individuals with Autism Spectrum Disorder (ASD) (Randi, Newman, and Grigorenko, 2010; Ricketts, 2011; Whalon, Al Otaiba, and Delano, 2009). The recent focus on studying reading difficulties in individuals with ASD demonstrates the acknowledgment that achieving proficient reading comprehension by the end of elementary school is crucial for future academic success, cognitive growth, and ultimately, career accomplishments (Solari, Grimm, Mclntyre, Swain-Lerro, Zajic and Mundy, 2017). Therefore, it is essential to do research that enhances our knowledge of the acquisition of essential abilities in order to prevent or minimize reading comprehension difficulties, which is vital for the comprehensive management of ASD (Solari et al. 2017). Studies presented potential underlying variables that could contribute to deficiencies in reading comprehension. One possible reason is that children with ASD are less likely than their neurotypical classmates to utilize relevant cues that would assist in effectively establishing connections between the key concepts offered in a book (O'Connor and Klein, 2004; Reutebuch et al., 2015).

Thought bubbles

Thought bubbles provide a specific, natural, and effective way of evoking thoughts pictorially. They help individuals with ASD understand other people`s behaviors, mental states, and emotions (Wellman, Baron-Cohen, Caswell, Gomez, Swettenham, Toye and Lagattuta, 2002). Thought bubbles are an effective strategy to help individuals with ASD infer the thoughts or take the perspective of another person. In this strategy, children with ASD are asked to fill in the "thought bubble," which shows what one character thinks about the other (Bellini, 2014). Thought bubbles provide information to individuals with ASD about what other people think, do, and say by listening and watching.

The reasons for using the thought bubble strategy are more practical than other strategies, such as the picture-in-head strategy, which improves understanding of other people's behavior and mental states. Thoughts cannot be literally pictured inside the head; however, they may reflect something of thought`s representational qualities pictorially (Wellman et al., 2002). Thought bubbles may be naturally occurring, like speech bubbles in comics, children`s books, and cartoons. Furthermore, a 3- or 4-year-old

typically-developing child can easily understand thought bubbles as a depiction of what a person is thinking. Typically developing children can also understand even when two people have different thoughts about the same object through the use of thought bubbles (Wellman et al., 2002).

Zambo (2006) used two thought bubble pictures for students with ASD. In the class, the first picture was for boys, and the second picture was for girls. The researcher used the thought bubble strategy to analyze the students` feelings about reading. She prompted the students by telling them, "This boy (or girl) is reading a book. Draw what he or she looks like as he or she reads and what goes on in his or her head." Then, the researcher utilized a coding system to analyze the students` drawings. The researcher ranked the students` overall drawings. The result of the study showed that thought bubble strategy is beneficial because it showed the students` perceptions and feelings about reading.

Thought bubbles may be used with cartoon drawings and pictures of people (Bellini, 2014). For example, if Michael is talking about baseball, he is probably thinking about baseball as well. In this activity, researchers, professionals, teachers, or parents should read a statement to the child and ask her/him to fill in the thought bubble for the character. For instance, the child would write the word "baseball" in a thought bubble to define what Michael was thinking (Bellini, 2014). Thought bubble strategy is a theoretically-interesting teaching technique because it improves not only children`s behaviors, but also their understanding of thoughts. Thought bubble strategy is also an easy and effective when used with individuals with ASD (Wellman et al., 2002).

Wellman et al., (2002) used thought bubbles to improve Theory of Mind skills of seven male children with ASD. They utilized false belief tasks as a pretest and posttest tool. The researchers used four pretests in the first session of the study and four posttests in the final session of the study. The interventions took place for up to five sessions per day with each session lasting around 30 minutes. The study showed that children with ASD could easily understand the concept of the thought bubble and they appropriately improved their Theory of Mind skills by using thought bubbles. Kerr and Durkin (2004) have completed a study on thought bubbles as mental representations in 23 children: 12 normally developing children and 11 children with ASD. In this study, researchers tested the standard false belief

tasks and a number of task that used thought bubbles to represent mental states. The results of the study demonstrated that although children with ASD had low verbal mental age, they might be capable of understanding mental representations through to the use of thought bubbles. Another study has also examined the effectiveness of the thought bubble strategy for Theory of Mind development in children with ASD. In this study, Paynter and Peterson (2013) used 24 children with ASD as participants. The results of the study demonstrated that the thought bubble strategy became effective on Theory of Mind growth. Children with ASD generalized their skills to other Theory of Mind steps.

