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Research Article

The Efficacy of a Visual Auditory Bombardment Intervention (VABI) Versus Traditional Video Modeling Intervention (VMI) in Students with Pragmatic Language Impairments

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ABSTRACT

Individuals with Autism Spectrum Disorder (ASD), Asperger Syndrome (AS), and Social Communication Disorder (SCD) have deficits in the area of pragmatic (i.e., social) language. Individuals may have difficulty staying on topic, changing topic, providing appropriate comments/questions, using appropriate eye contact, and interpreting and utilizing nonverbal language such as facial expressions, gestures, as well as, changes in prosody/intonation. As speech and language assessments have become more distinguished, intervention approaches have also become more specialized. The current study aims to evaluate a visual auditory bombardment intervention (VABI) designed to target pragmatic language and compare this intervention to a traditional video modeling (VMI) condition, as well as a no-treatment condition (CON). Results of the current study revealed significant differences between the VABI and CON groups in the areas of paralinguistic decoding and paralinguistic signals scores. On the paralinguistic signal measure, the VMI group demonstrated a small effect size compared to the CON group. Additionally, results revealed that the VABI group's post-intervention scores were larger than the CON group. There was a significant effect size on all social language compression measures for individuals in the VABI group compared to the CON group, and a negligible effect size for the difference between the VMI and CON groups. The key findings of this study are both the CAPs and CASL-2 are effective tools in assessing individuals with pragmatic language deficits. Additionally, the VABI intervention proved to be an effective treatment approach of student's understanding and use of affective expression, paralinguistic decoding, and paralinguistic signals.

Keywords: Pragmatic language; Pragmatic language impairment; Visual auditory bombardment; Treatment; High-functioning autism; Social language

INTRODUCTION

Speech, language, and communication difficulties can be observed very early on in life in children with Autism Spectrum Disorder (ASD), Asperger Syndrome (AS), and Social Communication Disorder (SCD) [1,2]. Preschoolers with ASD will have difficulty with form, content, and use of language and as children with ASD continue into their early school years, pragmatic language difficulties become more transparent [2,3]. Children with high functioning Autism (HFA) and AS are typically described as having the desire to be social, but lacking the social competence to do so [4]. Children with SCD present with social language difficulties and may also present with structural language difficulties [5,6]. In order to be effective communicators, children must combine the various aspects of expressive and receptive language (i.e., phonology, morphology, syntax, and semantics) and use those skills appropriately in context (i.e., pragmatics). Individuals must be able to understand and use words, phrases, and sentences correctly, as well as interpret and use nonverbal signals (i.e., facial expressions, gestures, intonation) [7]. The pragmatic language deficits that appear in SCD overlap with deficits observed in students with HFA and AS [8]. Children with ASD, AS, and SCD may have difficulty taking turns during conversation, maintaining a conversational topic, introducing new/appropriate topics, understanding presuppositions, comprehending non-literal language, and interpreting verbal and nonverbal cues [5,6]. Difficulties with nonverbal cues may include troubles decoding and using facial expressions, as well as, interpreting changes in prosody, and using prosody appropriately when speaking [9-12]. Since social interactions rely heavily on understanding and using verbal and nonverbal language, it is important that social language treatments address both areas. Generally, research has focused on the interpretation of nonverbal language and has neglected the actual use of nonverbal language. Additionally, a review conducted by Parsons, Reinie Cordier, Munro, Joosten, and Speyer evaluated current pragmatic language interventions, and found that there were not any effective pragmatic language interventions for adolescents with ASD [13]. Parsons, Reinie Cordier, Munro,

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Joosten, and Speyer reported that this may be due to the complexity and evolution of pragmatic language skills as children develop into adolescents [13]. The current study aims to investigate the effectiveness of a visual auditory bombardment intervention that focuses on the identification and use of paralinguistic skills versus a traditional video modeling intervention.