Karayazi-Ozsayin (2017) stated that Agbayewa (2010) used Bubble Dialogue, a type of computer-mediated communication, to examine how children and adolescents with high-functioning autism and Asperger's syndrome understood verbal irony when the usual social cues were absent. The study's findings indicated that children with High-Functioning Autism/Autism Spectrum were able to achieve comparable performance to typically developing participants in terms of their perception of linguistic sarcasm. Many studies have examined thought bubble strategy on the improvement of Theory of Mind skills of children with ASD (Agbayewa, 2010), however, few studies have examined thought bubble training on reading skills of children with ASD, although children with ASD have difficulties with reading and reading comprehension (Agbayewa, 2010).

Study purpose

There has been a recent emphasis on the significance of developing evidence-based interventions aimed at enhancing reading comprehension abilities in children diagnosed with ASD (Drill and Bellini, 2022). This present study aims to improve the reading comprehension skills of individuals with ASD. The research question guiding this study is;

What is the effectiveness of thought bubble strategy on improving reading comprehension of individuals with ASD?

Methodology

Participants

Participants were one boy and two girls diagnosed with Autism Spektrum Disorders. Mustafa was a 11-year-old boy who has ASD. İpek was an 10-

year-old girl who has ASD and Down Syndrome. Zeynep was an 10-year-old girl who has ASD and Attention Deficit Hyperactivity Disorder (ADHD). All information about the participants was collected from their families, special education teachers, IEP forms and reports of Counseling and Research Center. The participants attended a regular education sixth grade classroom, with a part time aide, at a middle school in the Southeastern region in Turkey. All three participants were identified by their special education teachers as performing below grade level on fluency and comprehension tasks. The consent form was obtained from the mothers of the participants.

Settings

All baseline and intervention sessions took place in the participants' homes and applied the intervention pack in a one-on-one format. A quiet area that was not disturbed by other members of the family was chosen. Additionally, other types of distractions like computer games and television shows were not allowed during the all sessions of the study.

Materials

Oral reading skills and reading comprehension test- ii (SOBAT-II)

To determine the eligibility of the participants in this study, the researcher administered the Oral Reading Skills and Reading Comprehension Test-II (SOBAT-II) (Melekoğlu, Erden, and Çakıroğlu, 2021). SOBAT-II was developed as an oral reading and reading comprehension test consisting of two equivalent forms. It might be applied to children who have acquired basic reading skills but have problems with fluent reading and reading comprehension. It is not possible to apply it to children who have not yet acquired reading skills. As a result of SOBAT, children's performances in the dimensions of reading speed, accurate reading, fluent reading and reading comprehension can be determined, and standard score results can be obtained and the grade and age levels of children's reading performances can be determined (Melekoğlu et al., 2021). The test has two parallel forms, A and B Forms. A Form was applied before the sessions and B Form was applied after the sessions to the participants with ASD. Please see the Table 1 for the participants' results of SOBAT-II.

Table 1. Performance summary of Mustafa, İpek, Zeynep,- a form of SOBAT-II

MUSTAFA	Raw Total	Age Equivalent	Grade Equivalent	Percentile	Scaled Score
Rate	3	<7	<2	<1	1
Accuracy	4	<7	<2	<1	1
Fluency	7	<7	<2	<1	1
Comprehension	4	<7	<2	<1	1
İPEK	Raw Total	Age Equivalent	Grade Equivalent	Percentile	Scaled Score
Rate	3	<7	<2	<1	1
Accuracy	4	<7	<2	<1	1
Fluency	7	<7	<2	<1	1
Comprehension	4	<7	<2	<1	1
ZEYNEP	Raw Total	Age Equivalent	Grade Equivalent	Percentile	Scaled Score
Rate	0	<7	<2	<1	1
Accuracy	8	<7	<2	<1	1
Fluency	7	<7	<2	<1	1
Comprehension	14	<7	<2	<1	1

Data collection materials

A textbook which was given from the Ministry of Education of Turkey were administered to the participants during the sessions. Each text in the book included wh- questions. Each one had one point.