NON-VERBAL LANGUAGE

Facial expressions

An individual's ability to decode emotion from someone else's facial expressions has been associated with higher social competence [14]. Children are continually developing their ability to decode facial expressions and emotions until the age of ten at which point their decoding skills match that of adults [15]. Previous research has identified that children with HFA, AS, and SCD may have difficulty interpreting facial expressions as well as prosody [16,17]. When trying to interpret an emotional facial expression, typically we focus our gaze on the other's person's eyes and eyebrows. Studies have found for children with ASD, they tend to focus on the lower half of the face (i.e., mouth), in many social/emotional situations [9,18]. Additionally, Grossman and Tager-Flusberg found adolescents with HFA found it difficult to recreate visual sequences of emotional expressions [19]. Further, discovered that children with ASD were able to identify facial emotions when they were shown "strobe-like dynamic presentations," however, demonstrated deficits in the processing of "normal-paced dynamic expressions" [20]. Moreover, Lindner and Rosen conducted a study that compared typically developing children and children with AS and their ability to decode emotion through facial expression, prosody, and verbal content [17]. Lindner and Rosen found that both groups presented with higher than average receptive language skills [17]. Children with AS were found to have a more difficult time decoding emotions from static facial expression, dynamic facial expression, and tone of voice when compared to typically developing peers. There have been limited studies that have evaluated children's use of facial expressivity. A study conducted by Faso, Sasson, and Pinkham investigated facial expressivity in children with ASD compared to typically developing children [10]. In this study, typically developing students and students with ASD were observed by naïve observers who evaluated intensity, naturalness, and emotional category of emotions. ASD expressions were rated as "more intense" and "less natural" than typically developing students expressions. Faso, Sasson, and Pinkham concluded that the findings of their study highlight the differences, not reductions, in facial expressivity in students with ASD that may impact social interaction quality [10].

Prosody/Inflections

For Just as a person's facial expression conveys important information, so does a person's tone of voice. The voice contains important information about a person's emotional and motivational state [21]. In order to successfully communicate with others, it is important that we can understand and process vocal information. Furthermore, it is crucial that we utilize appropriate prosody or tone of voice when communicating. Pragmatic prosody/inflection is used alongside the syntax of a sentence to provide additional information such as a speaker's intentions [22]. For example, when an individual's pitch goes from low to high, it may indicate questioning, excitement, surprise, or insincerity. When there is a downward inflection, the pitch goes from high to low and may indicate empathy, certainty, or confidence. Additionally, stress, can be used to emphasize a certain word or phrase of a sentence to draw attention and affective prosody can provide information into how a person is feeling [22,23]. Children with ASD and AS have been described as having deficits in the use of pitch and volume, having monotone intonation, slow syllable-timed speech, rapid rate of speech, and using aberrant stress patterns [24,25]. Further, individuals with HFA and AS appear to have similar prosodic productions; however, there are significant differences between these two groups and typically developing speakers [25].

Previous research has provided evidence that individuals with ASD have difficulty recognizing emotions and mental states when listening to a speaker [26,27]. Mazefsky and Oswald investigated emotional facial and prosodic stimuli with students between the ages of 8-15 who presented with AS or HFA [28]. The results of their study revealed that students with HFA were significantly impaired in identifying prosodic emotion expressions. Schelinski and von Kriegstein evaluated the relationship between vocal emotion and vocal pitch perception abilities in adults with HFA and adults with typical development [29]. Adults in the HFA group were found to demonstrate less accurate perceptions of vocal emotion than the adults with typical development. Schelinski and von Kriegstein's study suggests that difficulties in vocal emotion recognition may be due to the difficulties of processing sensory features such as vocal pitch [29]. A study conducted by Rutherford et al. examined individuals with HFA and AS's ability to interpret the affective meaning of phrases [30]. Individuals listened to dialogue from audio books that varied in prosody, vocal quality, loudness, speech rate, and pitch. The individuals were asked to listen and then pick one of two adjectives that best described what they heard. The results of Rutherford et al. study showed that when compared to typically developing, individuals with HFA and AS had difficulty judging the speaker's affective meaning [30].

NONVERBAL LANGUAGE INTERVENTIONS

Over the years, there have been numerous interventions designed to target pragmatic language skills in children with ASD, AS, and SCD. Ryan and Charragain investigated Emotion Recognition Training (ERT) in children aged 6 to 14 [31]. ERT aims to teach six core emotions (happy, sad, angry, scared, surprised, and disgusted) using photographs. During treatment, children engage in role-play of emotions, trace and draw emotions, and play various games and discuss what changes facial expressions (e.g., raised eye brow, raised eye-lid, mouth, etc.). Role-play using emotional expressions, tracing and free drawing of facial expressions, and matching activities are used during training. Soorya et al. investigated the efficacy of Nonverbal communication, Emotion recognition, and Theory of mind Training (NETT) in children diagnosed with ASD aged 8 to 11 [32]. NETT is a manualized intervention that targets nonverbal communication and emotion recognition. NETT has a cognitive behavioral approach and uses activities such as skillstreaming, skills training, relationship development intervention, and thought bubbles. Parent training and homework are also incorporated in the training. Soorya et al. found that nonverbal communication, empathic responding, and social relations improved immediately after treatment, however, no significant differences were found at three-month follow up [32]. A study conducted my Thomeer et al. investigated the efficacy of the Mind Reading (MR) computer program in HFA children aged 7 to 12 [33]. MR aims to train

students to decode facial expressions and prosody. MR training involves audio-visual stimuli of voices and faces to learn simple and complex emotions through observation of emotion expressions, structures lessons, quizzes, etc. The MR program also uses in vivo rehearsal trials throughout each session. Thomeer et al.'s study found that students who received the treatment performed significantly better than the control group in regards to emotion decoding and encoding [33].

Current training interventions are typically targeted for children between the ages of six and twelve. As research has shown, social language skills begin to develop early on in children into adulthood, and thus, an intervention that recognizes the various stages of social interactions may prove to be more effective in the training of nonverbal social language skills. Additionally, current treatments typically follow a traditional video modeling approach. The current study aims to evaluate a more complex, visual auditory bombardment intervention (VABI) and compares this more thorough treatment to tradition video modeling interventions (VMI).

MATERIALS

Measures

The Clinical Assessment of Pragmatics (CAPs) and the Clinical Assessment of Spoken Language – Second Edition (CASL-2) were used to assess participants and qualify students as having a social communication disorder [34,35].

The CAPs subtests used in this this study was: Affective Expression, Paralinguistic Decoding, and Paralinguistic Signals.

- *Affective Expression* (expressing emotions) examines the ability to appropriately express polite refusal, regret, support peers, and give compliments, use humor, express empathy, gratitude, and encouragement. This requires higher level thinking because its purpose is not designed to fulfil basic needs. Generally, a speaker is responsive to their conversational partner. This can be expressed through verbal feedback or affective expression. Selection of either or both of these expressions is often changed or determined pending on what the conversational partner may say. The use of affective expression or non-verbal language is a significant factor that may impact a speaker's language use. These expressions are often noted in facial expressions, body posture, tone of voice, and eye contact. During the subtest, a student watches a video and is then asked questions such as, "Show me, what would you tell your friend and how?" While the participant provides an answer, the clinician may be evaluating how affect and prosody is used, and whether empathy was used.
- *Paralinguistic Decoding* (reading nonverbal cues) examines an individual's ability to read nonverbal language such as facial expressions, gestures, and micro-expressions. Nonverbal language plays a huge role when communicating with others. It can provide important information as to how a person is feeling and what they are thinking with/without the accompaniment of words. The ability to understand nonverbal language is essential during conversation as one understands of nonverbal language with produce a reaction and thus, impact the course of conversation. Philofsky, Fidler, and Hepburn have suggested that the inability to understand nonverbal language may lead to socially inappropriate comments, overuse of stereotyped responses, and use of non-existent words [36].
- *Paralinguistic Signals* (using nonverbal cues) examines an individual's ability to appropriately use nonverbal language (e.g., facial expressions, gestures, etc.) and prosody. The paralinguistic signals subtest is similar to affective expression in that the cues may impact the speaker's use of language and the direction of conversation. In particular, this subtest looks at individuals' ability to interpret prosody, which is defined as the rhythm, or intonation, of speech [37]. If an individual has difficulty with prosody, it will be difficult to draw inferences from tone of voice or rate of speech. Additionally, individuals will have a difficult time understanding and using idioms, metaphors, irony, and sarcasm [38].