Social validity

The researchers utilized a Likert-scale checklist in order to assess social validity. The duration of the survey was around 15-20 minutes, and the data obtained from the survey were subjected to analysis using descriptive statistics. The checklist was formed by the researcher. (see Appendix 1).

Procedure

Prior to beginning the baseline session, the researcher conducted a

thorough examination of the educational records of all participants and administered the SOBAT-II assessment to each individual. This was done to ascertain the suitability of each person for inclusion in the current study. Moreover, in anticipation of every session throughout the various stages of the study, the researcher thoroughly perused each segment of the chosen stories of the textbooks of the participants.

Baseline session

During the baseline session, reading comprehension data were collected without implementing the intervention. During this session, participants read a text which was not read before the participants in the textbooks and then completed the seven questions which were included in the textbooks. The purpose of the questions about the stories was to investigate whether or not the participants understand main ideas or details of the characters, the setting of the story, the main characters` appearance. Sessions lasted between 30-45 minutes and occurred three times per week.

Intervention session

After the baseline session, the researcher introduced the thought bubble strategy to the participants. The researcher provided verbal instruction on how thought bubbles work and show what the thought bubbles look like. Following verbal instruction and visual presentation of thought bubbles, the researcher and participants engaged in a practice thought bubble session. The researcher asked the participants to fill in the bubbles according to the story. When the participants provided a response that is not accurate, the researcher warned them and asked again to find the correct answer. When the participants provided verbal confirmation of having understood the task, training session was completed. Each time, the researcher rewarded the participants verbally, such as "good job!" when the participants answered the questions correctly. The intervention sessions were approximately lasted for 30-45 min.

Follow-up session

After a one-week break, each participant read the stories without thought bubbles. In this phase, the researcher collected at three data points. It was with the baseline session.

Experimental design

This study was single-case experimental research. A randomized multiple baseline (MBL) design with a follow-up extension across participants was implemented to determine the effects of thought bubble strategy on the students' reading comprehension skills. The Multiple Baseline Design (MBD) is an extension of the standard AB design. In the MBD, the baseline phase involves repeated measurements of a variable to establish a baseline effect. Following this, the intervention (independent variable) is introduced in the B condition to observe any changes. Experimental research designs are formulated with the purpose of facilitating the exhibition of change and the deduction that it is improbable for any factor other than the independent variable to be accountable for the observed alteration in the dependent variable (Kratochwill and Levin, 2014; Karayazi-Ozsayin, 2017). Baseline (without thought bubbles) and treatment (with thought bubbles) sessions were used to get data. The inclusion of this measure was deemed essential in order to adhere to the established standards set out by the What Works Clearinghouse (WWC) (Kratochwill, Hitchcock, Horner, Levin, Odom, Rindskopf and Shadish, 2010).

Dependent variables

The dependent variable of the study was reading comprehension as measured by the questions answered correctly on the textbooks.

Inter-rater agreement

A PhD student was trained to check the data. The inter-rater agreement rate was determined by dividing the entire number of agreements by the sum of agreements and disputes, and then multiplying by 100% (Drill and Bellini, 2022). For Mustafa, the mean percentage of inter-rater agreement across all phases of the study was 95% (range = 85%-100%). For İpek, it was 95% (range = 86%-100%), and for Zeynep 92% (range = 86%-100%). The researcher and the doctoral student independently checked inter-rater agreement across all phases of the study.

Data analysis

The data analysis in this study involved masked visual analysis which measures the extent of change, the rate of change, variability, and trends within each phase. The extent of change was assessed through visual

examination of the graphs and the alteration in average performance during each phase of the study (baseline, treatment, and maintenance) (Drill and Bellini 2022). The rate of change was utilized to measure the frequency at which improvements in reading comprehension skills occurred after the implementation of the intervention. This was determined by calculating the number of data points required to exceed the average of the first measurement (Drill and Bellini 2022).