The CASL-2 subtests used in this study were: Pragmatic Judgment, Meaning from Context, and Inference.

- *Pragmatic Judgment* examines an individual's awareness of the appropriateness of language in relation to the situation in which it is used and the ability to modify language to the situation. For example, individuals must generate questions, requests, or expressions of gratitude or sorrow; initiate conversation or turn-taking; and judge the appropriateness of certain language in a given situation.
- *Meaning from Context* examines recognition of the meaning of an unknown word by using the linguistic context in which the word is presented. Performance on this test is indicative of an individual's ability and/or difficulty when determining the meaning of a word given the context in which the word occurs. This involves making an inference by using only the information found within the linguistic context of the immediate stimulus (sentence) to determine the meaning of an unknown word or phrase.
- *Inference* examines an individual's ability to apply knowledge from past experience to draw conclusions when they are explicitly provided in the given context. Success on this subtest indicates the student's ability to combine information given by the speaker with the information form one's own background and experience in order to draw conclusions that are not explicitly stated.

METHODOLOGY

Participants

Thirty-eight children with pragmatic language difficulties due to ASD or SCD participated in the study. Children were between the ages of 9:0 and 10:11. Children were eligible to participate in this study if they obtained a standard score of ≤ 76 on both the CAPs (Subtests: Affective Expression, Paralinguistic Decoding and Paralinguistic Cues) and the CASL-2 (Subtests: Pragmatic Judgment, Meaning from Context, Inference), and attended general education classrooms for at least 4 hours per day [34,35]. None of the participants presented with hearing impairment, visual impairment, gross neurological impairment, oral–structural anomalies, or emotional disorders. Participants were excluded

from the study if they presented with intellectual disability, learning disability, and/or emotional disturbance. Additionally, students who presented with co-morbid disorders as defined by the American Psychiatric Association in the Diagnostic and Statistical Manual of Mental Health Disorders – Fifth Edition (DSM-V) such as personality disorders, mental health disorders, or general medical conditions were excluded from the study [39].

Experimental groups: Thirty children with PLI were recruited from a school district in California. All children who were receiving treatment for PLI were given informed consent forms and were asked to take them home to their parents. Children whose parents signed and returned the consent forms were randomly assigned to the visual auditory bombardment intervention (VABI) condition or the traditional video modeling intervention (VMI) condition. Fifteen children between the ages of 9:0 and 10:11 years received VABI, and fifteen children between the ages of 9:0 and 10:11 received VMI. There were ten males and five females in the VABI group and nine males and six females in the VMI group.

No-treatment condition (CON) group: Eight children between the ages of 9:0 and 10:11 years old who presented with pragmatic language impairment were placed in the no-treatment condition (CON) group. There were four males and four females in the CON group. Testing was conducted during summer break, so the children in the CON group were not receiving school instruction. Children in the CON group were given the same assessment measures as the children in the treatment groups, separated by an 8-week time period. Pre- and post-test assessments for all three groups were administered and were scored by a team of evaluators who were blind to group assignment and to the goals of the study.

PROCEDURES

Treatment frequency and attendance

Intervention was conducted two times per week for eight weeks, each session lasting 30 minutes. Intervention was provided in a public school, in small groups of two or three students by a California licensed speech language pathologist (SLP). The average attendance of the VABI group was 16 sessions and the average attendance of the VMI group was 15.6, which was not statistically different from the other group. Before implementing the social skills intervention programs, the clinicians who were providing the treatment participated in a training session to master the intervention procedures.

VABI Intervention - Children who were randomly assigned to the VABI group participated in a video modeling intervention that was heavily based on teaching paralinguistic cues. The VABI was structured around activities involving auditory and visual bombardment of facial expressions and vocal inflections and teaching their meanings. A critical difference between the VABI and VMI programs related to teaching of meanings of nonverbal language through use of auditory and visual bombardment of various facial expressions and vocal inflections. The VABI group watched videos of facial expressions up close, such as, nervous, uninterested, in pain, disappointed, etc. Next, they practiced those expressions and then participants listened and practiced vocal inflections based on peer-mentored examples. After role-playing was completed, participants watched videos of situations where something goes wrong and were asked specific questions (same protocol of questions used with all students on all videos), and discussed what went wrong and then role-played correct responses, facial expressions and inflections with practice videos based on 5 topics. The format of sessions went like this: the first session was an introduction, then the topics were introduced and each topic was focused on for 3 sessions.

VMI Intervention - The traditional video modeling group did the same treatment as the VABI group without the use of facial expression videos and vocal infections and without the facial expression and inflection exercises. The VMI participants practiced correct responses on practice videos through role-plays however, did not emphasize practice on facial expressions and inflections in role-play scenarios.

Data analyses

Table 1 shows pre-intervention means and standard deviations for all six dependent measures. There were no reliable group differences for the six dependent measures based on analysis of variance (ANOVA). Pre-test performance was used as a covariate to control for the effects of prior ability for all six dependent measures.

RESULTS

The overall goal of this study was to assess treatment efficacy of an auditory visual approach to teaching how to decode and use facial expressions and vocal inflections appropriately. The independent variable was group (VABI, VMI, and CON). In each case, the dependent variables were the subtests (affective expression,

Table 1: Pre-intervention means and standard deviations for dependent measures for three participant groups: visual auditory bombardment intervention group (VABI), video modeling intervention (VMI), and a no-intervention control group (CON).

	Group					
	VABI		VMI		CON	
	M	SD	M	SD	M	SD
Nonverbal Language						
CAPs Paralinguistic Decoding	8.6	1.2	9.2	0.9	8.8	1.3
CAPs Paralinguistic Signals	5.7	1.8	5.3	1.5	4.9	1.7
Social Language Comprehension						
CAPs Social Context Appraisal	10.7	1.2	11.3	1.6	10.9	1.8
CASL2 Pragmatic Language	23.4	2.4	22.8	2.6	22.5	1.9
CASL2 Idiomatic Language	4.6	1.7	3.9	2.1	4.2	1.5
CASL2 Nonliteral Language	5.6	2.2	6.1	1.6	6.3	2.1

Note: CAPs: Clinical Assessment of Pragmatics (Lavi, 2019); CASL2: Clinical Assessment of Spoken Language.

paralinguistic decoding, paralinguistic signals, pragmatic judgment, meaning from context, and inference) taken from the CAPs and CASL-2. Mixed-model analyses of covariance (ANCOVAs) were conducted on six dependent variables. The alpha level for this study was set at .1 to increase power [40]. Preliminary tests of the homogeneity for the six dependent variables were all non-significant. This suggests that the data met the critical assumptions of ANCOVA. Two pairwise comparisons (VABI vs. CON and VMI vs. CON) were used to analyse group differences as a follow-up to each ANCOVA. The two pairwise comparisons for each measure were tested at the 0.05 level with the alpha level at 0.1. An approximation of Cohen's d effect size that accounted for the mean square error, F for the covariate, raw score means, total sample size, and group size were used to compute the estimates of the effect size of the differences between the treatment and control groups for each dependent measure. A d value of 0.8 was considered to be large, a value of 0.5 was considered to be medium, and a value of 0.2 was considered to be small [41].

Table 2 presents unadjusted group means and standard deviations for six dependent measures. Additionally, group main effects from mixed-model ANCOVAs on nonverbal language and social language comprehension measures, p values for post hoc pairwise comparisons, and their corresponding effect sizes are reported below. There were significant group main effects for each of the nonverbal language measures (Paralinguistic Decoding and Paralinguistic Signals) and for all social language comprehension measures (Social Context Appraisal, Pragmatic Language, Idiomatic Language and Nonliteral Language).