The Split Middle Line Analysis, also known as the Extended Celebration Line (ECL) methodically recorded and analyzed the changes in performance, whether they were improvements or declines, and determined the direction of these changes (Drill and Bellini 2022). The researcher also applied Improved Rate of Differences (IRD) which is the nonparametric effect size metric. It shows the measure of improvement between the baseline and intervention sessions to identify the extend of change or effect size (Drill and Bellini 2022). IRD scores less or equal to 0.50 are considered to have uncertain effects, values ranging from 0.50 to 0.70 are considered to have moderate effects, and scores above 0.70 are considered to have significant impacts. IRD approaches, despite their imperfections, have enhanced statistical precision and are less vulnerable to outliers when compared to other overlap processes like Percent Non-Overlapping Data (PND) and Percentage of Data Exceeding the Mean (PEM) (Drill and Bellini 2022).

Figure 1 illustrates the entire set of data points seen across the various phases. The horizontal axis is indicative of the sessions, while the vertical axis reflects the percentage of correctly answered questions by each participant for each text.

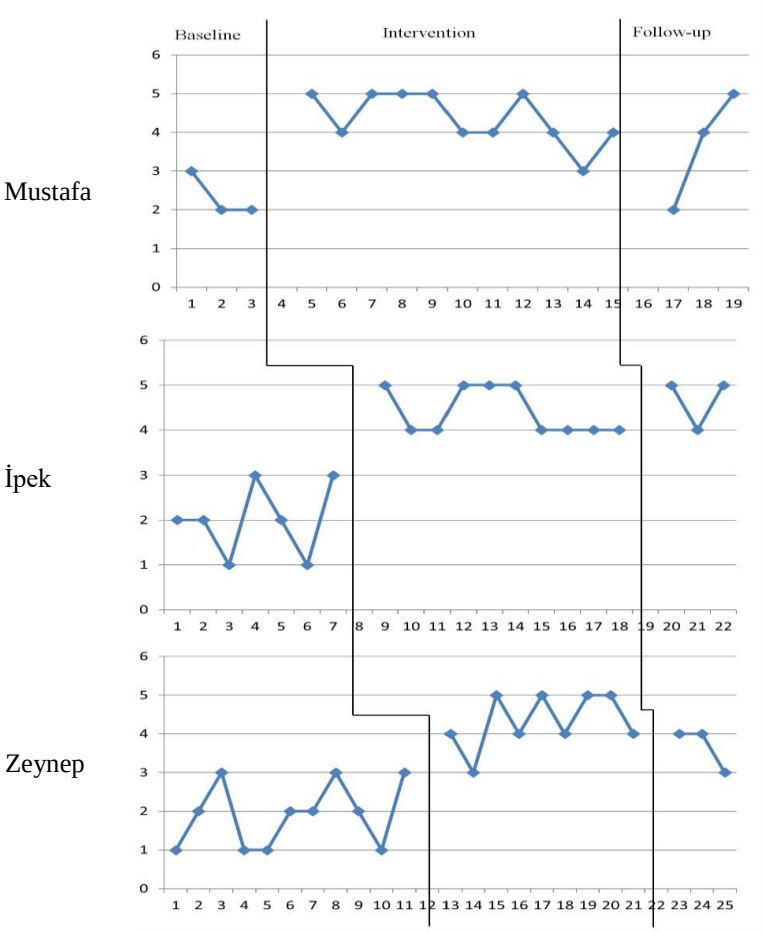

Figure 1. Correct responses in each session

Results

Mustafa

Extend of Change Mustafa's mean score of questions correct in the baseline was 2.33. In the intervention session, Mustafa's mean score of questions correct was 3.45. This shows a gain of 1.12 to Mustafa's baseline mean and a percentage increase of 148.06%to his baseline score in the intervention phase. Mustafa's follow-up phase score was 3.66.

Rate of Change Mustafa's initial mean accuracy rate of 2.33 and maximum accuracy rate of 3 were both exceeded by his first data point in the intervention phase, which had an accuracy rate of 5.