Nonverbal Language: An analysis of post hoc pairwise comparisons for each of the nonverbal language measures clearly revealed a pattern of results indicating higher intervention efficacy with the VABI group. There were significant differences between the VABI and CON groups for the Paralinguistic Decoding and Paralinguistic Signals scores. Similarly, the effect-size analyses revealed a pattern of results in favor of the VABI group. On Paralinguistic Decoding, there was a significant effect size (d=2.21) for the difference between the VABI and CON groups and a negligible effect size (d=0.04) for the difference between the VMI and CON groups. On the Paralinguistic Signals measure, there was a significant effect size (d=1.52) for the difference between the VABI and CON groups and a small effect size (d=0.30) for the difference between the VMI and CON groups, respectively.

Social Language Comprehension: An analysis of post hoc pairwise comparisons for each of the social language comprehension measures revealed that the VABI group's post-intervention scores were significantly larger than the no-intervention control group's scores. Similarly, the effect-size analyses revealed a pattern of results in favor of the VABI group. On all social language comprehension measures, there was a significant effect size (d=0.91; d=1.24; d=0.94 and d=0.91) for the difference between the VABI and CON groups and a negligible effect size (d=0.38; d=0.24; d=0.40 and d=0.21) for the difference between the VMI and CON groups, respectively.

DISCUSSION

The purpose of the current study was to evaluate the efficacy of a visual auditory bombardment intervention (VABI) versus a traditional video modeling intervention (VMI) in improving social language skills in individuals with pragmatic language deficits. At the beginning of the study, all participants were assessed with the Clinical Assessment of Pragmatics (CAPs) and Comprehensive Assessment of Spoken Language – Second Edition (CASL-2) [34,35]. Three subtests were used from the CAPs (Affective Expression, Paralinguistic decoding, and Paralinguistic signals) and three subtests from the CASL-2 (Pragmatic Judgment, Meaning from Context, and Inference) to determine if pragmatic language impairment was present in participants [34,35]. These assessments and subtests were given to all participants after the intervention period. Participants were randomly placed in one of three groups, and the three groups were comparatively analysed based on their pre and post assessment scores to evaluate improved performance.

Table 2: Post-intervention unadjusted means and standard deviations for dependent measures for three groups with post hoc pairwise least significant difference comparison p values and estimated Cohen's d effect sizes.

	Group			Comparisons	
	VABI	**VMI**	**CON**	**VABI *vs.* CON**	**VMI *vs.* CON**
Nonverbal Language					
CAPs Paralinguistic Decoding	10.9	9.6	8.9	0.003	0.261
F (2,18)=6.21; p=0.008; hp^2=0.412	(1.24)	(1.17)	(1.39)	(d=2.21)	(d=0.04)
CAPs Paralinguistic Signals	7.9	5.9	5.2	0.054	0.322
F (2,18)=5.54; p=0.015; hp^2=0.376	(1.62)	(1.74)	(1.67)	(d = 1.52)	(d=0.30)
Social Language Comprehension					
CAPs Social Context Appraisal	12.3	11.5	10.8	0.15	0.568
F (2, 18)=3.65; p=0.035; hp^2=0.289	(1.4)	(1.5)	(1.9)	(d=0.91)	(d=-0.38)
CASL2 Pragmatic Language	25.8	23.2	22.8	0.003	0.247
F (2,18)=6.45; p=0.007, hp^2=0.424	(2.8)	(2.3)	(2.1)	(d=1024)	(d=0.24)
CASL2 Idiomatic Language	6.8	4.9	4.3	0.028	0.265
F (2,18)=5.42; p=0.018; hp^2=0.379	(1.5)	(2.2)	(1.2)	(d=0.94)	(d=-0.40)
CASL2 Nonliteral Language	8.7	7.4	6.4	0.011	0.355
F (2,18)=6.42; p=0.007; hp^2=0.421	(2.1)	(1.4)	(1.8)	(d=0.91)	(d=0.21)