Trend within Each Phase All data points from the intervention phase (100%) surpass the trend line set by the baseline phase data. This exhibits a

highly favorable comparison to the anticipated 50% proportion of intervention data points positioned above the baseline trend line.

Variability Mustafa's accuracy during the baseline phase ranged from 2 to 3. Mustafa's accuracy throughout the intervention phase ranged from 3 to 5. Mustafa's accuracy throughout the maintenance phase ranged from 2 to 5.

IRD To eliminate overlap between the baseline and intervention, two data points would need to be excluded. The baseline consisted of 3 data points, while the intervention had 11 data points. The calculated Robust IRD is 0.91-0.33=0.58, which suggests that the intervention had a moderate impact.

İpek

Extend of Change İpek's mean score of questions correct in the baseline was 2. In the intervention session, İpek's mean score of questions correct was 4.4. This shows a gain of 2.4 to İpek's baseline mean and a percentage increase of 120% to his baseline score in the intervention phase. İpek's follow-up phase score was 4.66.

Rate of Change İpek's initial mean accuracy rate of 2.33 and maximum accuracy rate of 3 were both exceeded by her first data point in the intervention phase, which had an accuracy rate of 5.

Trend within Each Phase All data points from the intervention phase (100%) surpass the trend line set by the baseline phase data. This exhibits a highly favorable comparison to the anticipated 50% proportion of intervention data points positioned above the baseline trend line.

IRD There is no overlap data points between baseline and intervention. There were 11 data points in baseline and 9 data points in intervention level. The Robust IRD is 1-0.29=0.71 indicating that the intervention had a strong effect on the dependent variable.

Zeynep

Extend of Change Zeynep's mean score of questions correct in the baseline was 1.90. In the intervention session, Zeynep's mean score of questions correct was 4.3. This shows a gain of 2.43 to Zeynep's baseline mean and a percentage increase of 127% to her baseline score in the intervention phase. Zeynep's follow-up phase score was 3.66.

Rate of Change Zeynep's initial mean accuracy rate of 1.90 and maximum accuracy rate of 3 were both exceeded by his first data point in the intervention phase, which had an accuracy rate of 4.

Trend within Each Phase All data points from the intervention phase (100%) surpass the trend line set by the baseline phase data. This exhibits a highly favorable comparison to the anticipated 50% proportion of intervention data points positioned above the baseline trend line.
IRD To eliminate overlap between the baseline and intervention, one data points would need to be excluded. The baseline consisted of 11 data points, while the intervention had 9 data points. The calculated Robust IRD is 0.89-0.27=0.62, which suggests that the intervention had a moderate impact.

Results for social validity

According to the result of the social validity questionnaire, all participants indicated that they loved using the thought bubble strategy. In addition, one of the participants, Mustafa, shared that *reading with thought bubbles helped me to understand the main idea of the story and find the characters easily.* Another participant, Zeynep, shared that she enjoyed reading the stories by using thought bubbles. However, the participants expressed that thought bubbles were so enjoyable, but it is hard to draw it. A social validity questionnaire consisting of negative and positive statements to ascertain the participants` thoughts about thought bubble. The researcher applied the self-monitoring method to analyze the responses of the participants.

Discussion and Conclusion

In this study, the goal was to fill a gap indicated in previous literature for the need to examine thought bubble strategy on improving reading comprehension for individuals with ASD (Agbayewa, 2010). A multiple baseline single-case design was utilized to determine the effectiveness of the thought bubble strategy on reading comprehension skills of the individuals with ASD. The results were coherent with previous studies. For example, Zambo (2006) reports that the thought bubbles support individuals to express their ideas about abstract concept, and they make the ideas in the mind visible and concrete. The individuals with ASD got a higher percentage of the score at the end of treatment sessions than the baseline sessions. The thought bubbles helped them comprehend the story and made the ideas in their minds visible. Wellman et al. (2002) indicated that the thought bubble strategy is an effective and easy tool for individuals with ASD. During the study, the participants were eager to attend the intervention and response to the questions. They often mentioned to love

during the investigation.