Previous research and treatment has focused primarily on student's identification and understanding of basic with some complex emotions (i.e., angry, sad, happy, disappointed) [31]. The VABI program aims to teach both the understanding and the utilization of basic and more specific emotions (i.e., excited, supportive, uninterested, and sarcastic). Additionally, previous research has emphasized the interpretation of paralinguistic cues (e.g., facial expressions) and has not investigated the actual use of facial expressions in students with ASD and SCD (Volker, Lopata, Smith, & Thomeer, Brewer et al. investigated typically developing individuals' ability to read facial expressions of other typically developing individuals and facial expressions of individuals with ASD [42,43]. The study revealed that expressions made by a participant with ASD were less recognized than a typically developing individual's expression, and that this is most likely because individuals with ASD use atypical emotional expressions. Furthermore, it has been documented that multisensory interventions (i.e., auditory and visually) facilitates the ability to learn [44]. The VABI program is structured around activities that have both auditory and visual bombardment of facial expressions and vocal inflections to teach meaning. The VMI program followed a similar structure to the VABI program, however, did not use facial expression and vocal inflection videos, or exercises. The CON group received no treatment during the 8-week time frame.

Students with social language deficits due to ASD, or PLI demonstrated similar performances on the CAPs and CASL-2 subtests prior to intervention. After intervention, significant differences between the VABI and CON groups in the areas of Paralinguistic Decoding and Paralinguistic Signals were observed. Additionally, the VABI group's post-intervention scores were higher than the CON group and there was a significant effect size on all social language comprehension measures for individuals in the VABI group when compared to the CON group. The VMI group demonstrated a small effect size in the subtest of Paralinguistic Signals when compared to the CON group, however, a negligible effect size was found for the difference between the VMI and CON groups. Thus, the VABI program proved to be an effective treatment approach of student's understanding and use of affective expression, paralinguistic decoding, and paralinguistic signals. Results from the current study suggest that students with pragmatic language deficits due to ASD or SCD have the capacity to benefit from visual and auditory bombardment treatments. Students with social language deficits can watch role-play scenarios and practice their own facial expressions and prosody and begin to engage in more successful, meaningful, appropriate conversations with their family, friends, and peers.

STRENGTHS

A Strengths of the current study include the use of two current pragmatic language assessments, the CAPs and the CASL-2 to determine social language deficits [34,35]. Additionally, a second strength is the use of two treatment groups (VABI and VMI) compared to a no-treatment group. Further, all the participants in this study are from ethnically and culturally diverse backgrounds.

LIMITATIONS

Limitations of this study include the number of participants. There were fifteen participants in both treatment groups, and eight participants in non-treatment group. Additionally, participants were from ethnically and culturally diverse backgrounds, however, all participants came from one school district in California. Lastly, the study targeted only one age group, children 9;0 to 10;11. Future research may replicate the current study by utilizing more participants; expand groups to include multiple age groups, from different areas of the United States [34,35].

CONCLUSION

The clinical implications of this study confirm previous studies that indicate the CAPs and CASL-2 are valid and accurate social language assessment tools. Additionally, the current study demonstrated that social language interventions that utilize both visual and auditory bombardment components of training, focusing on paralinguistic skill development are an effective treatment for students with social language deficits due to ASD, AS, and SCD. Thus, the traditional video based intervention must expand its focus to the targeting of not only the identification of, but also the use of, facial expressions, gestures, and prosody. Additionally, intervention should focus not only on basic emotions, but also more complex emotions.

The findings of the current study echo previous research that emphasizes the importance of differentiating between the various aspects of pragmatic language. When assessments are able to pinpoint the specifics of pragmatic language impairment, intervention can target more appropriately. There have been limited studies and intervention programs that have focused on both the interpretation and use of paralinguistic cues. The results of the current study reveal that the VABI program assists students understanding and use of facial expressions, emotions, prosody, and sarcasm. Furthermore, the multisensory model (i.e., auditory and visual) of the VABI program may increase children's ability to learn social language skills more efficiently than other intervention programs. Thus, there are deeper levels of pragmatic language interventions that can and should be addressed in therapy. Future studies should continue to assess the effectiveness of the VABI programs. Additionally, younger children (aged 7 to 9) and older children (ages 11 to 21) should also be evaluated and treated to determine similarities and differences of paralinguistic skills throughout development. Furthermore, the connection between academic performance and pragmatic language deficits should be explored.

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