Thought bubble strategies were usually used to improve Theory of Mind skills, feelings of others, and verbal skills of children with ASD (Agbayewa, 2010). Thought bubble provides to infer the thoughts and understand the perspective of another person (Bellini, 2014). In this study, the participant also improved their understanding of perspective of the main characters` in the story.

A recent literature review has compiled information on reading comprehension difficulties in individuals with ASD (Solari et al., 2017). The recent focus on studying reading difficulties in individuals with ASD acknowledges the importance of achieving proficient reading comprehension by the end of elementary school. This skill is crucial for future academic success, cognitive growth, and ultimately, career advancement (Solari et al., 2017). This study contributes to the existing body of research by creating and assessing an intervention intended to address and improve reading comprehension deficiencies. The result of the study showed that there was a rising trend in reading comprehension skills of the participants with ASD following the intervention application. Future researcher should find successful interventions to improve reading comprehension of individuals with ASD based on the recommendations.

Limitations and future research

Although the study revealed positive findings, it is important to acknowledge the existing limitations. The utilization of a single case design has an impact on the generalizability of the investigation due to the limited sample size. In addition, the study consisted of three different participants. These participants had both strengths and limitations in their academic and social profiles. The three participants in this study do not serve as a representative sample of all individuals with ASD; rather, they only represent themselves. Hence, due to the considerable variation across persons on the autism spectrum and the study's use of a single case design, it is imperative that other researchers replicate this study to ascertain if the intervention can be deemed evidence-based (Drill and Bellini 2022). Furthermore, the study faced a constraint in terms of the number of available students throughout the maintenance phase. This limitation poses a challenge in assessing the extent to which the intervention gains may be

applied to a broader population over time after the intervention is discontinued.

According to the What Works Clearinghouse (2016), minimum of five observations should be applied to establish constancy when new data is introduced. However, for Mustafa, there were only three observations in the baseline session. More observations should be included to get more reliable results. Generalizing the results of the single subject design research is not possible; thus, more research is needed to examine the effectiveness of the thought bubble strategy on reading comprehension skills for individuals with ASD and individuals who have learning disabilities, ADHD, or other deficits which cause a disadvantage in reading comprehension skills. Future research should replicate the current study in different settings such as; school, clinical settings, or home. Future studies also may consider this current study for different grade-level students.

References

Agbayewa, A. S. (2010). *Verbal irony comprehension for children and adolescent with high-functioning autism and asperger`s syndrome in computer-mediated communication* (Master's Dissertation). http://mspace.lib.umanitoba.ca/handle/1993/4319

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington DC: Author.

Bellini, S. (2014). *Building social relationships. A systematic approach to teaching social interaction skills to children and adolescents with autism spectrum disorders and other social difficulties,* Lenexa, Kansas: AAPC Publishing.

Davidson, M. M. and Ellis Weismer, S. (2014). Characterization and prediction of early reading abilities in children on the autism spectrum. *Journal of autism and developmental disorders*, *44*, 828-845.

Drill, R. B., and Bellini, S. (2022). Combining readers theater, story mapping and video self-modeling interventions to improve narrative reading comprehension in children with autism spectrum disorder. *Journal of autism and developmental disorders*, *52*(1), 1-15.

Kerr, S. and Durkin, K. (2004). Understanding of thought bubbles as mental representations in children with autism: Implications for theory of mind. *Journal of autism and developmental disorders*, *34*(6), 637-648.

Khowaja, K., and Salim, S. S. (2013). A systematic review of strategies and computer-based intervention (CBI) for reading comprehension of children with autism. *Research in autism spectrum disorders*, *7*(9), 1111-1121.

Kratochwill, T. R., Hitchcock, J., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M. and Shadish, W. R. (2010). Single-case designs technical documentation. Retrieved from What Works Clearinghouse website: http://ies.ed.gov/ncee/wwc/pdf/wwc_scd.pdf.

Kratochwill, T.R. and Levin, J.R. (2014). Introduction: An overview of single-case intervention research. In K. T. Editor & L. J. R. Editor (Eds.), *Single-case intervention research: Methodological and statistical advances* (pp. 3-23). Washington, DC: American Psychological Association.

Liu, J., Wang, Y., and Yi, L. (2023). Heterogeneity and imbalance of reading profiles in autism spectrum disorders. *Research in autism spectrum disorders*, *100*, 102088.

McIntyre, N. S., Solari, E. J., Grimm, R. P., E Lerro, L., E Gonzales, J., and Mundy, P. C. (2017). A comprehensive examination of reading heterogeneity in students with high functioning autism: Distinct reading profiles and their relation to autism symptom severity. *Journal of autism and developmental disorders*, *47*, 1086-1101.

Nation, K., Clarke, P., Wright, B., and Williams, C. (2006). Patterns of reading ability in children with autism spectrum disorder. *Journal of autism and developmental disorders*, *36*(7), 911–919.

O'Connor, I. M., and Klein, P. D. (2004). Exploration of strategies for facilitating the reading comprehension of high-functioning students with autism spectrum disorders. *Journal of autism and developmental disorders*, *34*(2), 115-127.

Ozsayin, S. K. (2017). *Improving reading comprehension of children with ASD: Implication of anaphoric reference support with computer programming* (Doctoral dissertation, University of South Florida).

Paynter, J., and Peterson, C. C. (2013). Further evidence of benefits of thought-bubble training for theory of mind development in children with autism spectrum disorders. *Research in autism spectrum*

disorders, 7, 7344-348. doi:10.1016/j.rasd.2012.10.001

Randi, J., Newman, T., and Grigorenko, E. L. (2010). Teaching children with autism to read for meaning: Challenges and possibilities. *Journal of autism and developmental disorders*, *40*, 890-902.

Reutebuch, C. K., El Zein, F., Kim, M. K., Weinberg, A. N., and Vaughn, S. (2015). Investigating a reading comprehension intervention for high school students with autism spectrum disorder: A pilot study. *Research in autism spectrum disorders*, *9*, 96-111.

Ricketts, J. (2011). Research review: Reading comprehension in developmental disorders of language and communication. *Journal of child psychology and psychiatry*, *52*(11), 1111-1123.

Ricketts, J., Jones, C. G., Happé, F., and Charman, T. (2012). Reading comprehension in autism spectrum disorders: The role of oral language and social functioning. *Journal of autism and developmental disorders*, *43*(4), 807-816.

Solari, E. J., Grimm, R., McIntyre, N. S., Swain-Lerro, L., Zajic, M., and Mundy, P. C. (2017). The relation between text reading fluency and reading comprehension for students with autism spectrum disorders. *Research in autism spectrum disorders*, *41*, 8-19.

Tirado, M. J., and Saldana, D. (2016). Readers with autism can produce inferences, but they cannot answer inferential questions. *Journal of autism and developmental disorders*, *46*, 1025-1037.

Wellman, H. M., Baron-Cohen, S., Caswell, R., Gomez, J. C., Swettenham, J., Toye, E., and Lagattuta, K. (2002). Thought-bubbles help children with autism acquire an alternative to a theory of mind. *Autism*, *6*(4), 343-363. 10.1177/1362361302006004003

Whalon, K. J., Al Otaiba, S., and Delano, M. E. (2009). Evidence-based reading instruction for individuals with autism spectrum disorders. *Focus on autism and other developmental disabilities*, *24*(1), 3-16.

What Works Clearinghouse. (2016). *Procedures and standards handbook version 3.0*. Washington, DC: US Department of Education.

Zambo, D. (2006). Using thought-bubble pictures to assess students' feelings about reading. *The Reading Teacher*, (8), 798.

Appendix 1.

Social validity / Likert-Type scale for children with ASD

ID	Statements	5	4	3	2	1
1	Thought Bubbles helped me to find the main concept.					
2	I like to use the thought bubbles					
3	I feel comfortable					
4	I am bored with it					
5	It (thought bubble) is easy to use					
	Comment					
5: Strongly Agree, 4: Agree, 3: Neutral, 2: Disagree ,1: Strongly Disagree						